National Aeronautics and Space Administration
Langley Research Center

Scientific and Technical Information Program Office

Scientific and Technical Aerospace Reports

STAR

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The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at http://www.uspto.gov/patft/.

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Subject Term Index
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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see *categories 02 through 09*. For information related to space vehicles *see 12 Astronautics*.

20040035729 National Renewable Energy Lab., Golden, CO
New Developments for the NWTC's FAST Aeroelastic HAWT Simulator
Jonkman, J. M.; Buhl, M. L.; Oct. 2003; 18 pp.; In English
Report No.(s): DE2003-15004845; NREL/CP-500-35077; No Copyright; Avail: Department of Energy Information Bridge

Discrepancies in response predictions among FAST, ADAMS, and other industry-accepted wind turbine analysis codes led the National Renewable Energy Laboratory to dedicate significant time and effort to overhauling its FAST aeroelastic horizontal-axis wind turbine simulator. Included in the overhaul were improvements to the system dynamics models and upgrades in functionality. Improvements were made to the drive train dynamics models, output processing algorithms, tower and blade deflection characterizations, and other models. New features include an enhanced input/output environment, aeroacoustic noise prediction algorithms, periodic linearization routines for controls design, as well as a preprocessing utility that enables FAST to generate ADAMS datasets of wind turbine models. In order to verify that the new features and improved models included in the upgraded FAST were correct, verification tests were run against ADAMS. Comparisons of response predictions between the codes, in general, show excellent agreement. Regions where the different response predictions do not exactly coalesce are attributable to differences in the modeling techniques. This work has culminated in an upgraded version of FAST, equipped with more functionality, that predicts more accurate wind turbine responses than previous versions.
NTIS
Aeroelasticity; Simulators; Wind Turbines; Computerized Simulation

20040037767 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronautics and Astronautics, Volume 35, No. 6, 2003
Dewang, L.; Dec. 2003; 136 pp.; In Chinese
Report No.(s): PB2004-102632; Copyright; Avail: National Technical Information Service (NTIS)

Partial Contents: Generation of Sharp and Semi-Sharp Features of Hybrid Subdivision Surfaces; Study and Practice of Imaging Signal Processing for Airborne SAR; Research on Single-Phase AC Excitation of Bifunctional Synchronous AC Motors. Modeling for Doubly-Salient Electro-Magnet Motor Based on Nonlinear Inductance; Data Segmentation Algorithm for a Triangular Mesh Model; WAV Information Automatic Extract Method in XBASE Conversion; Invariant of Group of Motions in Riemann Manifold.
NTIS
Algorithms; Alternating Current; Computational Grids

20040037789 NASA Langley Research Center, Hampton, VA, USA
Angle-of-Attack-Modulated Terminal Point Control for Neptune Aerocapture
Queen, Eric M.; [2004]; 10 pp.; In English; 14th AAS/AIAA Space Flight Mechanics Conference, 8-12 Feb. 2004, Maui, HI, USA
Contract(s)/Grant(s): 800-90-50
Report No.(s): AAS-04-129; Copyright; Avail: CASI; A02, Hardcopy

An aerocapture guidance algorithm based on a calculus of variations approach is developed, using angle of attack as the primary control variable. Bank angle is used as a secondary control to alleviate angle of attack extremes and to control

inclination. The guidance equations are derived in detail. The controller has very small onboard computational requirements and is robust to atmospheric and aerodynamic dispersions. The algorithm is applied to aerocapture at Neptune. Three versions of the controller are considered with varying angle of attack authority. The three versions of the controller are evaluated using Monte Carlo simulations with expected dispersions.
Author
Algorithms; Aerocapture; Angle of Attack; Neptune (Planet); Control Theory; Terminal Guidance

20040040081 NASA Langley Research Center, Hampton, VA, USA
A Two-Timescale Discretization Scheme for Collocation
Desai, Prasun; Conway, Bruce A.; [2004]; 12 pp.; In English; 14th AAS/AIAA Space Flight Mechanics Meeting, 8-12 Feb. 2004, Maui, HI, USA
Contract(s)/Grant(s): 23-759-30-00
Report No.(s): AAS Paper 04-234; Copyright; Avail: Other Sources

The development of a two-timescale discretization scheme for collocation is presented. This scheme allows a larger discretization to be utilized for smoothly varying state variables and a second finer discretization to be utilized for state variables having higher frequency dynamics. As such. the discretization scheme can be tailored to the dynamics of the particular state variables. In so doing. the size of the overall Nonlinear Programming (NLP) problem can be reduced significantly. Two two-timescale discretization architecture schemes are described. Comparison of results between the two-timescale method and conventional collocation show very good agreement. Differences of less than 0.5 percent are observed. Consequently. a significant reduction (by two-thirds) in the number of NLP parameters and iterations required for convergence can be achieved without sacrificing solution accuracy.
Author
Collocation; Nonlinear Programming; Discretization (Mathematics); Aerospace Engineering

20040041322 Congressional Research Service, Washington, DC, USA, Congressional Research Service, Washington, DC, USA
Homeland Security: Protecting Airliners from Terrorist Missiles
Bolkcom, C.; Elias, B.; Feickert, A.; Nov. 2003; 26 pp.; In English
Report No.(s): PB2004-103941; RL-31741; No Copyright; Avail: CASI; A03, Hardcopy

Recent events have focused attention on the threat that terrorists with shoulder fired surface-to-air missiles (SAMs) pose to commercial airliners. Most believe that no single solution exists to effectively mitigate this threat. Instead, a menu of options may be considered, including installing infrared (IR) countermeasures on aircraft; modifying flight operations and air traffic control procedures; improving airport and regional security; and strengthening missile non-proliferation efforts. Equipping aircraft with missile countermeasure systems can protect the aircraft even when operating in areas where ground-based security measures are unavailable or infeasible to implement. However, this option has a relatively high cost, between $1 million and $3 million per aircraft, and the time needed for implementation does not allow for immediate response to the existing terrorist threat. Legislation introduced in the 108th Congress (H.R. 580, S. 311) calls for the installation of missile defense systems in all turbojet aircraft used in scheduled air carrier service. The Department of Homeland Security (DHS) appropriations for Fiscal Year 2004 (P.L. 108-90) designated $60 million dollars for development and testing of a prototype missile countermeasure system for commercial aircraft. DHS anticipates a two year program totaling about $100 million to develop, test, and certify a suitable system. This report will be updated as needed.
NTIS
Commercial Aircraft; Surface to Air Missiles; Missile Defense; Optical Countermeasures

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also *34 Fluid Mechanics and Thermodynamics*.

20040036047 editerranee Univ., Marseille
Study of the Boundary Layer in the Inboard Sections of a Tilt-Rotor Blade by Embedded LDV Measurements
Maresca, Christian; Nsi Mba, Marcellin; Berton, Eric; Favier, Daniel; Barla, Charlie; Jul. 2003; 19 pp.; In English
Contract(s)/Grant(s): N62558-02-M-5609
Report No.(s): AD-A420100; TR-03-00-16-8; ARDSG-R/D-9327-AN-01; No Copyright; Avail: CASI; A03, Hardcopy

This report focuses on the boundary layer (BL) velocity distribution in the inboard region of a tiltrotor blade. The instrumentation consists of a Laser Doppler Velocimeter embedded in the inboard region of the blade. This set up allows measuring the chordwise and spanwise component of the boundary layer velocity from a distance of 0.3 mm to 20 mm along a direction normal to the blade surface. The experiments were carried out on a two-bladed rotor with a blade geometry close to the one of CAMRAD II model of TRAM. The blade section located at r/R=0.3 was explored in three abscissa x/C=0.10; 0.33; 0.54, and for 3 pitch angles, two of them at values lower than the static stall angle of incidence, the third at a higher value. During the tests the tip Mach number was maintained constant at M(sub tip)=0.22. Results obtained on the velocity components have allowed characterizing the different aspects of the BL. At low incidences, chordwise velocity profiles exhibit a turbulent behavior (power law in 1/n) for x/C=0.33 and 0.54. At the chord station x/C=0.10, the BL is very thin with a laminar velocity profile. At the incidence higher than the static stall one, it is worthy to note that the chordwise velocity profile at x/C=0.3 shows an attached turbulent BL, while at x/C=0.54 the velocity profile begins to deviate from a turbulent shape to a separated one that produces the thickening of the BL and an evolution of the profile to a velocity distribution with an inflexion point. This result confirms the delay of the BL separation due to rotation, already observed. At the leading edge (x/C=0.1), and for the present low rotational speed OMEGA, the velocity distribution in the BL seems to point out a transitional zone inside of which the randomness of the velocity intensity attests to a high vorticity that may be due to a leading edge vortex or a bubble formation sustaining during the rotation the reattachment of the BL as observed at x/C=0.33.
DTIC
Boundary Layers; Doppler Effect; Laser Doppler Velocimeters; Rotary Wings; Tilt Rotor Aircraft; Unsteady Flow

20040036049
Investigation of the Orthogonal Blade-Vortex Interaction
Early, J. M.; Green, R. B.; Coton, F. N.; Dec. 2003; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N62558-02-M-6011
Report No.(s): AD-A420101; GU-AERO-0318; ARDSG-R/D-9324-AN-01; No Copyright; Avail: CASI; A03, Hardcopy

A Stereoscopic Particle Image Velocimetry (SPIV) system was developed and applied to measurements of the Orthogonal Blade-Vortex Interaction (BVI) in a wind tunnel. Measurements of the isolated vortex showed that the SPIV system could resolve the jet velocity profile within the vortex core to a reasonable accuracy, and views of the vortex from different sides of the wind tunnel showed similar velocity profiles. For the BVI measurements the SPIV system showed the existence of a strong splash' back effect as the vortex impacted on the lower surface of the blade; the splash effect consists of deceleration and reversal of the vortex core jet velocity. Over the upper surface the SPIV system again showed a reduction of the vortex core jet velocity, but could only suggest the development of an in-flow towards the blade surface. As such the SPIV system has not provided a complete physical description of the fluid dynamics of the BVI over the blade upper surface, and any further investigation should probably use Laser Doppler Anemometry. Behind the blade the vortex rapidly becomes reorganized. (16 figures, 44 refs.)
DTIC
Blade-Vortex Interaction; Jet Flow; Rotary Wings

20040036383 Rutgers - The State Univ., New Brunswick, NJ
High Repetition Rate Pulse-Burst Laser and Camera for Energy Deposition Research
Elliott, Greg; Knight, Doyle; Nov. 30, 2003; 13 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0283; Proj-3484
Report No.(s): AD-A420384; AFRL-SR-AR-TR-04-0115; No Copyright; Avail: CASI; A03, Hardcopy

Final Progress (1 Jun 02 30 Nov 03): A high speed camera and pulse-burst Nd:YAG laser system has been purchased as part of the DURIP equipment grant to be used for the development of novel diagnostic techniques and research associated with energy deposition. This system will allow a burst of laser pulses (for diagnostics and flow excitation utilizing laser energy deposition) and subsequent imaging at MHz rates. Preliminary images with the DALSTAR 64K1M camera system and two Epix frame grabbing boards have been taken for flows associated with laser induced breakdown in air and arc/plasmas plumes to test the system. The custom built pulse burst laser has been designed, assembled and initial performance evaluations completed. The laser is initiated with a Lightwave cw Nd:YAG diode pumped laser, chopped with a programmable Pockels cell Kentech pulse shaper, and amplified by five Nd:YAG flashlamp from Quantronics-Continuum. The system can provide a packet of pulses with over 28 mJ of energy with pulse separation variable from one microsecond and above. The laser and camera will be used in the study of energy deposition in supersonic flows and the development of temporally resolved flow visualization and quantitative diagnostics techniques. The techniques developed will be applied to current research projects

involving energy deposition for local flow control and as well as other studies of DOD research interest.
DTIC
Energy Transfer; Neodymium Lasers; Pulsed Lasers; Yag Lasers

20040040109 Research and Technology Organization, Neuilly-sur-Seine, France
Flight Test Measurement Techniques for Laminar Flow
October 2003; In English; Original contains color illustrations
Report No.(s): RTO-AG-300-Vol-23; AC/323(SCI-040)/45-Vol-23; Copyright; Avail: CASI; C01, CD-ROM

This AGARDograph provides information on flight test techniques, instrumentation, environmental effects, and flight procedures that have been used successfully in laminar flow research. Many techniques are described for measuring the location of boundary layer transition in-flight, from the very simple to the more complex. References to previous works are included for readers to explore. Specific instrumentation for flight is described and the unique environmental effects of flight noted. Procedures for flight test maneuvers are also included.
Author
Laminar Flow; Boundary Layer Transition; Test Facilities; Data Acquisition

20040040163 NASA Langley Research Center, Hampton, VA, USA
A Reduced-Order Model for Efficient Simulation of Synthetic Jet Actuators
Yamaleev, Nail K.; Carpenter, Mark H.; December 2003; 32 pp.; In English
Contract(s)/Grant(s): WU 23-762-20-11
Report No.(s): NASA/TM-2003-212664; L-18331; No Copyright; Avail: CASI; A03, Hardcopy

A new reduced-order model of multidimensional synthetic jet actuators that combines the accuracy and conservation properties of full numerical simulation methods with the efficiency of simplified zero-order models is proposed. The multidimensional actuator is simulated by solving the time-dependent compressible quasi-1-D Euler equations, while the diaphragm is modeled as a moving boundary. The governing equations are approximated with a fourth-order finite difference scheme on a moving mesh such that one of the mesh boundaries coincides with the diaphragm. The reduced-order model of the actuator has several advantages. In contrast to the 3-D models, this approach provides conservation of mass, momentum, and energy. Furthermore, the new method is computationally much more efficient than the multidimensional Navier-Stokes simulation of the actuator cavity flow, while providing practically the same accuracy in the exterior flowfield. The most distinctive feature of the present model is its ability to predict the resonance characteristics of synthetic jet actuators; this is not practical when using the 3-D models because of the computational cost involved. Numerical results demonstrating the accuracy of the new reduced-order model and its limitations are presented.
Author
Active Control; Jet Flow; Finite Difference Theory; Navier-Stokes Equation; Actuators; Cavity Flow

20040040172 Pratt and Whitney Aircraft Group, East Hartford, CT, USA
Advanced Subsonic Technology (AST) 22-Inch Low Noise Research Fan Rig Preliminary Design of ADP-Type Fan 3
Jeracki, Robert J., Technical Monitor; Topol, David A.; Ingram, Clint L.; Larkin, Michael J.; Roche, Charles H.; Thulin, Robert D.; February 2004; 68 pp.; In English
Contract(s)/Grant(s): NAS3-27727; WBS 22-781-30-12
Report No.(s): NASA/CR-2004-212718; E-14242; No Copyright; Avail: CASI; A04, Hardcopy

This report presents results of the work completed on the preliminary design of Fan 3 of NASA s 22-inch Fan Low Noise Research project. Fan 3 was intended to build on the experience gained from Fans 1 and 2 by demonstrating noise reduction technology that surpasses 1992 levels by 6 dB. The work was performed as part of NASA s Advanced Subsonic Technology (AST) program. Work on this task was conducted in the areas of CFD code validation, acoustic prediction and validation, rotor parametric studies, and fan exit guide vane (FEGV) studies up to the time when a NASA decision was made to cancel the design, fabrication and testing phases of the work. The scope of the program changed accordingly to concentrate on two subtasks: (1) Rig data analysis and CFD code validation and (2) Fan and FEGV optimization studies. The results of the CFD code validation work showed that this tool predicts 3D flowfield features well from the blade trailing edge to about a chord downstream. The CFD tool loses accuracy as the distance from the trailing edge increases beyond a blade chord. The comparisons of noise predictions to rig test data showed that both the tone noise tool and the broadband noise tool demonstrated reasonable agreement with the data to the degree that these tools can reliably be used for design work. The section on rig airflow and inlet separation analysis describes the method used to determine total fan airflow, shows the good

agreement of predicted boundary layer profiles to measured profiles, and shows separation angles of attack ranging from 29.5 to 27deg for the range of airflows tested. The results of the rotor parametric studies were significant in leading to the decision not to pursue a new rotor design for Fan 3 and resulted in recommendations to concentrate efforts on FEGV stator designs. The ensuing parametric study on FEGV designs showed the potential for 8 to 10 EPNdB noise reduction relative to the baseline.
Author
Computational Fluid Dynamics; Aerodynamic Noise; Air Flow; Noise Prediction; Flow Distribution

20040040199 NASA Langley Research Center, Hampton, VA, USA
A Comparison of Active and Passive Methods for Control of Hypersonic Boundary Layers on Airbreathing Configurations
Berry, Scott A.; Nowak, Robert J.; [2003]; 16 pp.; In English; JANNAF 27th Airbreathing Propulsion Subcommittee Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA
Contract(s)/Grant(s): 23-794-40-31; No Copyright; Avail: CASI; A03, Hardcopy

Active and passive methods for control of hypersonic boundary layers have been experimentally examined in NASA Langley Research Center wind tunnels on a Hyper-X model. Several configurations for forcing transition using passive discrete roughness elements and active mass addition, or blowing, methods were compared in two hypersonic facilities, the 20-Inch Mach 6 Air and the 31-Inch Mach 10 Air tunnels. Heat transfer distributions, obtained via phosphor thermography, shock system details, and surface streamline patterns were measured on a 0.333-scale model of the Hyper-X forebody. The comparisons between the active and passive methods for boundary layer control were conducted at test conditions that nearly match the nominal Mach 7 flight trajectory of an angle-of-attack of 2-deg and length Reynolds number of 5.6 million. For the passive roughness examination, the primary parametric variation was a range of trip heights within the calculated boundary layer thickness for several trip concepts. The prior passive roughness study resulted in a swept ramp configuration being selected for the Mach 7 flight vehicle that was scaled to be roughly 0.6 of the calculated boundary layer thickness. For the active jet blowing study, the blowing manifold pressure was systematically varied for each configuration, while monitoring the mass flow, to determine the jet penetration height with schlieren and transition movement with the phosphor system for comparison to the passive results. All the blowing concepts tested were adequate for providing transition onset near the trip location with manifold stagnation pressures on the order of 40 times the model static pressure or higher.
Author
Hypersonic Speed; Hypersonic Boundary Layer; Air Breathing Engines; Flight Paths; Thermography; Static Pressure; Boundary Layer Control; Reynolds Number

20040040216 QinetiQ Ltd., Farnborough, UK
Military Vortices
Lovell, D. A.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 12 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper briefly reviews the wide range of vortex flows encountered on military vehicles. Vortex flows are classified into those designed into a vehicle to improve performance, those which cannot be avoided and whose deleterious effects must be minimized, and those that were not expected to occur. Examples of vortex-flow effects on air and sea vehicles and in propulsion systems are cited to illustrate these categories. It is concluded that vortex flows are all-pervasive and can have major effects on the operation and performance of military vehicles. With the trend to increased diversity in shape for future vehicles it is deemed essential to continue to improve the knowledge and predictive capability for vortex flows.
Author
Military Aircraft; Vortices; Aerodynamics; Ships; Hydrodynamics

20040040222 Defence Evaluation Research Agency, Bedford, UK
An Experimental and Computational Study of the Aerodynamics of a Square Cross-Section Body at Supersonic Speeds
Birch, Trevor J.; Prince, Simon A.; Simpson, Graham M.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 14 pp.; In English; See also 20040040215; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

An experimental and computational study has been carried out to investigate the aerodynamic characteristics of a square

cross-section body at supersonic speeds. The results show that a square cross-section body generates higher normal force and offers improved lift-to-drag ratios when compared with conventional circular cross-section bodies for certain preferred orientations. However it was found that square cross-section bodies can also generate significant lateral forces and moments, and very complicated leeside vortical flowfields which complicate the missile control system. A Parabolized Navier-Stokes solver was successfully employed to predict the forces and moments, and provided added valuable insight into the complex vortical flows which develop on the leeside of bodies at incidence.
Author
Aerodynamic Characteristics; Supersonic Speed; Squares (Mathematics)

20040040245 Institute for Aerospace Research, Ottawa, Ontario, Canada
Motion Effects on Leading-Edge Vortex Behavior over Delta Wings and Generalized Modeling
Huang, X. Z.; Hanff, E. S.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 21 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Effects of static attitude and three different motions on vortex behavior and its breakdown over delta wings have been investigated. These motions include 1) harmonic oscillation or ramp-and-hold motion in roll at constant resultant angle of attack, 2) harmonic oscillation or ramp-and-hold in pitch and 3) coning at constant resultant angle of attack. A basic 65 deg delta wing configuration was tested in two wind tunnels as well as in a water tunnel. A roll rig, pitch rig and coning rig (OPLEC) were employed for the investigation. Quite different flow characteristics have been found within the spiral vortex breakdown region even under steady conditions. The point where vortex breaks down into large scale turbulence has a very long response time to perturbations and is the major cause for the dramatic time dependence observed in the airloads. In addition, bi-stable vortex breakdown locations are observed in the case of slender delta wings when breakdown is located close to the trailing edge. Under dynamic conditions, the behavior of the vortex and its breakdown region have been found to be highly dependent on motion waveform and reduced angular rates. An analytical model based on the Nonlinear Indicial Response Method and a formulation suggested by Tobak et al, and capable of reflecting the above effects is proposed to predict breakdown location under dynamic conditions.
Author
Leading Edges; Vortices; Delta Wings; Attitude (Inclination); Vortex Breakdown; Wind Tunnel Tests

20040040246 Air Force Research Lab., Wright-Patterson AFB, OH, USA
An Experimental Investigation of Leading Edge Vortices and Passage to Stall of Nonslender Delta Wings
Ol, Michael V.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 16 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper describes an experimental investigation of the structure and decay of the leading edge vortices (LEVs) produced by a nonslender delta wing. The work was conducted in a water tunnel facility at the California Institute of Technology, and was sponsored by the Air Force Research Laboratory (AFRL). Stereoscopic digital particle image velocimetry was used to obtain three-component velocity data in planar slices across the flowfield above the wing leeward surface. These measurements were motivated by flow visualization by dye injection. Delta wings of 50 deg and 65 deg leading edge sweep at Reynolds numbers of 8000 and 14000, respectively, were studied. For both wings, stable primary LEVs were observed over the entire planform for 5 deg angle of attack and below. For the 50 deg wing, the secondary LEVs were found to decay more abruptly and at lower angle of attack than the primary LEVs, all but disappearing by 10 deg angle of attack. This suggests a possible predictive criterion for breakdown of the primary vortices, at least at low Reynolds number. The entire vortex system undergoes large-scale instabilities in the 12 deg - 20 deg angle of attack range. The leading edge shear layer, however, remains in an organized rolled-up state in this angle of attack range. By 20 deg, the flow over the leeward side of the wing is completely stalled.
Author
Leading Edges; Vortices; Delta Wings; Aerodynamic Stalling

20040040248 Nangia Aero Research Associates, Bristol, UK
Vortex Flow Dilemmas and Control on Wing Planforms for High Speeds
Nangia, R. K.; Miller, A. S.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 14 pp.; In English; See also 20040040215; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Aircraft for sustained supersonic flight usually feature low aspect ratio wings with varying (reducing) leading edge sweep over the outer portion to achieve an 'adequate' low-speed performance. A high-speed 'cruise' wing then becomes subject to mixed flows at low-speeds, including strong vortical flows. Dilemmas then arise whether to exploit the vortical flows or to control / suppress them (actively or passively) with LE and TE devices. On one hand vortical flows lead to higher lift at the expense of higher drag and possible flow breakdown over the outer wing. On the other hand, controlling them implies reduced lift but higher L/D. The dilemmas are more intense if the configuration is 'attitude-limited' (floor angle, tail strike). All this leads to the need for improving the understanding of vortical flows on a given configuration. This paper focuses on vortex control with different types of LE and TE devices. Several examples are given. The techniques developed can be adapted to more complex configurations including canards, nacelles, etc.
Author
Vortices; Wing Planforms; Circulation Control Airfoils

20040040249 Orleans Univ., France
Unsteady Aerodynamic Model for Thin Wings with Evolutive Vortex Sheets
Leroy, Annie; Buron, Franck; Devinant, Philippe; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper presents recent advances in a computing method for unsteady inviscid incompressible flows around thin lifting surfaces with arbitrary motion. This involves the velocity field, deriving from a potential, the pressure field and the free vortex sheet characteristics (geometry and vortex strength). When considering high angles of attack, the separation lines along which the vortex sheets are shed are the trailing edge, as well as wing tips or parts of the leading edge. Compared to classical methods of singularity, such as panel methods, an improved vortex wake model was constructed. It consists in representing the wake by a vortex particle concept, particularly well suited for the prediction of its unsteady deformations. This approach stems from the unsteady vortex sheet theory established by MUDRY, in which the vortex sheet is considered as a median layer, on which is founded the concept of continuous vortex particle. This ensures the computing method to compare favorably with the classical methods in terms of flexibility and computing costs. Computed unsteady flow-field simulations are presented for several cases and compared with some available experimental data.
Author
Unsteady Aerodynamics; Thin Wings; Vortex Sheets

20040040291 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen, Germany
Study on Unsteady Vortex Behaviour of a Rolling 65 deg Delta Wing at M=0.8 using Pressure Sensitive Paint (PSP)
Engler, Rolf H.; Klein, Christian; Fonov, Sergey; Buetefisch, Karl-Aloys; Bock, Karl-Wilhelm; Weiskat, Dirk; Fritz, Willi; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 11 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Since the need for improvements in high angle-of-attack maneuverability of aircraft in transonic flight was of concern, a model was rotated around its longitudinal body axis with a dimensionless rolling rate of omega = 0.0762 (10 Hz), resulting in flow conditions with extensive vortical behavior and strongly non-linear, wing/vortex interference effects. This paper deals with validation experiments performed at the DLR Gottingen. The objective of this activity was to provide experimental data for comparison with numerical calculations performed within the international WEAG TA 15 group: Alenia (Italy), DERA (UK), DLR and EADS (Germany), and NLR (The Netherlands). A special 65 deg delta wing, the DLR PSP-model, was designed, manufactured and finally tested in the transonic 1m x 1m wind tunnel DNW-TWG in Gottingen. A rolling apparatus was built up to enable roll rates up to 10 Hz. A new sting concept was developed as elastic simulations showed dangerous problems associated with the rolling model exposed to the periodic aerodynamic load. The experiments were carried out at angles of attack alpha = 10 deg and 17 deg, M = 0.8, Reynolds number of 5.3 Mio in the case of steady and 2.2 Mio for unsteady conditions. The model was equipped with only a few pressure taps for PSI and Kulite sensors, as surface pressure distributions of the model should be obtained using the pressure sensitive paint (PSP) technique, to measure the pressure all over the whole surface of the model. As the model was rotating an unsteady PSP technique had to be applied. Several steps had to be considered in order to finally use the measured pressure distributions for comparison with numerical predictions. In the case of steady conditions the results compare quite well with the conventional pressure taps and numerical calculations, in the case of the spinning model discrepancies between Kulite values and PSP as well as numerical results could be stated.

Vortex breakdown predicted by the Euler calculations can be confirmed by the experiment.
Author
Unsteady Aerodynamics; Vortices; Delta Wings; Roll

20040040293 Lockheed Martin Aeronautics Co., Fort Worth, TX, USA
Transonic Pressure, Force, and Flow-Visualization Measurements on a Pitching Straked Delta Wing at High Alpha
Cunningham, Atlee M., Jr.; Geurts, Evert G. M.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 28 pp.; In English; See also 20040040215; Original contains black and white illustrations
Contract(s)/Grant(s): F33657-84-C-0247; F49620-94-C-0093; NIVR-07501N; Copyright; Avail: CASI; A03, Hardcopy

A force and pressure test was conducted in May 1992 (at the National Aerospace Laboratory [NLR], The Netherlands) on a simple straked wing with the objective to extend the understanding of flow fields at low speed and high incidence obtained in earlier tests, up to transonic speeds also at high incidences. A flow-visualization test was then conducted with the same simple straked wing modes in August 1996 for the purpose of obtaining flow-visualization data to complement the pressure and force database generated in the earlier tests. These tests were conducted in order to examine the flow-field characteristics at high-alpha conditions that involve vortices, shocks, and separated flows. Laser light sheet/water vapor techniques were used to illuminate the flows, and video recording was used to obtain the data. Both low- and high-speed video cameras were used to examine spanwise and streamwise laser sheet positions. In addition, under NLR funding, some preliminary particle image velocimetry (PIV) data were obtained at M = 0.225 and 0.6, as well as some pulsed laser-flow visualization (9 nano-sec pulse) at M = 0.9. Correlation was performed between the flow-visualization data from this test and the pressure/force data obtained in 1992 on the same configuration. The database described in this paper has been included in the RTO database for verification and validation data for computational unsteady aerodynamics.
Author
Transonic Flow; Flow Visualization; Delta Wings; Strakes; Angle of Attack

20040040304 NASA Langley Research Center, Hampton, VA, USA
Experimental Hypersonic Aerodynamic Characteristics of the Space Shuttle Orbiter for a Range of Damage Scenarios
Brauckman, Gregory J.; Scallion, William I.; [2003]; 22 pp.; In English; JANNAF 27th Airbreathing Propulsion Subcommittee, 1-5 Dec. 2003, Colorado Springs, CO, USA
Contract(s)/Grant(s): 23-372-20-80; No Copyright; Avail: CASI; A03, Hardcopy

Aerodynamic tests in support of the Columbia accident investigation were conducted in two hypersonic wind tunnels at the NASA Langley Research Center, the 20-Inch Mach 6 Air Tunnel and the 20-Inch Mach 6 CF4 Tunnel. The primary purpose of these tests was to measure the forces and moments generated by a variety of outer mold line alterations (damage scenarios) using 0.0075-scale models of the Space Shuttle Orbiter (approximately 10 inches in length). Simultaneously acquired global heat transfer mappings were obtained for a majority of the configurations tested. Test parameters include angles of attack from 38 to 42 deg, unit Reynolds numbers from 0.26 to 3.0 x10^6 per foot, and normal shock density ratios of 5 (Mach 6 air) and 12 (Mach 6 CF4). The damage scenarios evaluated included asymmetric boundary layer transition, gouges in the windward surface acreage thermal protection system tiles, wing leading edge damage (partially and fully missing reinforced carbon-carbon (RCC) panels), holes through the wing from the windward surface to the leeside, deformation of the wing windward surface, and main landing gear door and/or gear deployment. The aerodynamic data were compared to the magnitudes and directions observed in flight, and the heating images were evaluated in terms of the location of the generated disturbances and how these disturbance might relate to the response of discrete gages on the Columbia Orbiter vehicle during entry. The measured aerodynamic increments were generally small in magnitude, as were the flight-derived values during most of the entry. Asymmetric boundary layer transition (ABLT) results were consistent with the flight-derived Shuttle ABLT model, but not with the observed flight trends for STS-107. The partially missing leading edge panel results best matched both the early aerodynamic and heating trends observed in flight. A progressive damage scenario is presented that qualitatively matches the flight observations for the full entry.
Author
Aerodynamic Characteristics; Hypersonic Wind Tunnels; Heat Transfer

20040040305 NASA Langley Research Center, Hampton, VA, USA

Aerosciences, Aero-Propulsion and Flight Mechanics Technology Development for NASA's Next Generation Launch Technology Program

Cockrell, Charles E., Jr.; [2003]; 14 pp.; In English; AIAA 12th International Space Planes and Hypersonic Systems and Technologies Conference, 15-19 Dec. 2003, Norfolk, VA, USA

Report No.(s): AIAA Paper 2003-6948; No Copyright; Avail: CASI; A03, Hardcopy

The Next Generation Launch Technology (NGLT) program, Vehicle Systems Research and Technology (VSR&T) project is pursuing technology advancements in aerothermodynamics, aeropropulsion and flight mechanics to enable development of future reusable launch vehicle (RLV) systems. The current design trade space includes rocket-propelled, hypersonic airbreathing and hybrid systems in two-stage and single-stage configurations. Aerothermodynamics technologies include experimental and computational databases to evaluate stage separation of two-stage vehicles as well as computational and trajectory simulation tools for this problem. Additionally, advancements in high-fidelity computational tools and measurement techniques are being pursued along with the study of flow physics phenomena, such as boundary-layer transition. Aero-propulsion technology development includes scramjet flowpath development and integration, with a current emphasis on hypervelocity (Mach 10 and above) operation, as well as the study of aero-propulsive interactions and the impact on overall vehicle performance. Flight mechanics technology development is focused on advanced guidance, navigation and control (GN&C) algorithms and adaptive flight control systems for both rocket-propelled and airbreathing vehicles.

Author

Aerothermodynamics; Flight Mechanics; Reusable Launch Vehicles; Supersonic Combustion Ramjet Engines; Launch Vehicles

20040040335 Swales Aerospace, Hampton, VA, USA

Integrated Mode Choice, Small Aircraft Demand, and Airport Operations Model User's Guide

Yackovetsky, Robert E., Technical Monitor; Dollyhigh, Samuel M.; February 2004; 18 pp.; In English

Contract(s)/Grant(s): NAS1-00135; WU 23-762-50-02

Report No.(s): NASA/CR-2004-212998; No Copyright; Avail: CASI; A03, Hardcopy

A mode choice model that generates on-demand air travel forecasts at a set of GA airports based on changes in economic characteristics, vehicle performance characteristics such as speed and cost, and demographic trends has been integrated with a model to generate itinerate aircraft operations by airplane category at a set of 3227 airports. Numerous intermediate outputs can be generated, such as the number of additional trips diverted from automobiles and schedule air by the improved performance and cost of on-demand air vehicles. The total number of transported passenger miles that are diverted is also available. From these results the number of new aircraft to service the increased demand can be calculated. Output from the models discussed is in the format to generate the origin and destination traffic flow between the 3227 airports based on solutions to a gravity model.

Author

Civil Aviation; Air Transportation; Aircraft Models; Airports; Demand (Economics); Airline Operations

20040040346 Institute of Space Medico-Engineering, Beijing, China

Aerodynamic Characteristics of Crewman's Arms During Windblast

Zhang, Yun-Ran; Wu, Gui-Rong; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 344-348; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to study the aerodynamic characteristics of crewman's arms with or without protective devices in the status with raised legs or not. The experiments were performed in an FL-24 transonic and supersonic wind tunnel, over Mach number range of 0.4 - 2.0, with 5 deg - 30 deg angles of attack, 0 deg - 90 deg sideslip angles and Re number of (0.93 - 3.1) x 10(exp 6). The test model was a 1/5-scale crewman/ejection seat combination. The aerodynamic characteristics of the various sections of crewman's arms were studied and analyzed. The results showed that: 1) The effect of raised leg on the aerodynamic characteristics of the crewman's arms was very evident, and was related to the status of leg raising; 2) The sideslip considerably increased aerodynamic loads on the crewman's arms, in particular when beta = 50 deg the loads were severe in the test; 3) The tested protective devices was valid, the effectiveness of wind deflector in protecting crewman's arms was evident; 4) A formula for calculating aerodynamic force acting on crewman's arms was presented. The following conclusions can be drawn: 1) The tested protective device was valid, and the effectiveness of wind deflector in protecting crewman's arms was evident; 2) An aerodynamic basis for the development of crewman windblast protective device

was presented; 3) The calculation formula presented is useful in estimating aerodynamic forces of crewman's arms.
Author
Flight Crews; Aerodynamic Characteristics; Arm (Anatomy); Wind Tunnel Tests; Ejection Seats; Protectors

20040042478 NASA Ames Research Center, Moffett Field, CA, USA
Neural Network Modeling of UH-60A Pilot Vibration
Kottapalli, Sesi; [2003]; 1 pp.; In English; American Helicopter Society 4th Decennial Specialist's Conference on Aeromechanics, 21-23 Jan. 2004, San Francisco, CA, USA
Contract(s)/Grant(s): RTOP 712-92-43; No Copyright; Avail: Other Sources; Abstract Only

Full-scale flight-test pilot floor vibration is modeled using neural networks and full-scale wind tunnel test data for low speed level flight conditions. Neural network connections between the wind tunnel test data and the tlxee flight test pilot vibration components (vertical, lateral, and longitudinal) are studied. Two full-scale UH-60A Black Hawk databases are used. The first database is the NASMArmy UH-60A Airloads Program flight test database. The second database is the UH-60A rotor-only wind tunnel database that was acquired in the NASA Ames SO- by 120- Foot Wind Tunnel with the Large Rotor Test Apparatus (LRTA). Using neural networks, the flight-test pilot vibration is modeled using the wind tunnel rotating system hub accelerations, and separately, using the hub loads. The results show that the wind tunnel rotating system hub accelerations and the operating parameters can represent the flight test pilot vibration. The six components of the wind tunnel N/rev balance-system hub loads and the operating parameters can also represent the flight test pilot vibration. The present neural network connections can significandy increase the value of wind tunnel testing.
Author
Neural Nets; Wind Tunnel Tests; Vibration; Test Pilots; Flight Tests

20040043792 Naval Postgraduate School, Monterey, CA
Angular Rate Estimation by Multiplicative Kalman Filtering Techniques
Watson, Vincent C.; Dec. 2003; 68 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420668; No Copyright; Avail: CASI; A04, Hardcopy

Spacecraft attitude estimation and pointing accuracy have always been limited by imperfect sensors. The rate gyroscope is one of the most critical instruments used in spacecraft attitude estimation and unfortunately historical trends show this instrument degrades significantly with time. Degraded rate gyroscopes have impacted the missions for several NASA and ESA spacecraft, including the Hubble Telescope. A possible solution to this problem is using a mathematically modeled dynamic gyroscope in lieu of a real one. In this thesis, data from such a gyro is presented and integrated into a spacecraft attitude estimation algorithm. The impediment to spacecraft attitude estimation presented by imperfect sensors has been overcome by developing more accurate sensors and using Kalman filters to reduce the effect of noisy measurements. Kalman filters for spacecraft attitude estimation have historically been based on an Euler angle or quaternion formulation. Though Euler angles and quaternions are arguably the most common methods with which to describe the attitude of a spacecraft, other methods of describing attitudes do exist - including the Gibbs and Rodriguez parameters. A Kalman filter based upon the Gibbs parameter is presented and analyzed in this thesis.
DTIC
Angular Velocity; Attitude (Inclination); Gyroscopes; Kalman Filters

20040043812 Air Univ., Maxwell AFB, AL
Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1982. Volume 33, Number 4
Hatton, Jackie L.; Dec. 1982; 456 pp.; In English
Report No.(s): AD-A420706; No Copyright; Avail: CASI; A20, Hardcopy

The Air University Library Index to Military Periodicals is a subject index to significant articles, news items, and editorials appearing in 76 English language military and aeronautical periodicals not indexed in readily available commercial indexing services. The index originated with 23 titles as a quarterly publication in 1949, and has continued on a quarterly basis superseded by annual cumulations (triennial cumulative issues were published from 1952 through 1967). From 1949 to 1962 the index was issued as Air University Periodical Index. Staff members of Air University Library index all of the periodicals with the exception of four titles which are indexed by other Air Force, Army, and Navy libraries. Air University Library Index to Military Periodicals serves primarily the educational and research programs of Air University. The Index is available to other libraries upon request.
DTIC
Indexes (Documentation); Libraries; Periodicals; Subjects

20040043820 Air Univ., Maxwell AFB, AL

Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1975. Volume 26, Number 4

Rucks, Frances B.; Dec. 1975; 441 pp.; In English

Report No.(s): AD-A420720; No Copyright; Avail: CASI; A19, Hardcopy

The Air University Library Index to Military Periodicals is a subject index to significant articles, news items and editorials appearing in 67 English language military and aeronautical periodicals not indexed in readily available commercial indexing services. The Index originated with 23 titles as a quarterly publication in 1949, and has continued on a quarterly basis superseded by annual cumulations; triennial cumulative issues were published from 1952 through 1967. From 1949 to - 1962 the Index was issued as Air University Periodical Index. Staff members in the Reader Services Division and Editing Section of Air University Library index the periodicals with the exception of six titles which other Air Force, Army, and Navy libraries index. Air University Library Index to Military Periodicals serves primarily the educational and research programs of Air University. The Index is available to other libraries upon request.

DTIC

Indexes (Documentation); Libraries; Periodicals; Subjects; United States

20040043822 Air Univ., Maxwell AFB, AL

Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1977. Volume 28, Number 4

Rucks, Frances B.; Dec. 1977; 426 pp.; In English

Report No.(s): AD-A420722; No Copyright; Avail: CASI; A19, Hardcopy

The Air University Index to Military Periodicals is a subject index to significant articles, news items and editorials appearing in 75 English language military and aeronautical periodicals not indexed in readily available commercial indexing services. The Index originated with 23 titles as a quarterly publication in 1949, and has continued on a quarterly basis superseded by annual cumulations; triennial cumulative issues were published from 1952 through 1967. From 1949 to 1962 the Index was issued as Air University Periodical Index. Staff members in the Reader Services Division and Indexing Systems Branch, Systems Division, of Air University Library index the periodicals with the exception of six titles which other Air Force, Army, and Navy libraries index. Air University Library Index to Military Periodicals serves primarily the educational and research programs of Air University. The Index is available to other libraries upon request.

DTIC

Indexes (Documentation); Libraries; Periodicals; Subjects; United States

20040043831 Air Univ., Maxwell AFB, AL

Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1988. Volume 39, Number 4

Adams, Emily J.; Stewart, Martha; Dec. 1988; 623 pp.; In English

Report No.(s): AD-A420732; No Copyright; Avail: CASI; A99, Hardcopy

The Air University Library Index to Military Periodicals is a subject index to significant articles, news items, and editorials appearing in 77 English language military and aeronautical periodicals. It originated with 25 titles as a quarterly publication in 1949 and has continued on a quarterly basis superseded by annual cumulations (triennial cumulative issues were published from 1952 through 1967). From 1949 to 1962 the Index was issued as Air University Periodical Index. Staff members of Air University Library index all of the periodicals with the exception of five titles which are indexed by other Air Force, Army, and Navy libraries. The Air University Library Index to Military Periodicals serves primarily the educational and research programs of Air University; it is available to other libraries upon request.

DTIC

Indexes (Documentation); Libraries; Periodicals; Subjects

20040043904 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Nonlinear Transonic Flutter Prediction for F-16 Stores Configuration Clearance

Toth, Raymond G.; Mar. 2003; 180 pp.; In English

Report No.(s): AD-A420830; AFIT/GAE/ENY/03-8; No Copyright; Avail: CASI; A09, Hardcopy

Limit cycle oscillation (LCO) has been an issue for the F-16 since its operational deployment. Configuration validation requires large investments in time and resources due to the very specific and stringent guidelines used during flight test to ensure the aircraft does not encounter classical flutter or excessive LCO. A new approach, incorporating inherent nonlinearities that drive LCO is investigated using the Transonic Equivalent Strip method to account for wing thickness effects and shock structure. The g- method flutter solution is used to include first-order aerodynamic damping effects. Two F-16 store

configurations are examined to correlate predicted flutter onset speeds, frequencies, and character with those found in flight test, as well as the aerodynamic effect of modeling underwing stores on the flutter solution. Results show small changes in the tuning of the structural model resulted in large changes in the flutter boundary. The aerodynamic influence of underwing stores proved significant, particularly for the two most outboard wing stations. Most importantly, the character of the instability was predicted by the new method.
DTIC
Clearances; External Stores; F-16 Aircraft; Fighter Aircraft; Flutter; Flutter Analysis; Nonlinearity; Prediction Analysis Techniques; Transonic Flutter

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety* and *85 Technology Utilization and Surface Transportation*.

20040035794 NASA Glenn Research Center, Cleveland, OH, USA
A Computational Icing Effects Study for a Three-Dimensional Wing: Comparison with Experimental Data and Investigation of Spanwise Variation
Thompson, D.; Mogili, P.; Chalasani, S.; Addy, H.; Choo, Y.; [2004]; 19 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG3-2562; WBS 22-728-41-10
Report No.(s): AIAA Paper 2004-0561; Copyright; Avail: CASI; A03, Hardcopy

Steady-state solutions of the Reynolds-averaged Navier-Stokes (RANS) equations were computed using the Colbalt flow solver for a constant-section, rectangular wing based on an extruded two-dimensional glaze ice shape. The one equation Spalart-Allmaras turbulence model was used. The results were compared with data obtained from a recent wind tunnel test. Computed results indicate that the steady RANS solutions do not accurately capture the recirculating region downstream of the ice accretion, even after a mesh refinement. The resulting predicted reattachment is farther downstream than indicated by the experimental data. Additionally, the solutions computed on a relatively coarse baseline mesh had detailed flow characteristics that were different from those computed on the refined mesh or the experimental data. Steady RANS solutions were also computed to investigate the effects of spanwise variation in the ice shape. The spanwise variation was obtained via a bleeding function that merged the ice shape with the clean wing using a sinusoidal spanwise variation. For these configurations, the results predicted for the extruded shape provided conservative estimates for the performance degradation of the wing. Additionally, the spanwise variation in the ice shape and the resulting differences in the flow fields did not significantly change the location of the primary reattachment.
Author
Aircraft Icing; Rectangular Wings; Reynolds Averaging; Navier-Stokes Equation

20040035915 Virginia Transportation Research Council, Charlottesville, VA
Forensic Investigation of Pavement Distress: Old Airport Road in Bristol, Virginia
Freeman, T. E.; 2003; 30 pp.; In English
Report No.(s): PB2004-102828; VTRC-04-R6; Copyright; Avail: National Technical Information Service (NTIS)

A few years after Old Airport Road in Bristol, Virginia was reconstructed, inordinate distortions of remarkable uniformity began to appear in the paved asphalt surface directly above concrete pipe culverts, which were buried beneath and across the road to transport storm runoff. The distortions closely resemble broad speed bumps that extend across all lanes. The growing influence of the distortions on ride quality and subsequent complaints from the traveling public prompted the City of Bristol to request the investigation reported here. A summary of the project's construction background, methods and findings of the investigation, conclusions regarding the cause of distress, and recommendations for remedial action are presented. The portion of Old Airport Road afflicted by the distress is five lanes wide and extends to an approximately 0.80 mile in length from its intersection with Bonham Road to I-81 toward the north. Of the 20 pipe culverts that were constructed transversely beneath the road, 14 exhibited some sign of surface distortion at the time of this report. The culverts were placed as part of the Old Airport Road widening and reconstruction project in 1994. This forensic investigation, which included visual and video surveys of pavements and culverts, a geotechnical examination of subgrade conditions, a non-destructive pavement deflection

analysis, laboratory and microscopic analyses of culvert trench backfill material, and review of a pertinent geotechnical exploration conducted by others, was designed to determine if the distress was the result of (1) settlement between culverts, or (2) heaving of the trenches themselves.
NTIS
Distortion; Airports; Asphalt; Concretes; Surface Distortion

20040036175 Naval Air Warfare Center, China Lake, CA
Composite Materials in Aircraft Mishaps Involving Fire: A Literature Review
Wright, Mark T.; Luers, Ariam C.; Darwin, Robert L.; Scheffey, Joseph L.; Bowman, Howard L.; Jun. 2003; 107 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420193; NAWCWD-TP-8552; No Copyright; Avail: CASI; A06, Hardcopy

When Navy aircraft are involved in crash incidents, firefighters must be aware of hazards presented by airframe composite-material construction. Composite matrices may be combustible, contributing to the aircraft fuel load and burning hazard. Additionally, fibers released from burning composites may present a respiration hazard to firefighters. Current Navy and military doctrine recognize these hazards; cautionary guidance is provided for composite materials reinforced with carbon/graphite fibers and boron/tungsten fibers. The Naval Air Systems Command (NAVAIR), which provides technical guidance for aircraft fire safety, was concerned that hazards presented by new composite materials and greater quantities of composites may not be adequately addressed in current firefighting and guidance. The objective of this project was to perform a literature search to identify any existing 'gaps in knowledge' concerning the role of composite materials in a fire mishap involving an aircraft having composite construction materials. With these 'gaps' identified, future actions can be identified, prioritized, and performed.
DTIC
Aircraft Accidents; Aircraft Safety

20040036299 Advanced Information Engineering Services, Inc., Dayton, OH
JSF Caesar: Construction of a 3-D Anthropometric Sample for Design and Sizing of Joint Strike Fighter Pilot Clothing and Protective Equipment
Hudson, Jeffrey A.; Zehner, Gregory F.; Robinette, Kathleen M.; Sep. 2003; 184 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-02-C-6000; Proj-7184
Report No.(s): AD-A420324; LOCKHEED PO-7073412; AFRL-HE-WP-TR-2003-0142; No Copyright; Avail: CASI; A09, Hardcopy

The Joint Strike Fighter (JSF) anthropometric Cases 1 through 8 were not intended to represent a statistical description for the variation important in the design of personal clothing and equipment for the JSF pilot. Instead, the anthropometric measures associated with the JSF Cases define the minimum level of physical accommodation for men and women in the Joint Strike Fighter cockpit. The statistical process of constructing representative cases used in the design of clothing and gear require an entirely different multivariate approach. CAESAR, a 3-D whole body database, was sampled to produce 1374 subjects (651 men and 723 women) that represent a modern equivalent to the WATS population, but using projected demographics of JSF flyers in the Joint Services in the year 2010. After analysis, and overlay of the JSF Cases, 646 men and 695 women were identified as falling within weight allowances and the reconstructed ellipses of accommodation defined by the original JSF Cases. The forty traditional measures and the associated 3-D scans of these individuals represent the statistical base from which JSF flight clothing and equipment can be designed and/or sized.
DTIC
Anthropometry; Cockpits; Pilot Performance; Flight Clothing

20040036525 Air Univ., Maxwell AFB, AL
Probe And Drogue Aerial Refueling Requirements: How Will Air Force Special Operations Command Meet Future Demands?
Shapland, John S.; Jun. 2002; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420495; No Copyright; Avail: CASI; A05, Hardcopy

The demands placed on Air Force Special Operations Command (AFSOC) aerial refueling tankers have outpaced USA Special Operations Command's (USSOCOM) ability to organize, train, and equip the current forces to accomplish their mission. This paper asks the question 'How will AFSOC meet the requirements for helicopter aerial refueling in the 2007 to

2012 timeframe?' In order to place this question in context a short history of USSOCOM, AFSOC, and helicopter aerial refueling is presented first, Then this paper evaluates the predicted security environment of 2007 to 2012 and the expected shortfalls in AFSOC tanker capabilities The need to 'go deep with precision' is explored, as well as expected solutions to tanker shortages Suggestions for improvement to the predicted situation include accelerating the refueling modification of the MC-130H aircraft and purchasing 28 additional aircraft to increase the number of tanker assets, Secondly, the MC-130P should be modified with additional defensive equipment to transition to a 'penetrating tanker' status since they are already conducting operations over enemy territory with increased risk, Also, changes to the planning and coordination process are suggested to increase the efficiency and quality of planning for future tanker aircraft, Lastly, it is suggested that SOF and Rescue forces are combined in the future to produce a single air manager for all probe and drogue operations, These improvements will increase the flexibility and decrease the occurrence of tanker limitations on future USSOCOM operations.
DTIC
Air to Air Refueling; Military Operations; Tanker Aircraft; Towed Bodies

20040040084 NASA Glenn Research Center, Cleveland, OH, USA
Overview of High Speed Close-Up Imaging in an Icing Environment
Miller, Dean R.; Lynch, Christopher J.; Tate, Peter A.; February 2004; 16 pp.; In English
Contract(s)/Grant(s): WBS 22-728-41-01
Report No.(s): NASA/TM-2004-212925; AIAA Paper 2004-0407; E-14357; No Copyright; Avail: CASI; A03, Hardcopy

The Icing Branch and Imaging Technology Center at NASA Glenn Research Center have recently been involved in several projects where high speed close-up imaging was used to investigate water droplet impact/splash, and also ice particle impact/bounce in an icing wind tunnel. The combination of close-up and high speed imaging capabilities were required because the particles being studied were relatively small (d < 1 mm in diameter), and the impact process occurred in a very short time period (t(sub impact) << 1 sec). High speed close-up imaging was utilized to study the dynamics of droplet impact and splash in simulated Supercooled Large Droplet (SLD) icing conditions. The objective of this test was to evaluate the capability of a ultra high speed camera system to acquire quantitative information about the impact process (e.g., droplet size, velocity). Imaging data were obtained in an icing wind tunnel for spray cloud MVD > 50 m. High speed close-up imaging was also utilized to characterize the impact of ice particles on an airfoil with a thermally protected leading edge. The objective of this investigation was to determine whether ice particles tend to 'stick' or 'bounce' after impact. Imaging data were obtained for cases where the airfoil surface was heated and unheated. Based on the results from this test, follow on tests were conducted to investigate ice particle impact on the sensing elements of water content measurement devices. This paper will describe the use of the imaging systems to support these experimental investigations, present some representative results, and summarize what was learned about the use of these systems in an icing environment.
Author
High Speed Cameras; Ice Formation; Drops (Liquids); Detection; Moisture Content

20040040154 NASA Langley Research Center, Hampton, VA, USA
Synthetic Vision Enhances Situation Awareness and RNP Capabilities for Terrain-Challenged Approaches
Kramer, Lynda J.; Prinzel, Lawrence J., III; Bailey, Randall E.; Arthur, Jarvis J., III; [2003]; 11 pp.; In English; AIAA's 3rd Annual Aviation Technology, Integration and Operations Technical Forum, 17-19 Nov. 2003, Denver, CO, USA
Contract(s)/Grant(s): 728-60-10-03
Report No.(s): AIAA Paper 2003-6814; No Copyright; Avail: CASI; A03, Hardcopy

The Synthetic Vision Systems (SVS) Project of Aviation Safety Program is striving to eliminate poor visibility as a causal factor in aircraft accidents as well as enhance operational capabilities of all aircraft through the display of computer generated imagery derived from an onboard database of terrain, obstacle, and airport information. To achieve these objectives, NASA 757 flight test research was conducted at the Eagle-Vail, Colorado airport to evaluate three SVS display types (Head-Up Display, Head-Down Size A, Head-Down Size X) and two terrain texture methods (photo-realistic, generic) in comparison to the simulated Baseline Boeing-757 Electronic Attitude Direction Indicator and Navigation / Terrain Awareness and Warning System displays. These independent variables were evaluated for situation awareness, path error, and workload while making approaches to Runway 25 and 07 and during simulated engine-out Cottonwood 2 and KREMM departures. The results of the experiment showed significantly improved situation awareness, performance, and workload for SVS concepts compared to the Baseline displays and confirmed the retrofit capability of the Head-Up Display and Size A SVS concepts. The research also demonstrated that the pathway and pursuit guidance used within the SVS concepts achieved required navigation performance (RNP) criteria.
Author
Situational Awareness; Enhanced Vision; Navigation; Terrain; Head-Up Displays; Approach Control

20040040158 NASA Langley Research Center, Hampton, VA, USA
The Application of Lidar to Synthetic Vision System Integrity
Campbell, Jacob L.; UijtdeHaag, Maarten; Vadlamani, Ananth; Young, Steve; [2003]; 7 pp.; In English; 22nd Digital Avionics Systems Conference, 14-16 Oct. 2003, Indianapolis, IN, USA
Contract(s)/Grant(s): NAG1-351; 728-60-30-01; Copyright; Avail: CASI; A02, Hardcopy

One goal in the development of a Synthetic Vision System (SVS) is to create a system that can be certified by the Federal Aviation Administration (FAA) for use at various flight criticality levels. As part of NASA s Aviation Safety Program, Ohio University and NASA Langley have been involved in the research and development of real-time terrain database integrity monitors for SVS. Integrity monitors based on a consistency check with onboard sensors may be required if the inherent terrain database integrity is not sufficient for a particular operation. Sensors such as the radar altimeter and weather radar, which are available on most commercial aircraft, are currently being investigated for use in a real-time terrain database integrity monitor. This paper introduces the concept of using a Light Detection And Ranging (LiDAR) sensor as part of a real-time terrain database integrity monitor. A LiDAR system consists of a scanning laser ranger, an inertial measurement unit (IMU), and a Global Positioning System (GPS) receiver. Information from these three sensors can be combined to generate synthesized terrain models (profiles), which can then be compared to the stored SVS terrain model. This paper discusses an initial performance evaluation of the LiDAR-based terrain database integrity monitor using LiDAR data collected over Reno, Nevada. The paper will address the consistency checking mechanism and test statistic, sensitivity to position errors, and a comparison of the LiDAR-based integrity monitor to a radar altimeter-based integrity monitor.
Author
Enhanced Vision; Real Time Operation; Aircraft Safety; Radio Altimeters; Optical Radar

20040040164 NASA Langley Research Center, Hampton, VA, USA
Effects of an Approach Spacing Flight Deck Tool on Pilot Eyescan
Oseguera-Lohr, Rosa M.; Nadler, Eric D.; February 2004; 29 pp.; In English
Contract(s)/Grant(s): WU 23-728-60-10
Report No.(s): NASA/TM-2004-212987; L-18345; No Copyright; Avail: CASI; A03, Hardcopy

An airborne tool has been developed based on the concept of an aircraft maintaining a time-based spacing interval from the preceding aircraft. The Advanced Terminal Area Approach Spacing (ATAAS) tool uses Automatic Dependent Surveillance-Broadcast (ADS-B) aircraft state data to compute a speed command for the ATAAS-equipped aircraft to obtain a required time interval behind another aircraft. The tool and candidate operational procedures were tested in a high-fidelity, full mission simulator with active airline subject pilots flying an arrival scenario using three different modes for speed control. Eyetracker data showed only slight changes in instrument scan patterns, and no significant change in the amount of time spent looking out the window with ATAAS, versus standard ILS procedures.
Author
Eye Movements; Scanners; Speed Control; Airspeed

20040040165 NASA Langley Research Center, Hampton, VA, USA
An Integrated Decision-Making Model for Categorizing Weather Products and Decision Aids
Elgin, Peter D.; Thomas, Rickey P.; February 2004; 43 pp.; In English
Contract(s)/Grant(s): WU 23-728-40-10
Report No.(s): NASA/TM-2004-212990; L-18343; No Copyright; Avail: CASI; A03, Hardcopy

The National Airspace System s capacity will experience considerable growth in the next few decades. Weather adversely affects safe air travel. The FAA and NASA are working to develop new technologies that display weather information to support situation awareness and optimize pilot decision-making in avoiding hazardous weather. Understanding situation awareness and naturalistic decision-making is an important step in achieving this goal. Information representation and situation time stress greatly influence attentional resource allocation and working memory capacity, potentially obstructing accurate situation awareness assessments. Three naturalistic decision-making theories were integrated to provide an understanding of the levels of decision making incorporated in three operational situations and two conditions. The task characteristics associated with each phase of flight govern the level of situation awareness attained and the decision making processes utilized. Weather product s attributes and situation task characteristics combine to classify weather products according to the decision-making processes best supported. In addition, a graphical interface is described that affords intuitive selection of the appropriate weather product relative to the pilot s current flight situation.
Author
Decision Making; National Airspace System; Weather Forecasting; Civil Aviation; Air Transportation; Models

20040041294 National Transportation Safety Board, Washington, DC

National Transportation Safety Board Aircraft Accident Report: Loss of Control and Impact With Terrain Aviation Charter, Inc. Raytheon (Beechcraft) King Air A100, N41BE, Near Eveleth, Minnesota, on October 25, 2002

Nov. 18, 2003; 76 pp.; In English

Report No.(s): PB2003-910403; NTSB/AAR-03/03; NOTATION-7602; No Copyright; Avail: CASI; A05, Hardcopy

This report explains the accident involving Aviation Charter, Inc., which crashed while the flight crew was attempting to evacuate the VOR approach to runway 27 at Eveleth-Virginia Municipal Airport, Eveleth, Minnesota, on October 25, 2002. The safety issues discussed in this report include flight crew proficiency, Aviation Charter operational and training issues, inadequate crew resource management (CRM) training, Federal Aviation Administration (FAA) surveillance, and the need for improved low-airspeed awareness. Safety recommendations concerning CRM training, FAA surveillance, and low-airspeed alert systems are addressed to the FAA.

NTIS

Aircraft Accidents; Warning Systems; Flight Crews; Resources Management

20040041308 Civil Aerospace Medical Inst., Oklahoma City, OK, USA, Essex PB and R Corp., Edwardsville, IL, USA

Performance Criteria for Development of Extended Use Protective Breathing Equipment

Garner, Robert P.; Utechtt, Jeffrey S.; February 2004; 8 pp.; In English

Contract(s)/Grant(s): FAA-AM-B-03-PRS-94

Report No.(s): DOT/FAA/AM-04/3; No Copyright; Avail: CASI; A02, Hardcopy

The Federal Aviation Administration (FAA) requires under Federal Aviation Regulation (FAR) 121.337 that crew protective breathing equipment (PBE) for smoke and fume protection is installed aboard aircraft and that crewmembers be trained in the proper use of PBE (FAR 121.417). A variety of designs currently exist that meet the requirements of these regulations. However, the threat posed by atmospheric contamination in an environment that cannot be quickly escaped suggests that extending the protective capabilities of PBE devices beyond what is mandated by the FAA may be beneficial in aviation and other arenas. These experiments were conducted to evaluate the use of one style of PBE in terms of potential for long-term (>20 min) use and to identify issues critical to long-term use. A closed-circuit PBE device utilizing lithium hydroxide (LiOH) technology for carbon dioxide (CO2)removal was tested. The capability to supply fresh oxygen to the user had been incorporated into the prototype design. Breathing simulator testing clearly demonstrated that CO2 levels during use were consistent with theoretical values and represented the limiting factor for long-term wear when coupled with the 'ad libitum' use of oxygen. As expected, metabolic CO2 production rate was the primary factor limiting time of use in the prototype testing performed. From a practical standpoint, it was also clear that consistent and effective means of oxygen delivery and temperature control need to be developed. If these issues can be successfully addressed in terms of meeting a metabolic demand anticipated for a given operational environment, PBE capable of providing from 2 to 5 hours of protection to the user may be a viable possibility.

Author

Breathing Apparatus; Lithium Hydroxides; Carbon Dioxide; Flight Crews; Oxygen

20040043752 Air Univ., Maxwell AFB, AL

The Training of Military Pilots: Men, Machines, and Methods

Hays, Michael D.; Jun. 2002; 68 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420558; No Copyright; Avail: CASI; A04, Hardcopy

This study analyzes strategic issues in Air Force undergraduate pilot training (SUPT). After describing the key variables that determined pilot training's historical development, the author assesses what type of training system, generalized or specialized, produces the best ratio of cost to effect. The conclusion is that the current specialized system is more responsive to disparate operational needs, better matches training media to task, and generates large cost savings for the Air Force. Next, the writer evaluates recent structural changes to SUPT and analyzes the pilot training systems of the US Navy and Israeli Air Force, Several broad conclusions emerge from these inquiries: the need to stabilize the still-maturing SUPT system; the potential benefits of improved candidate pre-selection methods; and, finally, the pivotal role of the instructor pilot in any training program's success. The final chapter synthesizes the study's findings and implications to suggest an optimal course for future Air Force pilot training.

DTIC

Education; Flight Training; Human Beings; Males

20040043772 Naval Postgraduate School, Monterey, CA

Navy/Marine Corps TACAIR Integration: Impact on Operational and Supporting Activities

Lamoureux, Gerald P., Jr.; Forero, Juan F.; Martin, Richard C., Jr.; MartinezDiaz, Alberto; Dec. 2003; 59 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420633; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this MBA Project was to investigate and provide a comprehensive overview regarding the current issues regarding Tactical Aircraft Integration within the Department of the Navy. This project was conducted with the sponsorship and assistance of the Comptroller, Commander Naval Air Forces Pacific. The goal of this project was to identify issues and provide an analysis of the ongoing efforts between the Navy and Marine Corps. Four criteria were set aside for deliverables: 1) Produce key documentation, most notably the Memorandum of Understanding and the Memorandum of Agreement; 2) Produce any milestones or timetables required for integration; 3) Discuss issues regarding funding and resource allocation as applied to the integration process; 4) Provide information on requirements for integrating operational and supporting activities. This project delineates a brief history of the operational requirements of the F/A-18 and what necessitated changes within the TACAIR community. The topics covered will explain how the plan was developed based on key assumptions and challenges, the implementation of the transformational plan to date, current funding issues, an analysis with recommendations of the transformational process, and an overview of the cultural change that will inevitably come with the transformation.

DTIC

Military Aviation; Navy

20040043786 Air Command and Staff Coll., Maxwell AFB, AL

Improving Interface Between Aeromedical Evacuation and En Route Systems

Berry, Marie L.; Apr. 2002; 39 pp.; In English

Report No.(s): AD-A420660; AU/ACSC/017/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

Both the aeromedical evacuation and airlift en route systems have a long and glorious history. Working separately, they provide vital services to our military. Working in tandem, they represent a precious resource in our national security framework, for they reconstitute US combat capability by evacuating and redeploying combat and combat support personnel. Yet as the US begins its military transformation and fights rapid, short-duration, high- intensity conflicts, the tandem partnership between aeromedical evacuation and the en route system must evolve to handle faster-paced requirements for moving patients both intra- and inter-theater, Examining the organizational structures, missions and governing doctrines of both systems, one finds that there is little interface between the two, and operational success is predicated largely on innovation rather than design. In future operations, innovation may not be enough to guarantee success. As a result, this author recommends an interface framework to better educate the two sides of each other's respective missions, to train together to more fully understand the synergies between the two functions, and to set the stage for better communication in the crunch to ultimately save lives.

DTIC

Air Transportation; Evacuating (Transportation); Medical Services; Routes

20040043788 Air Command and Staff Coll., Maxwell AFB, AL

Unmanned Airlift: How Should We Proceed?

Budd, John T.; Apr. 2002; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420662; AU/ACSC/019/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

In 1996, the U,S Air Force Scientific Advisory Board identified 22 missions that might be accomplished by UAVs. Of the identified missions, there have been many studies conducted on the use of UAVs for intelligence, surveillance, and even combat applications, but none have been completed about the use of UAVs for air mobility roles, either tanker or airlift aircraft. This study seeks to break new ground by trying to answer the question, 'How should we proceed?' to make the concept of unmanned airlift a reality. To this end, this study provides a conceptual survey of the strategic need for unmanned airlift, it discusses how operational pressures on the National Aerospace System (NAS) are driving the advancement of automating technologies, and it shows how this drive toward automation is laying the foundation for unmanned airlift. Based upon this foundation, this paper will sketch a path to the future, identifying critical requirements, studies, and technologies that will help make unmanned airlift a reality.

DTIC

Drone Aircraft

20040043790 Air Command and Staff Coll., Maxwell AFB, AL

The Casualty Care Interface Between the Air Force Medical Service and Air Force Special Operations Forces

Costa, Janelle E.; Apr. 2002; 48 pp.; In English

Report No.(s): AD-A420666; AU/ACSC/02-027/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

This research paper examines the AF Special Operations Command (AFSOC) medical system, specifically the care and management of SOF casualties as they move from point of injury to hand-off to the conventional AF Medical Service (AFMS) systems. The paper analyzes current AFSOC medical assets, missions, capabilities, as well as limitations, constraints, and challenges with the aim of determining what additional capabilities AFSOC medics need and why. The critical interface points between SOF and the conventional AFMS are also studied. The intent is to determine where and how the interface should take place as well as how it can be improved. During this research, important issues were analyzed, leading to conclusions and recommendations. The primary conclusion is that AFSOC does need additional assets to enhance their medical capabilities. Specifically, like the conventional AFMS, AFSOC should have its own organic surgical and in-flight critical care capabilities in the form of teams developed for the SOF environment. Once established, these teams need the appropriate training, supplies, and equipment to provide life and limb-saving care as close to the seriously injured casualties as possible. In addition, recommendations are made regarding the SOF-conventional AFMS interface - where it should ideally take place and suggestions for improving the interaction between SOF and conventional forces.

DTIC

Casualties; Medical Services; Military Operations

20040043805 Air Command and Staff Coll., Maxwell AFB, AL

New Tool of Terrorism -- Airliners

Illes, Gabor; Apr. 2002; 32 pp.; In English

Report No.(s): AD-A420692; AU/ACSC/058/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

Since last September terrorism has become our most dangerous enemy. The suicidal criminals have discovered a unique way of getting the world's attention. In this research paper I analyze the new tool of terrorism, hijacking airliners and using them as guided missiles. This paper presents the background and the reason for terrorist hijacks of commercial airplanes, and assesses possible terrorists' motivation for such actions. I analyze the mistakes made in the last decade, which enabled the terrorists to complete their mission in the horrible method they used on September 11, 2001. I believe that we can eliminate this kind of catastrophe by putting more emphasis on improving intelligence and gathering more information about terrorist groups. We also need to rethink and work out a new security system, and change many rules both in airport security and flying security for commercial airliners. In this paper I make some proposals concerning security issues, and explain where we should place more emphasis to protect ourselves and decrease the threat.

DTIC

Commercial Aircraft; Terrorism

20040043818 Air Command and Staff Coll., Maxwell AFB, AL

Searching for the Silver Bullet: Coercion Mechanisms and Airpower Theory

Ehlers, Robert S., Jr; Apr. 2002; 40 pp.; In English

Report No.(s): AD-A420717; AU/ACSC/036/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

This paper examines air coercion, a strategy of increasing importance to the Air Force and other Services, Although a number of scholars have begun to look at air coercion strategies in some detail, to include theoretical underpinnings and application in historical examples, two key weaknesses persist in the existing literature, First, despite much recent attention, air coercion is still poorly defined, and scholars too often misuse the term or try to apply it where it should not be applied, Second, there has not been enough study of specific coercive mechanisms and how air power strategies influence them Mechanisms are the means by which attacks on various targets, such as fielded military forces, economic infrastructure, and public opinion, translate into coercive leverage against adversary leadership. To fill these gaps in the current scholarship, this paper defines air coercion and discusses briefly the kinds of armed conflicts in which it may or may not succeed, From there, it addresses the issue of coercive mechanisms in some detail, including an appraisal of their importance and utility to air campaign planners, Finally, it assesses the effectiveness of air coercion in two historical case studies: the air pressure campaign in the closing months of the Korean War and Operation Deliberate Force, flown against the Bosnian Serbs in 1995.

DTIC

Military Operations; Silver; Strategy

20040045168 NASA Langley Research Center, Hampton, VA, USA

Flight Test Evaluation of Synthetic Vision Concepts at a Terrain Challenged Airport

Kramer, Lynda J.; Prince, Lawrence J., III; Bailey, Randell E.; Arthur, Jarvis J., III; Parrish, Russell V.; February 2004; 110 pp.; In English

Contract(s)/Grant(s): WBS-22-728-60-10

Report No.(s): NASA/TP-2004-212997; L-18360; No Copyright; Avail: CASI; A06, Hardcopy

NASA's Synthetic Vision Systems (SVS) Project is striving to eliminate poor visibility as a causal factor in aircraft accidents as well as enhance operational capabilities of all aircraft through the display of computer generated imagery derived from an onboard database of terrain, obstacle, and airport information. To achieve these objectives, NASA 757 flight test research was conducted at the Eagle-Vail, Colorado airport to evaluate three SVS display types (Head-up Display, Head-Down Size A, Head-Down Size X) and two terrain texture methods (photo-realistic, generic) in comparison to the simulated Baseline Boeing-757 Electronic Attitude Direction Indicator and Navigation/Terrain Awareness and Warning System displays. The results of the experiment showed significantly improved situation awareness, performance, and workload for SVS concepts compared to the Baseline displays and confirmed the retrofit capability of the Head-Up Display and Size A SVS concepts. The research also demonstrated that the tunnel guidance display concept used within the SVS concepts achieved required navigation performance (RNP) criteria.

Author

Airports; Enhanced Vision; Flight Tests; Terrain; Flight Control; Display Devices; NASA Programs

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation, 17 Space Communications, Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar*.

20040035965 Ohio Univ., Athens, OH

Advanced Navigation Terminal System Using the Global Positioning System

Bartone, Chris; Jul. 2003; 54 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F29601-00-C-0212; Proj-4793

Report No.(s): AD-A420034; AFRL-VS-TR-2003-1133; No Copyright; Avail: CASI; A04, Hardcopy

This report is the final report for the Air Force Research Laboratory (AFRL), Space Vehicles Directorate (SV), Ballistic Missile Technology (BMT) demonstration under contract F29601-00- C-02l2. This document describes a program where the functional requirements and technical assessment for the development of an Advanced Navigation Terminal System (ANTS) using the Global Positioning System (GPS) were performed. Under the Base Year of this contract, a Functional Level Specification and System (FLSS) Architecture Study were performed. Under Option Year 1, Technology Assessment items on: 1)GPS transceiver (GPST) and a small All-zenith multipath limiting antenna (AZMLA) was performed. This report documents the outcomes from these activities.

DTIC

Global Positioning System

20040041407 North Carolina Agricultural and Technical State Univ., Greensboro, NC, USA

Development and Evaluation of Fault-Tolerant Flight Control Systems

Song, Yong D.; Gupta, Kajal, Technical Monitor; February 27, 2004; 22 pp.; In English

Contract(s)/Grant(s): NAG4-211; No Copyright; Avail: CASI; A03, Hardcopy

The research is concerned with developing a new approach to enhancing fault tolerance of flight control systems. The original motivation for fault-tolerant control comes from the need for safe operation of control elements (e.g. actuators) in the event of hardware failures in high reliability systems. One such example is modem space vehicle subjected to actuator/sensor impairments. A major task in flight control is to revise the control policy to balance impairment detectability and to achieve sufficient robustness. This involves careful selection of types and parameters of the controllers and the impairment detecting filters used. It also involves a decision, upon the identification of some failures, on whether and how a control reconfiguration should take place in order to maintain a certain system performance level. In this project new flight dynamic model under uncertain flight conditions is considered, in which the effects of both ramp and jump faults are reflected. Stabilization algorithms based on neural network and adaptive method are derived. The control algorithms are shown to be effective in

dealing with uncertain dynamics due to external disturbances and unpredictable faults. The overall strategy is easy to set up and the computation involved is much less as compared with other strategies. Computer simulation software is developed. A serious of simulation studies have been conducted with varying flight conditions.
Derived from text
Flight Control; Fault Tolerance; Actuators; Dynamic Models; Flight Conditions

20040043668 NASA Ames Research Center, Moffett Field, CA, USA
Mobile Agents: A Distributed Voice-Commanded Sensory and Robotic System for Surface EVA Assistance
Clancey, William J.; Sierhuis, Maarten; Alena, Rick; Crawford, Sekou; Dowding, John; Graham, Jeff; Kaskiris, Charis; Tyree, Kim S.; vanHoof, Ronnie; October 30, 2003; 8 pp.; In English; Earth and Space 2004, March 2004, Houston, TX, USA; Copyright; Avail: CASI; A02, Hardcopy

A model-based, distributed architecture integrates diverse components in a system designed for lunar and planetary surface operations: spacesuit biosensors, cameras, GPS, and a robotic assistant. The system transmits data and assists communication between the extra-vehicular activity (EVA) astronauts, the crew in a local habitat, and a remote mission support team. Software processes ('agents'), implemented in a system called Brahms, run on multiple, mobile platforms, including the spacesuit backpacks, all-terrain vehicles, and robot. These 'mobile agents' interpret and transform available data to help people and robotic systems coordinate their actions to make operations more safe and efficient. Different types of agents relate platforms to each other ('proxy agents'), devices to software ('comm agents'), and people to the system ('personal agents'). A state-of-the-art spoken dialogue interface enables people to communicate with their personal agents, supporting a speech-driven navigation and scheduling tool, field observation record, and rover command system. An important aspect of the engineering methodology involves first simulating the entire hardware and software system in Brahms, and then configuring the agents into a runtime system. Design of mobile agent functionality has been based on ethnographic observation of scientists working in Mars analog settings in the High Canadian Arctic on Devon Island and the southeast Utah desert. The Mobile Agents system is developed iteratively in the context of use, with people doing authentic work. This paper provides a brief introduction to the architecture and emphasizes the method of empirical requirements analysis, through which observation, modeling, design, and testing are integrated in simulated EVA operations.
Author
Voice; Sensors; Robotics; Extravehicular Activity; Architecture (Computers); Bioinstrumentation; Computer Programs

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information see also *18 Spacecraft Design, Testing and Performance*; and *39 Structural Mechanics*. For land transportation vehicles see *85 Technology Utilization and Surface Transportation*.

20040035812 Lawrence Livermore National Lab., Livermore, CA
Data Transport in a Novel Wireless Sensor Network
Roberts, R. S.; Jun. 01, 2001; 10 pp.; In English
Report No.(s): DE2003-15004785; UCRL-JC-144072; No Copyright; Avail: Department of Energy Information Bridge

The deployment and operation of large wireless sensor networks can pose difficult problems, particularly in time critical situations, over large geographic areas, or in rugged terrain. An approach to this problem is to use unmanned air vehicles to first deploy the sensors, and then provide communication services to the sensors. This paper presents a network model that describes the flow of data through such a sensor network. Simulation results are presented that illustrate the behavior of the data flow in steady state and transient conditions.
NTIS
Wireless Communication; Detectors; Communication Networks; Pilotless Aircraft

20040035836 Westinghouse Savannah River Co., Aiken, SC, USA
Building 773-A, Lab F003 Glovebox Project Radiological Design Summary Report
Gaul, W. C.; Sep. 2003; 28 pp.; In English
Report No.(s): DE2003-819797; WSRC-TR-2003-00425; No Copyright; Avail: Department of Energy Information Bridge

Engineering Standards present the radiological design criteria and requirements, which must be satisfied for all SRS facility designs. The radiological design criteria and requirements specified in the standard are based on the Code of Federal

Regulations, DOE Orders, Site manuals, other applicable standards, and various DOE guides and handbooks. This report contains top-level requirements for the various areas of radiological protection for workers. For the purposes of demonstrating compliance with these requirements, the designer must examine the requirement for the design and either incorporate or provide a technical justification as to why the requirement is not incorporated. This document reports a radiological design review for the STREAK lab glovebox upgrades of inlet ventilation, additional mechanical and electrical services, new glovebox instrumentation and alarms. This report demonstrates that the gloveboxes meet the radiological design requirements of Engineering Standards.
NTIS
Design Analysis; Handling Equipment; Radiation Protection; Radiology; Requirements

20040035914 National Defence Research Establishment, Linkoeping, Sweden
Prestudy of EW Suite for Helicopter
Berglund, L.; Andersson, B.; Andersson, J.; Eneroth, A.; Olsson, G.; Sep. 2002; In Swedish
Report No.(s): PB2004-101794; FOI-R-0582-SE; No Copyright; Avail: National Technical Information Service (NTIS)
The report gives a number of areas where there is a need for research activities within the field of electronic warfare (EW) suite for helicopters. First a description is given for the different helicopters presumed to perform. Then a number of questions concerning EW suite for helicopters are given. Finally the research areas of interest are given and they are: Generating scenarios and an overall evaluation; task analysis; crew resource management; possible means of communication between helicopters for EW suite; trust; simulation environment; stealth and EW suite; measurement, modeling and evaluation of helicopter signatures; and interoperability concerning EW suite.
NTIS
Electronic Warfare; Helicopters; Stealth Technology

20040035938 Swedish Defence Research Establishment, Stockholm
Introduction of Liquid Hydrogen-Fuelled Aircaft into the Swedish Domestic Air Taffic
Svensson, F.; Hasselrot, A.; Mar. 2003; In English
Report No.(s): PB2004-101807; FOI-R-0743-SE; No Copyright; Avail: National Technical Information Service (NTIS)
In this report the practical feasibility of using hydrogen for civil aviation is evaluated by the compilation of a number of transition scenarios, which imply changing from a conventional fleet of aircraft to a LH(sub 2)-fuelled fleet, over a certain time period. In order to accomplish this, SAS's share of the Swedish domestic air traffic is investigated. Realistic transition scenarios are compiled, and the emissions related to these scenarios are estimated, and presented in relation to emissions of the conventional fleet. The fuel sources and infrastructure changes needed at the airport, and for distribution of the LH(sub 2) are identified and assessed. It may be concluded that an essential increase in airport capacity, at all airports, is required to cope with the increasing traffic demand. In all scenarios it is reasonable to change to a fleet powered with liquid hydrogen, solely, by 2050.
NTIS
Liquid Hydrogen; Air Transportation

20040035943 Boeing Co., Saint Louis, MO
Axisymmetric and Non-Axisymmetric Initiation of Vortex Breakdown
Cary, Andrew W.; Darmofal, David L.; Mar. 2003; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418955; No Copyright; Avail: CASI; A03, Hardcopy
No abstract available
Axisymmetric Flow; Fluid Dynamics; Pipe Flow; Vortex Breakdown

20040035983 CPU Technology, Inc., Pleasanton, CA
H-60 Mission Avionics Technology Insertion
Jan. 2004; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00421-03-P-0821
Report No.(s): AD-A420058; No Copyright; Avail: CASI; A03, Hardcopy
Due to funding pressures, program and personnel realignments, existing helicopters are going to be required to remain in service longer. However, the need to maintain, upgrade and enhance the relative stature of the U.S. arsenal and their expanding missions continues to exist. Currently, the H-60 mission avionics systems utilize processors that implement the

required functionality. However, avionics microprocessors are hampered in two significant areas: performance, and the fact they are 16-bit computers, which limits the memory and size of the operand among other things. The fact that these processors have fallen behind can be readily seen in today's systems: the response time is degraded due to insufficient processing through-put, the types of missions that can be executed on a given flight are limited, and often old features must be eliminated in order to add new ones. These deficiencies reduce mission effectiveness, limit aircraft potential and expose pilots to increased risk.
DTIC
Computer Techniques; H-60 Helicopter

20040036231 Naval War Coll., Newport, RI
From Persistent ISR to Precision Strikes: The Expanding Role of UAVs
Trefz, John L., Jr; May 16, 2003; 25 pp.; In English
Report No.(s): AD-A420264; No Copyright; Avail: CASI; A03, Hardcopy

This paper addresses the employment of Unmanned Aerial Vehicles (UAVs) and their impact on the Operational Commander. The author believes that technological advances continue to improve the capabilities and reliability of the UAV. These platforms are able to provide 24-hour surveillance of the battlefield and a limited self-contained strike potential to the Operational Commander while reducing the support structure required for manned aircraft. UAVs will ease the high operational tempo of LD/HD assets and allow these aircraft to be deployed in a more predictable fashion. Further, the increased use of UAVs will reduce the risk to coalition aircrews now performing presence and monitoring missions, greatly enhancing the ability of the Operational Commander to utilize these assets to their fullest potential. This paper begins with a short history of the UAV and continues through their use in Operation Iraqi Freedom. Topics discussed include current systems capabilities and limitations, operational functions that can be performed and their benefits to the Operational Commander, and recommendations for the future development and employment of UAVs. (34 refs.)
DTIC
Drone Vehicles

20040036355 Naval Postgraduate School, Monterey, CA
Cost Benefit Analysis of the Department of the Navy's F-5 Tiger II contract
Brown, Jeffrey C.; DeGuzman, Robert K., Jr.; Fulford, Thomas S., III; Porter, Jesse E., Sr.; Dec. 2003; 135 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420357; No Copyright; Avail: CASI; A07, Hardcopy

This project consists of a Cost Benefit Analysis (CBA) of the costs, issues and effects associated with replacing the F-5E/F Tiger II aircraft with F/A-18A/B. The three alternatives analyzed are (1) continued operation of the F-5E/ F, (2) replacement of the F-5 with F/A-18A/B by 2008, and (3) installation of 4th generation pulse-doppler radar in the F-5E/F by 2008. The objective was to compare the three alternatives, choosing the alternative which provides the greatest net benefit and most efficient use of resources. The analysis involved data collection of operational costs per flight hour, total cost over the life of the program, and Contractor supported maintenance. Data for this research project were gathered from the actual maintenance contracts for both the F-5E/F Tiger II and F/A- 18A/B aircraft at Fallon, NV, Naval Aviation Systems Command, and OFC-20. Our results suggest that NAVAIR should continue to use the F-5E/F tiger II aircraft for the VFC- 13 adversary training mission through 2014.
DTIC
Cost Analysis; Cost Effectiveness

20040036459 Air Command and Staff Coll., Maxwell AFB, AL
An Investigation into the Effects of the Hangar Queen Program
Larson, Kelly J.; Mar. 2002; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420440; AU/ACSC/069/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

The focus of this paper concerns the effects of the different command hangar queen (HQ) programs currently in place for the Combat Air Forces, These differences are based on the thresholds established to determine when an aircraft becomes a HQ. The importance of this issue can be seen in the additional workload placed on aircraft maintenance personnel to return aircraft to flight based on an unvalidated requirement. By consolidating the studies performed on cannibalizations (CANNs) and the HQ program, this paper attempts to provide an understanding of the rationale and effects/benefits of the different HQ

thresholds. Hopefully, this research combined with new guidance from the Air Staff on CANNs to prevent HQs will prevent unnecessary CANNs.
DTIC
Aircraft Maintenance

20040036487 Naval Postgraduate School, Monterey, CA
The Costs and Benefits of High Speed Vessels Relative to Traditional C-17 Military Airlift
Strenge, Thomas; Ralston, Kevin W.; Dec. 2003; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420463; No Copyright; Avail: CASI; A05, Hardcopy

This cost-benefit analysis conducted on behalf of MSC compared HSVs against C-17 aircraft, Using financial and operational data garnered from the WestPac Express, as well as third-party research, the researchers investigated the following questions: Is the HSV a better choice for intra- theater lift than AMC7 Should DoD buy or lease? Should the crew be military or civilian? What other theaters require an intra-theater lift platform? How many HSVs does DoD need? The results indicate that in ranges of up to 1,500 nautical miles, HSVs have a speed advantage over C-17 airlift, One HSV can move a single battalion of Marines, whereas AMC7 requires seventeen C-17 aircraft, a number rarely available for such a mission Additionally, during routine FYO3 operations, WestPac Express incurred costs of $ 12 million This saved $8.7 million compared to an estimated AMC7 cost of $20.7 million The study also recommends bareboat leasing to take advantage of the increased operational flexibility, In the absence of significant cost differences, civilian manning is superior to military manning due to organizational fit. The study concludes with a recommendation that MSC institutionalize HSV service in the III MEF AOR and expand the service to all other maritime theaters,
DTIC
Cost Analysis; High Speed; Jet Aircraft

20040036489 Naval Air Warfare Center, Patuxent River, MD
Evolution of Fractograph During Fatigue and Stress Corrosion Cracking
Lee, E. U.; Lei, C.; Sanders, H. C.; Taylor, R.; Feb. 23, 2004; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420467; NAWCADPAX/TR-2004/12; No Copyright; Avail: CASI; A03, Hardcopy

Fatigue and stress corrosion cracking (SCC) behaviors were studied for three landing gear steels, AerMet 100, 300M, and 4340. The three steels were subjected to identical fatigue tests in vacuum, air, and 3.5% NaCl solution and identical stress corrosion cracking tests in 3,5% NaCl solution. The variation of fatigue crack growth rate with stress intensity range and maximum stress intensity was evaluated for different stress ratios and environments. Also, the variation of SCC rate with stress intensity was investigated. Subsequently, the fatigue- and SCC-induced crack surface morphologies were examined, and the fractographic evolution was defined with respect to the stress ratio, crack growth rate, stress intensity, and environment.
DTIC
Crack Propagation; Fracture Mechanics; Landing Gear; Stress Corrosion; Stress Corrosion Cracking

20040036549 Air Univ., Maxwell AFB, AL
Soviet Assault Aviation 1938-1945
Plavins, Jurijs; Apr. 2002; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420519; AU/SCHOOL/NNN/2001-04; No Copyright; Avail: CASI; A03, Hardcopy

This work speaks about Soviet Union assault aviation development from the 1933 to 1945. It provides a short view on the creation phase of the Bed Army military aviation. Next, it gives a purview of Red Army theoretical ideas according to functions and applications of military aviation. At the next stage, it focuses on the development of assault aviation theory and ideas for special aircraft created for accomplish these missions. This chapter examines in detail the sturmovik IL-2 as racy deputy of that type of aviation at WWII period of time. The last part of the research analyzes the application of the assault aviation in the Great Patriotic War (Stalingrad, Kuban, and Kitrskay, a Dtiga), using several particular period documents.
DTIC
Attacking (Assaulting); Military Operations

20040036555 Air Univ., Maxwell AFB, AL
Cost-Benefit Analysis Tools for Avionics Parts Obsolescence
Shuman, Luvenia L.; Apr. 2002; 34 pp.; In English
Report No.(s): AD-A420530; AU/ACSC/02-103/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

Obsolescence management, an ever-increasing topic in the Department of Defense, is not new. Since the service life of military systems is much longer than commercial systems, maintaining military systems when parts and components go out of production remains a sustainment challenge. Typically, resolving obsolete parts problems are incorrectly identified as reliability and maintainability issues that provide no improved capability or reduced cost; the primary benefit is continued sustainability of the existing system. Since loss of a capability is not an option, maintaining the capability without a part redesign does require increased cost for the commercial market to support a military- unique application. In addition, constrained defense funding will necessitate prudent use of limited funding to balance current systems maintenance and new systems acquisition. The specific objective of this project is to show the need for automated cost-benefit analysis tools to assist program/ item managers in identifying the cost savings associated with resolving obsolete parts problems. The project provides an analysis of the cost-benefit relationship of the resolution options available to the program/item manager. Additionally, the project identifies and analyzes cost-benefit analysis tools for making decisions associated with sustaining the obsolete item versus acquiring a supportable replacement.
DTIC
Cost Analysis; Cost Effectiveness

20040036573 Naval Postgraduate School, Monterey, CA
Improvement of the Performance of a Turbo-Ramjet Engine for UAV and Missile Applications
Krikellas, Dimitrios; Dec. 2003; 157 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420553; No Copyright; Avail: CASI; A08, Hardcopy

An existing turbo-ramjet engine was modified in order to increase the produced thrust and sustain combustion at increased freejet Mach numbers. The engine's afterburner fuel system was redesigned to improve the vaporization and atomization of the fuel. The engine performed satisfactorily at speeds up to Mach 0.3, producing 100% more thrust over the baseline turbojet. The data acquisition system of the turbo- ramjet engine's performance measurement in a freejet facility was also updated. Various Computational Fluid Dynamics models of the flow through the turbo-ramjet engine were developed to visualize the flow and to predict the engine performance at different Mach numbers.
DTIC
Drone Vehicles; Ramjet Engines; Turboramjet Engines

20040036577 Air Univ., Maxwell AFB, AL
The Death of 'Superman': The Case Against Specialized Tanker Aircraft in the USAF
Gibson, Thomas L.; Jun. 2002; 94 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420556; No Copyright; Avail: CASI; A05, Hardcopy

This thesis analyzes the need for a comprehensive recapitalization of USA Air Force air refueling capabilities. The end of the Cold War resulted in an uncertain international security environment devoid of a monolithic threat. While adjusting to its role as the world's sole superpower, the USA adopted an attitude of global responsibility, resulting in increased commitment of military forces. Subsequent deployments have taxed the core USAF tanker, the KC-l35, to near critical levels, generating the recapitalization need. Conclusions are based on the synthesis of historical trends, organizationally endorsed material, and a feasibility-acceptability-adequacy model. Five options, including staying with the current tanker force, modifying commercial aircraft, acquiring an all-new tanker, civilian contract refueling, and unmanned aerial tankers are assessed. The resulting combination of dynamic and static analysis reveals the need for a paradigm shift regarding the USAF tanker fleet. The USAF should not acquire specialized tanker aircraft to meet its needs, There has been a migration away from specialized tanker platforms to multi-role aircraft for decades. Future concepts of operations will continue to demand a robust, capable tanker fleet. In order to meet future needs, the USAF should continue to maintain its current fleet, despite unplanned maintenance delays, acquire an interim capability in the form of a commercially modified tanker, and begin the acquisition process on a KC-X next generation tanker. This study concludes, however, that each of these steps should occur within the context of the new paradigm such that the aircraft are employed as communications relays, reconnaissance platforms, or any number of other primary roles and perform the refueling mission secondarily.
DTIC
Tanker Aircraft

20040036587 Naval Postgraduate School, Monterey, CA
Establishing a Vibration Threshold Value, Which Ensures a Negligible False Alarm Rate for Each Gear in CH-53 Aircraft Using the Operational Data
Elyurek, Mehmet; Dec. 2003; 97 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420564; No Copyright; Avail: CASI; A05, Hardcopy

Rotating machinery such as gears plays an important role in control of an aircraft. The condition of this machinery is a key ingredient to both platform safety and mission success, especially in military operations. The purpose of the thesis research is to establish a vibration threshold level for each particular gear in CH-53 aircraft such that, while minimizing in-flight risk, a negligible false alarm rate is obtained. This study uses Box-Jenkins time series modeling (ARMA) with regression, Mahalanobis distance metrics, goodness-of-fit tests and the Bonferroni correction to explore the structure of the historical acquisition datasets for particular gear type and aircraft, to set vibration threshold values for 'Warning' and 'Alarm' situations. Although 28 datasets could not be modeled because of small sample sizes, the other 224 data sets were successfully modeled using ARMA with regression modeling technique. The Mahalanobis distance metric was then used to set a threshold value of 'Warning' and 'Alarm' for each gear type. These threshold values were then checked with new data and 200 outliers for 'Warning' and 69 outliers for 'Alarm' were detected. These outliers might be evaluated as false alarms.
DTIC
False Alarms; H-53 Helicopter

20040037790 NASA Marshall Space Flight Center, Huntsville, AL, USA
X-37 Flight Demonstrator: Approach and Landing Test Vehicle Flight Test Approach
Taylor, Terry L.; February 11, 2004; 10 pp.; In English; Space Technology and Apllication International Forum, 11 Feb. 2004, Albuquerque, NM, USA; No Copyright; Avail: CASI; A02, Hardcopy

Approach and Lending Test Vehicle (ALTV) reduces risk to the X-37 orbital vehicle (OV) flight program by: Testing a subset of OV technologies in a critical portion of the flight envelope. Validating the calculated air data system (CADS) performance/subsonic aerodynamic database. Demonstrating OV approach and landing trajectory. Expending the operational flight envelope of the OV-enabling more landing opportunities for orbital missions.
Derived from text
Air Data Systems; Flight Envelopes; Flight Test Vehicles; X-37 Vehicle

20040040170 NASA Glenn Research Center, Cleveland, OH, USA
Exo-Skeletal Engine: Novel Engine Concept
Chamis, Cristos C.; Blankson, Isaiah M.; January 2004; 22 pp.; In English; Turbo Expo 2003, 16-19 Jun. 2003, Atlanta, GA, USA
Contract(s)/Grant(s): WBS 22-708-04-03
Report No.(s): NASA/TM-2004-212621; E-14179; GT2003-38204; No Copyright; Avail: CASI; A03, Hardcopy

The exo-skeletal engine concept represents a new radical engine technology with the potential to substantially revolutionize engine design. It is an all-composite drum-rotor engine in which conventionally heavy shafts and discs are eliminated and are replaced by rotating casings that support the blades in spanwise compression. Thus the rotating blades are in compression rather than tension. The resulting open channel at the engine centerline has immense potential for jet noise reduction and can also accommodate an inner combined-cycle thruster such as a ramjet. The exo-skeletal engine is described in some detail with respect to geometry, components, and potential benefits. Initial evaluations and results for drum rotors, bearings, and weights are summarized. Component configuration, assembly plan, and potential fabrication processes are also identified. A finite element model of the assembled engine and its major components is described. Preliminary results obtained thus far show at least a 30-percent reduction of engine weight and about a 10-dB noise reduction, compared with a baseline conventional high-bypass-ratio engine. Potential benefits in all aspects of this engine technology are identified and tabulated. Quantitative assessments of potential benefits are in progress.
Author
Ramjet Engines; Mathematical Models; Engine Design; Shafts (Machine Elements)

20040040180 NASA Marshall Space Flight Center, Huntsville, AL, USA
X-37 Flight Demonstrator: X-40A Flight Test Approach
Mitchell, Dan; February 11, 2004; 10 pp.; In English; Space Technology and Applications International Forum, 11 Feb. 2004, Albuquerque, NM, USA; No Copyright; Avail: CASI; A02, Hardcopy

The flight test objectives are: Evaluate calculated air data system (CADS) experiment. Evaluate Honeywell SIGI (GPS/INS) under flight conditions. Flight operation control center (FOCC) site integration and flight test operations. Flight test and tune GN&C algorithms. Conduct PID maneuvers to improve the X-37 aero database. Develop computer air date system (CADS) flight data to support X-37 system design.
Derived from text
Flight Tests; Support Systems; Flight Operations; Flight Conditions

20040040195 NASA Langley Research Center, Hampton, VA, USA

Some Analytic Results for the Study of Broadband Noise Radiation from Wings, Propellers and Jets in Uniform Motion

Farassat, F.; Casper, J.; International Journal of Aeroacoustics; 2003; Volume 2, No. 3-4, pp. 335-350; In English

Contract(s)/Grant(s): 23-781-10-11; No Copyright; Avail: CASI; A03, Hardcopy

Alan Powell has made significant contributions to the understanding of many aeroacoustic problems, in particular, the problems of broadband noise from jets and boundary layers. In this paper, some analytic results are presented for the calculation of the correlation function of the broadband noise radiated from a wing, a propeller, and a jet in uniform forward motion. It is shown that, when the observer (or microphone) motion is suitably chosen, the geometric terms of the radiation formula become time independent. The time independence of these terms leads to a significant simplification of the statistical analysis of the radiated noise, even when the near field terms are included. For a wing in forward motion, if the observer is in the moving reference frame, then the correlation function of the near and far field noise can be related to a space-time cross-correlation function of the pressure on the wing surface. A similar result holds for a propeller in forward flight if the observer is in a reference frame that is attached to the propeller and rotates at the shaft speed. For a jet in motion, it is shown that the correlation function of the radiated noise can be related to the space-time crosscorrelation of the Lighthill stress tensor in the jet. Exact analytical results are derived for all three cases. For the cases under present consideration, the inclusion of the near field terms does not introduce additional complexity, as compared to existing formulations that are limited to the far field.

Author

Broadband; Wings; Aeroacoustics; Boundary Layers; Space-Time Functions

20040040219 NASA Dryden Flight Research Center, Edwards, CA, USA

Comparison of X-31 Flight and Ground-Based Yawing Moment Asymmetries at High Angles of Attack

Cobleigh, Brent; Croom, Mark A.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 14 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Significant yawing moment asymmetries were encountered during the high-angle-of-attack envelope expansion of the two X-31 aircraft. These asymmetries caused position saturations of the thrust-vectoring vanes and trailing-edge flaps during some stability-axis rolling maneuvers at high angles of attack. The two test aircraft had different asymmetry characteristics, and ship 2 has asymmetries that vary as a function of Reynolds number. Several aerodynamic modifications have been made to the X-31 forebody with the goal of minimizing the asymmetry. These modifications include adding transition strips on the forebody and noseboom, using two different length strakes, and increasing nose bluntness. Ultimately, a combination of forebody strakes, nose blunting, and noseboom transition strips reduced the yawing moment asymmetry enough to fully expand the high-angle-of-attack envelope. Analysis of the X-31 flight data is reviewed and compared to wind-tunnel and water-tunnel measurements. Several lessons learned are outlined regarding high-angle-of-attack configuration design and ground testing.

Author

Angle of Attack; Asymmetry; X-31 Aircraft; Yawing Moments; Ground Tests; Water Tunnel Tests; Wind Tunnel Tests

20040040220 Oxford Univ., Oxford, UK

Detailed Performance Assessment of 16% Blockage Interrupted Ribs At 60 deg Inclination in a Square Section Turbine Blade Cooling Passage

Tsang, C. L. P.; Gillespie, D. R. H.; Ireland, P. T.; Dailey, G. M.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 14 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Three conventional configurations of 60 degrees inclined, interrupted ribs at 16% blockage were tested using a large-scale model of a cooling passage inside a turbine blade. Transient heat transfer experiments using liquid crystal were used to determine the full distribution of local heat transfer coefficient. Heat transfer data on all gas swept surfaces, including heat transfer level on the roughness elements themselves were obtained and compared with data in the literature. The passage thermal efficiency is also presented using pressure loss measurements. Finally detailed flow field at the end of the ribbed section were measured using a miniature 4-hole pyramid probe and the data are used to interpret the heat transfer results.

Author

Turbine Blades; Aerodynamic Configurations; Scale Models; Cooling; Ribs (Supports); Inclination; Aerothermodynamics

20040040230 Office National d'Etudes et de Recherches Aerospatiales, Lille, France

Model of Unsteady Aerodynamic Coefficients of a Delta Wing Aircraft at High Angles of Attack

Planckaert, L.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 11 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Several approaches for modelling the longitudinal aerodynamic coefficients of a fighter aircraft at high angles of attack, including the unsteady effects are presented. A traditional approach where the model of the coefficient arises in the form of the steady and unsteady effects, the unsteady effect being modelled by means of transfer functions. The second approach uses an internal variable descriptive of the flow field: the vortical state of the flow on the wing. An example of application of this method through neural network model is described.

Author

Angle of Attack; Delta Wings; Unsteady Aerodynamics; Mathematical Models; Aerodynamic Coefficients

20040040231 Research and Technology Organization, Neuilly-sur-Seine, France

X-31, The First Aircraft Designed for High Angle of Attack Maneuvering

Ross, H.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; In English; See also 20040040215; Copyright; Avail: Other Sources; Paper was not available at the time of publication

No abstract available

Angle of Attack; X-31 Aircraft; Aircraft Design; Aircraft Maneuvers

20040040232 NASA Langley Research Center, Hampton, VA, USA

Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7

Gonzalez, Hugo A.; McLachlan, Blair G.; Erickson, Gary E.; Bell, James H.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 39 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The effects of linear, diamond, and parabolic fillets on a double delta wing were investigated in the NASA Langley 7 x 10 ft High Speed Tunnel from Mach 0.18 to 0.7 and angles of attack from 4 deg. to 42 deg. Force and moment, pneumatic pressures, pressure sensitive paint, and vapor screen flow visualization measurements were used to characterize the flow field and to determine longitudinal forces and moments. The fillets increased lift coefficient and reduced induced drag without significantly affecting pitching moment. Pressure sensitive paint showed the increase in lift is caused by an increase in suction and broadening of the vortex suction footprint. Vapor screen results showed the mixing and coalescing of the strake fillet and wing vortices causes the footprint to broaden.

Author

Aerodynamic Coefficients; Delta Wings; Diamonds; Fillets; Flow Distribution; Induced Drag; Subsonic Speed

20040040269 NASA Langley Research Center, Hampton, VA, USA

An Assessment of CFD Effectiveness for Vortex Flow Simulation to Meet Preliminary Design Needs

Raj, P.; Ghaffari, F.; Finley, D. B.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

The low-speed flight and transonic maneuvering characteristics of combat air vehicles designed for efficient supersonic flight are significantly affected by the presence of free vortices. At moderate-to-high angles of attack, the flow invariably separates from the leading edges of the swept slender wings, as well as from the forebodies of the air vehicles, and rolls up to form free vortices. The design of military vehicles is heavily driven by the need to simultaneously improve performance and affordability.1 In order to meet this need, increasing emphasis is being placed on using Modeling & Simulation environments employing the Integrated Product & Process Development (IPPD) concept. The primary focus is on expeditiously providing design teams with high-fidelity data needed to make more informed decisions in the preliminary design stage. Extensive aerodynamic data are needed to support combat air vehicle design. Force and moment data are used to evaluate performance and handling qualities; surface pressures provide inputs for structural design; and flow-field data facilitate system integration. Continuing advances in computational fluid dynamics (CFD) provide an attractive means of

generating the desired data in a manner that is responsive to the needs of the preliminary design efforts. The responsiveness is readily characterized as timely delivery of quality data at low cost.
Derived from text
Computational Fluid Dynamics; Effectiveness; Vortices; Structural Design; Flow Distribution; Flight Characteristics

20040040279 Rolls-Royce Deutschland G.m.b.H., Dahlewitz, Germany
An Alternate Air System Concept for Application in a High Pressure Turbine
Pietsch, Dieter; Friedl, Winfried-Hagen; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 10 pp.; In English; See also 20040040215; Original contains color illustrations
Contract(s)/Grant(s): 20T9506A; Copyright; Avail: CASI; A02, Hardcopy

In 1995, the German government initiated an aerospace research program in order to support the capabilities of german companies in the more and more challenging environment of aerospace business. Engine 3E is the research part of this overall programme concentrating on jet engines. It's aim was to develop technologies to reduce the impact of turbojet engines onto the environment, where 3E stands for Efficiency, Economy and Environment. In this research framework, one of the subprojects concerned the development of a new high pressure turbine (HPT) air system concept, which is presented in this paper. Main objective of the air system itself is provision of sufficient cooling air for the turbine blades on the one hand and sealing of the rim between stator and rotor in the hub area against hot gas ingestion from the annulus on the other hand. The conventional BR700 family HPT air system relies on high pressure compressor (HPC) exit stage bleed air as feed for blade cooling of both HPT stages and rim sealing. An optimized HPT rotor air system has been developed, which uses bleed air of three different HPC stages as feed for blade cooling and rim sealing. This system has the advantage to provide adequate feed pressures for the respective turbine locations. According to the required pressure level HPC exit stage bleed air is used for blade cooling of the first HPT rotor and rim sealing in front of rotor 1. Lower stage bleed air is fed through external pipes through the HPT stage 2 vanes for rim sealing in front of and behind the HPT stage 2 vanes. Bleed air of an even lower HPC stage is used for ventilation of the inner interstage cavity and blade cooling of the second stage rotor blades. The optimized HPT air system concept additionally features a new secondary preswirl system with a brush seal and a mini disc in the interstage cavity. The mini disc is introduced to separate bleed air of different stages inside the interstage cavity. The whole concept was introduced into a BR700 family core engine and tested successfully in the altitude test facility of the University of Stuttgart. A comparison of the measured air and metal temperatures of both concepts as well as the implication on specific fuel consumption and feasibility of both concepts will be presented within the paper. Implications on manufacturing, assembly and failure behaviour will be addressed.
Author
High Pressure; Turbojet Engines; Air Flow; Systems Engineering; Manufacturing

20040043756 Air Univ., Maxwell AFB, AL
Unmanned Airlift: A Viable Option for Meeting the Strategic Airlift Shortfall
Manske, Chad T.; Jun. 2002; 130 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420609; No Copyright; Avail: CASI; A07, Hardcopy

This study examines whether there is a suitable role for unmanned airlifters in the USAF. A three-pronged approach is undertaken to make this determination: 1) an examination of the operational requirements that justify unmanned airlifters, 2) an investigation into current and emerging UAV technologies that are likely to meet the operational requirements, and 3) an analysis of the cost effectiveness of unmanned airlift, The author begins by establishing the fact that a strategic airlift shortfall exists, Mobility requirements studies conducted over the past 20 years illustrate the point that if the nation were called upon to fulfill the wartime requirements outlined in the National Security and Military Strategies to fight one major theater war and multiple small-scale conflicts, the Air Force would be woefully short of strategic airlift, The author postulates the concept of unmanned airlift as a potential solution for meeting the gap between requirements and existing capability, The author concludes that operational requirements for airlift could be satisfied within 10 to 20 years, and that technologies essential to unmanned airlift are indeed both a technological feasible and cost effective alternative for complementing and augmenting the USAF's fleet of venerable airlifters.
DTIC
Drone Vehicles

20040043770 Air Univ., Maxwell AFB, AL

UCAV - The Next Generation Air-Superiority Fighter?

Lewis, William K.; Jun. 2002; 110 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420631; No Copyright; Avail: CASI; A06, Hardcopy

Air superiority is an essential military mission, and will continue to be so for the foreseeable future, Control of the air is not an end of its own, but rather it provides the flexibility and freedom of action central to a full range of military capabilities In the coming century the USA will confront a number of disparate and ambiguous challenges to its hegemony The resources available to meet those challenges will undoubtedly be constrained, Extremely long lead times in the acquisition and procurement of new technologies mean that now, as the F-22 Raptor begins to replace the venerable F-15 Eagle, the next-generation air- superiority fighter is entering development Unmanned aircraft must be considered as an alternative to manned aircraft for this critical mission, While cost has been the driving factor for advances in UCAV, technology has been the major limitation This thesis concludes that an air-superiority UCAV should be feasible by the year 2025 and that it should provide an effective and affordable alternative to manned air-superiority fighters,

DTIC

Fighter Aircraft

20040043778 Naval Postgraduate School, Monterey, CA

Effects of Radio Wave Propagation in Urbanized Areas On UAV-GCS Command and Control

Willy, Lock W.; Dec. 2003; 107 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420643; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this research was to examine the effects of radiowave propagation in urbanized areas on unmanned aerial vehicle-ground control station (UAV-GCS) command and control. Operating at high frequency has merits of higher data rate transfer, which is crucial to support the large quantity of voice and video data to be transmitted via UAV-GCS linkage. However, high frequencies are attenuated more rapidly in lossy materials and weather. Having a shorter operational range translates to a smaller RF spread radius, and thus lowers the susceptibility to detection and jamming. The software, Urbana, was used to investigate the propagation of radio signals in urban environments under varying conditions. Simulations were conducted for a small group of buildings and a large collection of buildings representative of a big city. The data clearly illustrate the effect of 'urban canyons' and diffraction around buildings. An UAV deployed for military operations in urban terrain (MOUT) must have the inherent capability to hover or fly at low speeds to be able to adapt to the dynamic urban environment and to capitalize on communications opportunities. Simulations show that a single UAV hovering at three times the height of the tallest building in the central city was found to provide concentric, uniform signal coverage.

DTIC

Command and Control; Drone Vehicles; Electromagnetic Wave Transmission; Radio Equipment; Radio Transmission; Radio Waves; Telecommunication; Wave Propagation

20040043780 Naval Postgraduate School, Monterey, CA

Theoretical and Experimental Study of Micro Air Vehicle Powered by RF signal at 10 GHz

Tsolis, George; Dec. 2003; 133 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420646; No Copyright; Avail: CASI; A07, Hardcopy

The concept of using electromagnetic energy in the form of microwaves for transferring power from one point to another through free space is very old. However, the idea for powering micro air vehicles using microwaves is less than a decade old. This thesis presents a theoretical and experimental study of powering a micro air vehicle, using electromagnetic energy at the frequency of 10 GHz. Two micro air vehicle prototypes were designed and built, and various experiments conducted in order to specify the power requirements of such a vehicle. The vehicle weighted 9-15 grams and its maximum dimension was six inches. The rectifier antenna (rectenna) is a major component in a microwave power transmission process. A quality factor used for rectenna characterization is the conversion efficiency from microwave power to dc power. A key component in any rectenna design is the Schottky barrier diode, which is used to rectify the microwave energy to dc energy. A small rectenna array was manufactured using sixteen identical elements. Each element consisted of a circular patch antenna, a rectifying diode, and input and output low pass filters. The circuit was tested and the results showed a 10.3% conversion efficiency of the individual rectenna element, and 8.2% conversion efficiency for the total circuit.

DTIC

Drone Vehicles; Microwave Transmission; Radio Frequencies

20040043782 Naval Postgraduate School, Monterey, CA

Investigation of Increased Forward Flight Velocities of Helicopters Using Second Harmonic Control and Reverse Velocity Rotor Concept

Van Riper, Steven G.; Dec. 2003; 163 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420649; No Copyright; Avail: CASI; A08, Hardcopy

Described is the behavior of a rotorcraft equipped with Higher Harmonic Stall Control (HHSC) and a Reverse Velocity Rotor (RVR). Current rotorcraft are limited in forward flight speed by retreating blade stall and compressibility effects on the advancing blade. Stall occurs as the blade encounters increasingly severe reverse flow. HHSC enables conventional rotor systems to fly on the forward and aft sections of the rotor disk, greatly reducing reliance on the mixed flow regions defined by the advancing and retreating blades. Employment of the RVR allows lift generation while the rotor is experiencing reverse flow. A similar type of two per revolution (2/rev) input can be tailored to deliver maximum benefit to RVR equipped rotorcrafi. Modification of the Joint Army Navy Rotorcraft Analysis and Design (JANRAD) computer program allows 2/rev cyclic input, use of the RVR, and analysis using high fidelity graphical output to examine angle of attack, coefficient of lift, and air load. Computational results show performance gains in conventional helicopters and high speed flight potential for RVR equipped aircraft. The RVR is applied to the Joint Heavy Vertical Lift (JVHL) aircraft conceptual design for preliminary analysis. This conceptual design can be used as an indicator of the performance% of a high speed RVR equipped aircraft.

DTIC

Harmonic Control; Helicopters; Horizontal Flight; Rotors

20040043787 Air Command and Staff Coll., Maxwell AFB, AL

Non-Lethal Weaponry: Applications to AC-130 Gunships

Bobb, Justin L.; Apr. 2002; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420661; AU/ACSC/018/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

The theory and application of non-lethal weapons is not new and has been in use by ground combat troops and civil authorities for some time, in situations requiring the application of less than lethal force, With the increasing involvement of US military in operations other than war, the AC-130 Gunship has been the weapon of choice to provide air support This paper analyzes the viability of integrating existing non-lethal technologies with current AC-130 Gunships' weapons and equipment for use in supporting combat operations or Military Operations Other Than War, The research begins with an overview of the gunship's current capabilities, roles and missions followed by a summarization of current and future non-lethal weapons, There appears to be current and emerging weapons technology which shows great potential in fulfilling the non-lethal requirement for Air Force Special Operations Command's AC-130 Gunships, Many issues, however, must be addressed before these weapons are fully integrated into the AC-130's arsenal, Technical and engineering evaluation, funding, training, doctrine reviews, safety, and legal concerns are some issues requiring further assessment Given the capabilities and flexibility of the gunship and mission suitability, non-lethal weapons integration will enhance US military mission accomplishment by providing commanders a full range of weaponry from an airborne platform which was not previously available to them

DTIC

Alternating Current

20040043803 Air Univ., Maxwell AFB, AL

Fear No Evil: Unmanned Combat Air Vehicles For Suppression of Enemy Air Defenses

Suminsby, Robert E.; Apr. 2002; 81 pp.; In English

Report No.(s): AD-A420687; No Copyright; Avail: CASI; A05, Hardcopy

American strategies for the employment of airpower are increasingly based on the presumption of rapidly attaining air superiority with minimal losses. Such strategies presume an ability to locate and destroy enemy air defenses, exploiting US advantages in intelligence collection, stealth, and precision strike. While stealth technology has given US forces a huge advantage over most adversaries, and enables unprecedented freedom of action, this 'technology gap' is not an advantage that the US can take for granted. The proliferation of advanced air defenses, especially the so- called 'double-digit' surface to air missiles, raises the specter of significant losses for manned platforms attempting to attack those defenses. Viability of current airpower strategies depends upon acquiring and maintaining a means to find, fix, track, target, and destroy those defenses, in order to permit the application of air power to other objectives. An unmanned combat air vehicle, properly integrated with proper sensors and capabilities, offers the potential to answer this need. Furthermore, the unique capability of such a vehicle to provide persistent intelligence, surveillance and reconnaissance over a battlefield makes it an even more attractive asset.

DTIC

Air Defense; Combat; Drone Vehicles; Fear; Remote Control

20040043806 Air Univ., Maxwell AFB, AL

Stealth, Precision, and the Making of American Foreign Policy

O'Mara, Raymond P.; Jun. 2002; 133 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420694; No Copyright; Avail: CASI; A07, Hardcopy

The end of the Cold War greatly reduced the risk that a limited, peripheral conflict would escalate to a major war between the great powers. It would seem, with this constraint removed, that the USA should be freer to intervene militarily in the affairs of other peoples. Indeed, in the last decade of the twentieth century, the USA intervened militarily as many times as it had during the full forty years of the Cold War, Alternatively, the decision to intervene had always been based on the best interest of Amenca. With the fall of the Soviet Union, America's most vital national interest, its security, was assured, Logic would dictate a less-interventionist foreign policy, as the need to intervene was drastically reduced, This study examines the paradox by investigating the presidential decision making process that leads to military intervention, determining the relative weight for intervention before and after the Cold War, and assessing the importance of technology - in this case the maturity of the combination of stealth aircraft and precision guided weapons - that made the president's decision to intervene after 1990 easier. The president's decision is influenced by six domestic and international factors: national interest, domestic politics, potential for success, potential cost (in lives), public support, and coalition or alliance responsibilities, Tracking changes in the relative influence of each of these factors over time, the importance of promising technological capabilities emerges as much more significant than the shift in balance of power in explaining the increased intervention policies of the USA, Specifically, conclusions are drawn on the real impact of stealth and precision's ability to reduce not only American casualties, but also collateral casualties and damage as well.

DTIC

Foreign Policy; Precision; Stealth Technology

20040043807 North Dakota Univ., Grand Forks, ND

Self-Evaluating Space and Robotic Agents

Marsh, Ronald; Hexmoor, Henry; Feb. 12, 2004; 21 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0302

Report No.(s): AD-A420696; AFRL-SR-AR-TR-04-0127; No Copyright; Avail: CASI; A03, Hardcopy

In the past three years, we focused on self- evaluative methods for agents that interact with other agents and dynamic environments. We started with the observation that it would be beneficial for agents to sense prevailing qualities that stem from their interactions such as situation awareness, sociability, coordination, autonomy, failure tolerance, timeliness, and purposefulness. Agents usually have access to constraining requirements over these qualities. Additionally, many of these qualities are conflicting but a balance is desirable for a given domain and agents can discover that in operation. We have shown that an agent could attempt adjustments in it interactions to bring about favorable global changes. Such abilities require agents to have capabilities at the architectural level. Theoretical results include various models of relationships among social notions, and several models of autonomy, trust, and Power Simulation results include two implemented multiagent systems as testbeds. Over 60 published reports listed at the end of this report present our theoretical developments and reports of experiments from simulations. In the next two sections we briefly outline theoretical developments and implemented simulations.

DTIC

Decision Making; Robotics

20040043949 Brown Univ., Providence, RI

Structural Integrity of a Fighter Aircraft Undergoing Dynamic Combat Maneuvers

Karniadakis, George E.; Feb. 27, 2004; 15 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0035

Report No.(s): AD-A420891; AFRL-SR-AR-TR-04-0142; No Copyright; Avail: CASI; A03, Hardcopy

Under this AFOSR grant, we have developed a parallel spectral/hp element fluid solver that: enables an accurate and fast resolution of the flow field, and is linked to an hp-FEM structural solver, which in turn enables a realistic representation of thin solid structures, e. g. wings. Specifically, the flow solver is NEKTAR, which we have developed and modified for LES type computations of compressible flows. The structural solver is StressCheck, which has also been initially developed under AFOSR support by Prof. B. Szabo and subsequently by Engineering Software Research & Development, Inc.

DTIC

Combat; Fighter Aircraft; Structural Failure

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also *04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics*; and *35 Instrumentation and Photography*.

20040035809 Lawrence Livermore National Lab., Livermore, CA
STOMP: A Software Architecture for the Design and Simulation UAV-Based Sensor Networks
Jones, E. D.; Roberts, R. S.; Hsia, T. C. S.; Oct. 28, 2002; 12 pp.; In English
Report No.(s): DE2003-15005363; UCRL-JC-151771; No Copyright; Avail: Department of Energy Information Bridge

This paper presents the Simulation, Tactical Operations and Mission Planning (STOMP) software architecture and framework for simulating, controlling and communicating with unmanned air vehicles (UAVs) servicing large distributed sensor networks. STOMP provides hardware-in-the-loop capability enabling real UAVs and sensors to feedback state information, route data and receive command and control requests while interacting with other real or virtual objects thereby enhancing support for simulation of dynamic and complex events.
NTIS
Computerized Simulation; Pilotless Aircraft; Communication Networks; Command and Control; Mission Planning

20040035930 Foersvarets Forskningsanstalt, Linkoeping (Sweden), Linkoeping, Sweden
Temporal Displayer
Stroemberg, D.; Andersson, M.; Pettersson, G.; Forsgren, R.; Sep. 2002; 44 pp.; In Swedish
Report No.(s): PB2004-102697; FOI-R-0576-SE; No Copyright; Avail: CASI; A03, Hardcopy

The temporal display is a way to graphically illustrate the threat situation for an operator of a mobile platform (aircraft, ship and land vehicle) in combat. It has grown out from the knowledge that each mobile platform has energy content in its movement in relation to other platforms, and that this energy content can be expressed in terms of action possibilities and time intervals. The report describes how these circumstances might be illustrated with graphical techniques in a temporal display, sometimes also called threat display. Furthermore, an important information source for the threat display is described. This method, Hidden Markov Models, can infer target type information from sensor data. An example shows how flying patterns can reveal some facts about the type of an aircraft. Finally, a theory within cognitive science is presented, where operator and machines are described in a common terminology with the aim to improve the integration of operators and operator roles in complex technical systems. Cognitive Systems Engineering uses the decision loop as a common tool towards which both operators and machines can interact in all kinds of decision support tools.
NTIS
Display Devices; Temporal Resolution; Mobility; Information Systems

20040041310 Ohio Univ., Athens, OH, USA
A 3-Dimensional Cockpit Display with Traffic and Terrain Information for the Small Aircraft Transportation System
UijtdeHaag, Maarten; Thomas, Robert; Rankin, James R.; March 08, 2004; 13 pp.; In English
Contract(s)/Grant(s): NAG3-2612; No Copyright; Avail: CASI; A03, Hardcopy

The report discusses the architecture and the flight test results of a 3-Dimensional Cockpit Display of Traffic and terrain Information (3D-CDTI). The presented 3D-CDTI is a perspective display format that combines existing Synthetic Vision System (SVS) research and Automatic Dependent Surveillance-Broadcast (ADS-B) technology to improve the pilot's situational awareness. The goal of the 3D-CDTI is to contribute to the development of new display concepts for NASA's Small Aircraft Transportation System research program. Papers were presented at the PLANS 2002 meeting and the ION-GPS 2002 meeting. The contents of this report are derived from the results discussed in those papers.
Author
Display Devices; General Aviation Aircraft; Situational Awareness

07
AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power; 28 Propellants and Fuels*; and *44 Energy Production and Conversion*.

20040035787 NASA Langley Research Center, Hampton, VA, USA
Analysis and Design of Rectangular-Cross-Section Nozzles for Scramjet Engine Testing
Gaffney, Richard L., Jr.; Korte, John J.; [2004]; 16 pp.; In English; 42nd AIAA Aerospace Science Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paper 2004-1137; Copyright; Avail: CASI; A03, Hardcopy

The flow in the square-cross-section Mach-6 nozzle used in the NASA Langley Research Center Arc-Heated Scramjet Test Facility has been analyzed using three-dimensional viscous CFD methods. The primary cause of the non-uniform flow exiting the nozzle is identified as cross-flow pressure gradients imposed on wall boundary layers. The cross-flow pressure gradients cause the boundary layer to roll up into counter-rotating vortex pairs on each of the four sides of the nozzle. These four vortex pairs produce significant non-uniformity in the nozzle-exit flow. In order to improve the quality of the test flow in the facility, two alternative nozzle designs (one axisymmetric and one rectangular with a 2-D contour) have been investigated. While the axisymmetric design produced the most uniform flow, the 2-D design also produced very good flow. The 2-D design was selected for further refinement, resulting in a new nozzle design which has been constructed and awaits calibration.
Author
Design Analysis; Nozzle Design; Rectangles; Cross Sections; Engine Tests; Nozzle Flow

20040035789 NASA Langley Research Center, Hampton, VA, USA
Dual-Pump CARS Thermometry and Species Concentration Measurements in a Supersonic Combustor
OByrne, Sean; Danehy, Paul M.; Cutler, Andrew D.; [2004]; 17 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): 23-762-55-MB
Report No.(s): AIAA Paper 2004-0710; Copyright; Avail: CASI; A03, Hardcopy

The dual-pump coherent anti-Stokes Raman spectroscopy (CARS) method was used to measure temperature and the absolute mole fractions of N2, O2 and H2 in a supersonic combustor. Experiments were conducted in NASA Langley Research Center's Direct Connect Supersonic Combustion Test Facility. In this facility, hydrogen and air bum to increase the enthalpy of the test gas; O2 is then added to simulate air. This gas is expanded through a Mach 2 nozzle and into a combustor model consisting of a short constant-area section followed by a small rearward facing step and another constant area section. At the end of this straight section H2 fuel is then injected at Mach 2 and at 30 deg. angle with respect to the freestream. One wall of the duct then expands at a 3 deg. angle for over 1 meter. The ensuing combustion is monitored optically through ports in the side of the combustor. CARS measurements were performed at the nozzle exit and at four different planes downstream fuel injection. Maps were obtained of the mean temperature, as well as quantitative N2 and O2 and qualitative H2 mean mole fraction fields. Correlations between fluctuations of the different measured parameters are presented for one of the planes of data.
Author
Combustion Chambers; Concentration (Composition); Raman Spectroscopy; Temperature Measurement; Friction; Nitrogen; Oxygen; Hydrogen

20040036547 Naval Postgraduate School, Monterey, CA
Design of a Lift Fan Engine for a Heavy Lift Aircraft
Goebel, James E.; Dec. 2003; 75 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420517; No Copyright; Avail: CASI; A04, Hardcopy

Recent conflicts have highlighted the difficulties in using aircraft to supply troops in modern warfare. Lift fan technology is seen as one way in which to improve future supply aircraft to meet the needs of the military. A previous study designed a heavy lift aircraft with lift fan engines that used future engine technology. This present study modified the design by using current engine technology for the lift fan engines. The modification is important because a design that uses current technology is more likely to be brought into service in the near future. This thesis documents the process required to use current technology in a lift fan engine for a heavy lift aircraft. The process uses current software and focuses on the design of the

following components: the powerplant the transmission shafts and the lift fan. The result is a propulsion system which allows a 185,000 lb aircraft to takeoff vertically as well as cruise at speeds greater than Mach 0.6.
DTIC
Aircraft Engines; Lift Fans

20040040086 NASA Glenn Research Center, Cleveland, OH, USA
Development of an Information Fusion System for Engine Diagnostics and Health Management
Volponi, Allan J.; Brotherton, Tom; Luppold, Robert; Simon, Donald L.; February 2004; 22 pp.; In English; 39th Combustion/27th Airbreathing Propulsion/21st Propulsion Systems Hazards/3rd Modeling and Simulation Joint Subcommittee Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA
Contract(s)/Grant(s): NAS3-01138; WBS 22-704-30-01; DA Proj. 1L1-61102-AF-20
Report No.(s): NASA/TM-2004-212924; ARL-TR-3127; E-14364; No Copyright; Avail: CASI; A03, Hardcopy

Aircraft gas-turbine engine data are available from a variety of sources including on-board sensor measurements, maintenance histories, and component models. An ultimate goal of Propulsion Health Management (PHM) is to maximize the amount of meaningful information that can be extracted from disparate data sources to obtain comprehensive diagnostic and prognostic knowledge regarding the health of the engine. Data Fusion is the integration of data or information from multiple sources, to achieve improved accuracy and more specific inferences than can be obtained from the use of a single sensor alone. The basic tenet underlying the data/information fusion concept is to leverage all available information to enhance diagnostic visibility, increase diagnostic reliability and reduce the number of diagnostic false alarms. This paper describes a basic PHM Data Fusion architecture being developed in alignment with the NASA C17 Propulsion Health Management (PHM) Flight Test program. The challenge of how to maximize the meaningful information extracted from disparate data sources to obtain enhanced diagnostic and prognostic information regarding the health and condition of the engine is the primary goal of this endeavor. To address this challenge, NASA Glenn Research Center (GRC), NASA Dryden Flight Research Center (DFRC) and Pratt & Whitney (P&W) have formed a team with several small innovative technology companies to plan and conduct a research project in the area of data fusion as applied to PHM. Methodologies being developed and evaluated have been drawn from a wide range of areas including artificial intelligence, pattern recognition, statistical estimation, and fuzzy logic. This paper will provide a broad overview of this work, discuss some of the methodologies employed and give some illustrative examples.
Author
Aircraft Engines; Gas Turbine Engines; Statistical Analysis; Artificial Intelligence; Multisensor Fusion; Flight Tests

20040040169 NASA Glenn Research Center, Cleveland, OH, USA
Controls and Health Management Technologies for Intelligent Aerospace Propulsion Systems
Garg, Sanjay; February 2004; 28 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): NASA/TM-2004-212915; AIAA Paper 2004-0949; E-14354; No Copyright; Avail: CASI; A03, Hardcopy

With the increased emphasis on aircraft safety, enhanced performance and affordability, and the need to reduce the environmental impact of aircraft, there are many new challenges being faced by the designers of aircraft propulsion systems. The Controls and Dynamics Technology Branch at NASA (National Aeronautics and Space Administration) Glenn Research Center (GRC) in Cleveland, Ohio, is leading and participating in various projects in partnership with other organizations within GRC and across NASA, the U.S. aerospace industry, and academia to develop advanced controls and health management technologies that will help meet these challenges through the concept of an Intelligent Engine. The key enabling technologies for an Intelligent Engine are the increased efficiencies of components through active control, advanced diagnostics and prognostics integrated with intelligent engine control to enhance component life, and distributed control with smart sensors and actuators in an adaptive fault tolerant architecture. This paper describes the current activities of the Controls and Dynamics Technology Branch in the areas of active component control and propulsion system intelligent control, and presents some recent analytical and experimental results in these areas.
Author
Active Control; Turbojet Engine Control; Aircraft Engines; Spacecraft Propulsion; Diagnosis

20040040173 NASA Glenn Research Center, Cleveland, OH, USA

Optimal Micro-Jet Flow Control for Compact Air Vehicle Inlets

Anderson, Bernhard H.; Miller, Daniel N.; Addington, Gregory A.; Agrell, Johan; February 2004; 63 pp.; In English; NATO Symposium of Vehicle Propulsion Integration, 6-9 Oct. 2003, Warsaw, Poland

Contract(s)/Grant(s): WBS 22-708-92-24

Report No.(s): NASA/TM-2004-212937; E-14376; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this study on micro-jet secondary flow control is to demonstrate the viability and economy of Response Surface Methodology (RSM) to optimally design micro-jet secondary flow control arrays, and to establish that the aeromechanical effects of engine face distortion can also be included in the design and optimization process. These statistical design concepts were used to investigate the design characteristics of 'low mass' micro-jet array designs. The term 'low mass' micro-jet may refers to fluidic jets with total (integrated) mass flow ratios between 0.10 and 1.0 percent of the engine face mass flow. Therefore, this report examines optimal micro-jet array designs for compact inlets through a Response Surface Methodology.

Author

Design Optimization; Fluidics; Mass Flow; Jet Flow

20040040176 NASA Glenn Research Center, Cleveland, OH, USA

Optimal Micro-Vane Flow Control for Compact Air Vehicle Inlets

Anderson, Bernhard H.; Miller, Daniel N.; Addington, Gregory A.; Agrell, Johan; February 2004; 43 pp.; In English; NATO Symposium of Vehicle Propulsion Integration, 6-9 Oct. 2003, Warsaw, Poland

Contract(s)/Grant(s): WBS 22-708-92-24

Report No.(s): NASA/TM-2004-212936; E-14375; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study on micro-vane secondary flow control is to demonstrate the viability and economy of Response Surface Methodology (RSM) to optimally design micro-vane secondary flow control arrays, and to establish that the aeromechanical effects of engine face distortion can also be included in the design and optimization process. These statistical design concepts were used to investigate the design characteristics of 'low unit strength' micro-effector arrays. 'Low unit strength' micro-effectors are micro-vanes set at very low angles-of-incidence with very long chord lengths. They were designed to influence the near wall inlet flow over an extended streamwise distance, and their advantage lies in low total pressure loss and high effectiveness in managing engine face distortion. Therefore, this report examines optimal micro-vane secondary flow control array designs for compact inlets through a Response Surface Methodology.

Author

Design Analysis; Inlet Flow; Control Equipment; Design Optimization

20040040233 Florence Univ., Italy

Thermal Behaviour Analysis of a Leading Edge Ribbed Channel Using Liquid Crystal Technique

Carcasci, Carlo; Migliorini, Giacomo; Coutandin, Daniele; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; January 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

The continuous developing of gas turbines as Aeroengines leads the designers to the reaching of higher performances in terms of increasing operating temperatures and lower emissions standards. Thus the necessity for more effective blade cooling, in order to maintain the metal temperature fields at levels consistent with blade design life, is required. This work intends to give information about the thermal behaviour of the fluid inside a turbine blade cooling system. We analysed a 5:1 model of an actual blade cooling system (leading edge ribbed channel) designed by FiatAvio, in order to retrieve the surface heat transfer coefficient distribution inside the model we used a transient method based on Thermochromic Liquid Crystal technique. To control the results provided from image analysis and data reduction we compared our results with those coming from correlations available in literature. From image visualisation and surface heat transfer maps we are able to see how the geometry of the system influences the heat transfer inside the blade.

Author

Thermal Analysis; Leading Edges; Liquid Crystals; Gas Turbines; Heat Transfer

20040040338 National Advisory Committee for Aeronautics. Lewis Flight Propulsion Lab., Cleveland, OH, USA
Preliminary Air-Flow and Thrust Calibrations of Several Conical Cooling-Air Ejectors with a Primary to Secondary Temperature Ratio of 1.0, 2, Diameter Ratios of 1.06 and 1.40
Greathouse, W. K.; Hollister, D. P.; August 12, 1952; 37 pp.; In English
Report No.(s): NACA-RM-E52F26; No Copyright; Avail: CASI; A03, Hardcopy

An investigation was made of the performance of nine conical cooling-air ejectors at primary jet pressure ratios from 1 to 10, secondary pressure ratios to 4.0, and a temperature ratio of unity. This phase of the investigation was limited to conical ejectors having shroud exit to primary nozzle exit diameter ratios of 1.06 and 1.40, with several spacing ratios for each. The experimental results indicated that the pumping range and amount of cooling-air flow obtained with a 1.06 diameter ratio ejector were relatively small for cooling purposes but that the maximum possible thrust loss, which occurred with no secondary flow, was only 7 percent of convergent nozzle thrust. The 1.40 diameter ratio ejector produced a large cooling air flow and showed a possible thrust loss of 29.5 percent with no cooling air flow. Thrust gains were attained with ejectors of both diameter ratios at secondary pressure ratios greater than 1.0. The limiting primary pressure ratio below which an ejector can operate at a specific secondary pressure ratio (cut-off point) may be estimated for various flight conditions from data contained herein.
Author
Air Flow; Thrust; Calibrating; Ejectors; Conical Flow

20040042495 NASA Langley Research Center, Hampton, VA, USA
X-43C Flight Demonstrator Project Overview
Moses, Paul L.; [2003]; 10 pp.; In English; Joint JANNAF Subcommittee Meeting: 39th Combustion, 1-5 Dec. 2003, Colorado Springs, CO, USA
Contract(s)/Grant(s): 22-794-70-60
Report No.(s): Paper-2C-3; No Copyright; Avail: CASI; A02, Hardcopy

The X-43C Flight Demonstrator Project is a joint NASA-USAF hypersonic propulsion technology flight demonstration project that will expand the hypersonic flight envelope for air-breathing engines. The Project will demonstrate sustained accelerating flight through three flights of expendable X-43C Demonstrator Vehicles (DVs). The approximately 16-foot long X-43C DV will be boosted to the starting test conditions, separate from the booster, and accelerate from Mach 5 to Mach 7 under its own power and autonomous control. The DVs will be powered by a liquid hydrocarbon-fueled, fuel-cooled, dual-mode, airframe integrated scramjet engine system developed under the USAF HyTech Program. The Project is managed by NASA Langley Research Center as part of NASA's Next Generation Launch Technology Program. Flight tests will be conducted by NASA Dryden Flight Research Center off the coast of California over water in the Pacific Test Range. The NASA/USAF/industry project is a natural extension of the Hyper-X Program (X-43A), which will demonstrate short duration (approximately 10 seconds) gaseous hydrogen-fueled scramjet powered flight at Mach 7 and Mach 10 using a heavy-weight, largely heat sink construction, experimental engine. The X-43C Project will demonstrate sustained accelerating flight from Mach 5 to Mach 7 (approximately 4 minutes) using a flight-weight, fuel-cooled, scramjet engine powered by much denser liquid hydrocarbon fuel. The X-43C DV design flows from integrating USAF HyTech developed engine technologies with a NASA Air-Breathing Launch Vehicle accelerator-class configuration and Hyper-X heritage vehicle systems designs. This paper describes the X-43C Project and provides the background for NASA's current hypersonic flight demonstration efforts.
Author
X-43 Vehicle; Air Breathing Engines; General Overviews; Hypersonic Flight; Technology Utilization; NASA Programs

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

20040035791 NASA Langley Research Center, Hampton, VA, USA
Applications of Computational Methods for Dynamic Stability and Control Derivatives
Green, Lawrence L.; Spence, Angela M.; [2004]; 18 pp.; In English; 42nd AIAA Applied Aerospace Sciences, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): 23-762-20-31
Report No.(s): AIAA Paper 2004-0377; Copyright; Avail: CASI; A03, Hardcopy

Initial steps in the application o f a low-order panel method computational fluid dynamic (CFD) code to the calculation of aircraft dynamic stability and control (S&C) derivatives are documented. Several capabilities, unique to CFD but not unique to this particular demonstration, are identified and demonstrated in this paper. These unique capabilities complement conventional S&C techniques and they include the ability to: 1) perform maneuvers without the flow-kinematic restrictions and support interference commonly associated with experimental S&C facilities, 2) easily simulate advanced S&C testing techniques, 3) compute exact S&C derivatives with uncertainty propagation bounds, and 4) alter the flow physics associated with a particular testing technique from those observed in a wind or water tunnel test in order to isolate effects. Also presented are discussions about some computational issues associated with the simulation of S&C tests and selected results from numerous surface grid resolution studies performed during the course of the study.
Author
Computational Fluid Dynamics; Dynamic Stability; Stability Derivatives; Aircraft Stability

20040037784 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Multiplicative Versus Additive Filtering for Spacecraft Attitude Determination
Markley, F. Landis; December 17, 2003; 8 pp.; In English; 6th International Conference on Control of Systems and Structures in Space, 18-22 Jul. 2004, Riomaggiore, Italy; No Copyright; Avail: CASI; A02, Hardcopy

The absence of a globally nonsingular three-parameter representation of rotations forces attitude Kalman filters to estimate either a singular or a redundant attitude representation. We compare two filtering strategies using simplified kinematics and measurement models. Our favored strategy estimates a three-parameter representation of attitude deviations from a reference attitude specified by a higher- dimensional nonsingular parameterization. The deviations from the reference are assumed to be small enough to avoid any singularity or discontinuity of the three-dimensional parameterization. We point out some disadvantages of the other strategy, which directly estimates the four-parameter quaternion representation.
Author
Kalman Filters; Attitude (Inclination); Mathematical Models; Spacecraft Control

20040040174 NASA Glenn Research Center, Cleveland, OH, USA
Integrated Control Modeling for Propulsion Systems Using NPSS
Parker, Khary I.; Felder, James L.; Lavelle, Thomas M.; Withrow, Colleen A.; Yu, Albert Y.; Lehmann, William V. A.; February 2004; 17 pp.; In English; 39th Conbustion/27th Airbreathing Propulsion/21st Propulsion Systems Hazards/3rd Modeling and Simulation Joint Subcommittee Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA
Contract(s)/Grant(s): WBS 22-765-10-05
Report No.(s): NASA/TM-2004-212945; E-14385; No Copyright; Avail: CASI; A03, Hardcopy

The Numerical Propulsion System Simulation (NPSS), an advanced engineering simulation environment used to design and analyze aircraft engines, has been enhanced by integrating control development tools into it. One of these tools is a generic controller interface that allows NPSS to communicate with control development software environments such as MATLAB and EASY5. The other tool is a linear model generator (LMG) that gives NPSS the ability to generate linear, time-invariant state-space models. Integrating these tools into NPSS enables it to be used for control system development. This paper will discuss the development and integration of these tools into NPSS. In addition, it will show a comparison of transient model results of a generic, dual-spool, military-type engine model that has been implemented in NPSS and Simulink. It will also show the linear model generator s ability to approximate the dynamics of a nonlinear NPSS engine model.
Author
Propulsion System Configurations; Programming Environments; Aircraft Engines; Spools

20040040334 NASA Dryden Flight Research Center, Edwards, CA, USA
Flight Test Results for the F-16XL With a Digital Flight Control System
Stachowiak, Susan J.; Bosworth, John T.; March 2004; 46 pp.; In English
Contract(s)/Grant(s): 953-50-00-SE-RR
Report No.(s): NASA/TP-2004-212046; H-2554; No Copyright; Avail: CASI; A03, Hardcopy

In the early 1980s, two F-16 airplanes were modified to extend the fuselage length and incorporate a large area delta wing planform. These two airplanes, designated the F-16XL, were designed by the General Dynamics Corporation (now Lockheed Martin Tactical Aircraft Systems) (Fort Worth, Texas) and were prototypes for a derivative fighter evaluation program conducted by the USA Air Force. Although the concept was never put into production, the F-16XL prototypes provided a unique planform for testing concepts in support of future high-speed supersonic transport aircraft. To extend the capabilities

of this testbed vehicle the F-16XL ship 1 aircraft was upgraded with a digital flight control system. The added flexibility of a digital flight control system increases the versatility of this airplane as a testbed for aerodynamic research and investigation of advanced technologies. This report presents the handling qualities flight test results covering the envelope expansion of the F-16XL with the digital flight control system.
Author
F-16 Aircraft; Flight Control; Flight Tests; Control Systems Design; Digital Systems; Aircraft Design

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see *03 Air Transportation and Safety*. For astronautical facilities see *14 Ground Support Systems and Facilities (Space)*.

20040035963 RAND Corp., Santa Monica, CA
Designing Airports for Security: An Analysis of Proposed Changes at LAX
Schell, Terry L.; Chow, Brian G.; Grammich, Clifford; Jan. 2003; 8 pp.; In English
Report No.(s): AD-A420033; RAND/IP-251; No Copyright; Avail: CASI; A02, Hardcopy

The Los Angeles International Airport (LAX) Master Plan explores a variety of ways to meet the changing aviation needs of Southern California in coming decades. The needs include increasing the safety of passengers and airport workers. A recent proposed alternative, Alternative D-Safety and Security, includes more features for the security of airport workers and passengers. Among the features of this plan are maintaining current gate capacity to accommodate growth to 78 million annual passengers by 2015 (from roughly 67 million in 2000) , with some reconfiguration to better accommodate very large aircraft, reconfiguring the Central Terminal Area, including removal of the U-road currently used for passenger loading and unloading, and the removal of all parking structures, limiting Central Terminal Area vehicle traffic to emergency vehicles, mass transportation vehicles (including 'FlyAway' buses to long-term parking lots), and vehicles making deliveries to tenants and concessionaires, constructing a large Ground Transportation Center in the Manchester Square Area, approximately two miles from the Central Terminal Area; all short-term parking and passenger dropoff and pickup would occur at this facility, constructing a mass transit system or 'people mover' linking the Ground Transportation Center, the Metro Green Line, the Central Terminal Area, and a consolidated car rental facility within the Central Terminal Area.
DTIC
Airports; Airport Security

20040041353 Air Force Missile Development Center, Holloman AFB, NM, USA
Wall Interference in a Perforated Wind Tunnel
Brescia, Riccardo; Atti Della Accademia Delle Scienze di Torino (Actions of the Academy of Sciences of Turin); May 1957; Volume 87; 29 pp.; In English
Report No.(s): NACA/TM-1429; No Copyright; Avail: CASI; A03, Hardcopy

The theory of cascades, made up of a series of flat plates placed one behind the other, is extended to the case where the impinging stream is not uniform, and the deduced properties of this cascade-flow are then applied to the study of the wall interference between such as cascade-like boundary and a vortex-source type of singularity. It is shown that the induced velocities, produced by the presence of such a wall, are equal to what is obtained by action of a suitably chosen 'reflected' singularity situated on one side of the wall, together with the action of another suitably chosen 'transmitted' singularity placed on the other side. The concepts of a reflection factor and a transmission factor are introduced to characterize various types of tunnel boundary, whether this is composed of solid wall, open and closed sequences, or just a free fluid surface. These ideas are then extended to cover the situation in which a pair of such walls are allowed to coalesce, especially in the event that one of the walls consists of open and closed portions and the other is a fluid surface. This latter particular combination of boundaries is called a perforated wall. Finally, the interference arising from an arbitrary general singularity placed symmetrically in between two such perforated walls is analyzed, and these results are then applied to the determination of the particular kinds of wall geometry that will produce no interference effects in the case of a slender lifting wing and also in the case of a symmetric profile having a finite thickness.
Author
Wind Tunnels; Perforated Plates; Cascade Flow; Wall Flow; Aerodynamic Interference

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

20040036419 Science Applications, Inc., San Diego, CA
Computing Surface Charging in the Auroral Environment Using NASCAP-2K
Davis, V. A.; Mandell, M. J.; Jongeward, G. A.; May 2003; 36 pp.; In English
Contract(s)/Grant(s): F19628-98-C-0074; Proj-2822
Report No.(s): AD-A420408; SAIC 03/2032; AFRL-VS-HA-TR-2003-1606; No Copyright; Avail: CASI; A03, Hardcopy

At high latitudes, during periods of auroral activity, low-earth polar orbiting spacecraft can pass through a region of intense, energetic electron fluxes and low thermal plasma density. The Nascap-2k computer code has been extended to model spacecraft surface charging in the auroral region. This report documents how to use the new capabilities, the equations used to describe the environment and its interactions with the surfaces, and the validation of the results.
DTIC
Computerized Simulation; Spacecraft Charging

20040036553 Air Univ., Maxwell AFB, AL
How to Institutionalize Space Superiority in the USA Air Force
Patenaude, Richard M.; Jan. 2001; 22 pp.; In English
Report No.(s): AD-A420527; No Copyright; Avail: CASI; A03, Hardcopy

The Air Force talks about space superiority, but as a whole it has not institutionalized space superiority as it has other mission areas such as air superiority. Air superiority is at the heart of what the Air Force does. Everyday airmen%en go to work and think about, plan for, wargame, and practice air superiority. It is not assumed; it is won. It is woven into the fabric of the Air Force and understood as essential at every level. That is what the Air Force must do to institutionalize space superiority weave it into the fabric of the Air Force and make it a top priority mission to be won rather than assumed. Institutionalizing space superiority would require making space superiority an established, clearly identifiable mission with formal, discernible organizational structures that standardize practices and approaches, and codify officially sanctioned beliefs. The result of institutionalization would be to take space superiority and make it a mainstream mission of the Air Force. All air professionals should understand the basic concepts and requirements, and why space superiority is important. All space professionals should do their everyday jobs with the knowledge that space superiority is essential, that it must be taken in to account at every level, at every step, and that without it, all other space missions are vulnerable.
DTIC
Space Missions; United States

20040041330 Swedish Defence Research Establishment, Stockholm, Sweden
Space and Defence
Lindstroem, L.; Jan. 2003; In English
Report No.(s): PB2004-102231; FOI-R-0765-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The importance of space assets has increased for civilian as well as military applications. As the technology matures the number of applications has increased and most people use on a daily basis systems that in one way or another rely on space assets. With the aim of doing an inventory of functions and problems related to space assets that are of interest to the Armed Forces, FOI has carried out a study entitled Space and Defense. The study has shown that space assets can be of use to the Swedish Armed Forces for a number of different functions. Three areas of special interest are: Satellite-related functions, anti-satellite systems and ionosperic modification. Due to the expected value of space assets to the Swedish Armed Forces and the interest shown by other nations in space-related systems, the study suggests that a process for gathering knowledge and information about military applications of space assets should be initiated.
NTIS
Armed Forces; Inventories; Military Technology

20040042388 California Inst. of Tech., Pasadena, CA, USA
A Summer Research Program of NASA/Faculty Fellowships at the Jet Propulsion Laboratory
Albee, Arden; [2004]; 3 pp.; In English
Contract(s)/Grant(s): NAG5-13630; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Faculty Fellowship Program (NFFP) is designed to give college and university faculty members a rewarding personal as well as enriching professional experience. Fellowships are awarded to engineering and science faculty for work on collaborative research projects of mutual interest to the fellow and JPL host colleague. The Jet Propulsion Laboratory (JPL) and the California Institute of Technology (Caltech) have participated in the NASA Faculty Fellowship Program for the past 25 years. Administrative offices are maintained both at the Caltech Campus and at JPL; however, most of the activity takes place at JPL. The Campus handles all fiscal matters. The duration of the program is ten continuous weeks. Fellows are required to conduct their research on-site. To be eligible to participate in the program, fellows must be a U.S. citizen and hold a teaching or research appointment at a U.S. university or college. A travel allowance is paid to those fellows outside the 50-mile radius of JPL.

Derived from text

NASA Programs; Education; Research Facilities

20040043779 Air War Coll., Maxwell AFB, AL
The 65-Mile Seam
Russo, Anthony J.; Feb. 2002; 40 pp.; In English
Report No.(s): AD-A420645; No Copyright; Avail: CASI; A03, Hardcopy

The idea of the air and space environments being part of the same 'seamless continuum' pervades Air Force thinking about the nature of space operations. According to doctrine the 'aerospace medium' is an indivisible whole where the military activities of the U.S. can perform in this environment are essentially the same whether or not the platform is based in air or in space. Airpower theorist Alexander de Seversky, as quoted in Air Force doctrine, said 'The air ocean and its endless outer space extension are one and the same.' According to the Air Force's most fundamental expressions of doctrinal thought, Air Force Doctrine Document 1 (AFDD 1) Basic Aerospace Doctrine of the USA Air Force and AFDD 2 (Organization and Employment of Aerospace Forces), the characteristic advantages of operations in the air are identical to the advantages of operations in space. The logical extension of Air Force doctrine implies the lessons learned from a century of airpower experience are directly applicable to operations in space, without modification. A new, and vastly improved, version of Space Operations Doctrine (AFDD 2-2) was published on 27 Nov 01. Written almost entirely by space operations experts, this document opens the door for innovative consideration of the potentially unique contributions from operations in space. However, this otherwise forward-thinking document still begins Chapter One with the assertion 'There is no division... between air and space. Air and space are an indivisible field of operations.'

DTIC

Airspace; Seams (Joints); Space Missions

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

20040035831 Lawrence Livermore National Lab., Livermore, CA
Eyeglass: A Very Large Aperture Diffractive Space Telescope
Hyde, R.; Dixt, S.; Weisberg, A.; Rushford, M.; Jul. 29, 2002; 18 pp.; In English
Report No.(s): DE2003-15005362; UCRL-JC-149397; No Copyright; Avail: Department of Energy Information Bridge

Eyeglass is a very large aperture (25-100 meter) space telescope consisting of two distinct spacecraft, separated in space by several kilometers. A diffractive lens provides the telescope's large aperture, and a separate, much smaller, space telescope serves as its mobile eyepiece. Use of a transmissive diffractive lens solves two basic problems associated with very large aperture space telescopes; it is inherently fieldable (lightweight and flat, hence packagable and deployable) and virtually eliminates the traditional, very tight, surface shape tolerances faced by reflecting apertures. The potential drawback to use of a diffractive primary (very narrow spectral bandwidth) is eliminated by corrective optics in the telescope's eyepiece. The

Eyeglass can provide diffraction-limited imaging with either single-band, multiband, or continuous spectral coverage.
NTIS
Apertures; Eyepieces; Diffraction; Spaceborne Telescopes

20040036071 Cincinnati Univ., OH
Near-Far Resistance of Alamouti Space-Time Coded CDMA Communication Systems
Yue, Xiaodong; Fan, H. H.; Dec. 5, 2003; 7 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0529
Report No.(s): AD-A420117; ARO-40087.13-C1; No Copyright; Avail: CASI; A02, Hardcopy

In this paper, the near-far resistance of the MMSE detector is derived for the code division multiple access (CDMA) communication systems with the Alamouti space-time block coding. It is shown that transmitter/receiver diversity has benefits on the near-far resistance performance while receiver diversity has more impact on the near-far resistance.
DTIC
Code Division Multiple Access; Radio Equipment; Satellite Communication

20040036117 Aerospace Corp., El Segundo, CA
Velocity-Tunable Magneto-Optical -Trap-Based Cold Cs Atomic Beam
Wang, H.; Buell, W. F.; Dec. 30, 2003; 12 pp.; In English
Contract(s)/Grant(s): FA8802-04-C-0001
Report No.(s): AD-A420149; TR-2004(8555)-3; SMC-TR-04-08; No Copyright; Avail: CASI; A03, Hardcopy

In this paper, the authors report on their observation and investigation of a MOT-based, low-velocity Cs atomic beam for atomic clock applications. A continuous Cs atomic beam is generated from a vapor-cell magneto-optical trap (MOT) of Cs atoms by forming a leak tunnel along one of the trapping laser beams. The mean velocity of the cold Cs beam is measured by the time of flight (TOF) technique to be 7. 3 m/s with a velocity spread of 1 m/s under nominal experimental conditions. By adjusting the MOT parameters, they are able to tune the Cs-beam velocity from 5 m/s to 8.5 m/s while the velocity spread remains to be 1 m/s. The Cs beam has an instantaneous atomic flux of 3.6 x 10(exp 10) atoms/s when operated in pulsed mode and an estimated continuous beam flux of 2 x 10(exp 8) atoms/s. The acceleration kinetics of the Cs beam in the acceleration region is analyzed and simulated. Their theoretical model reveals that the MOT inhomogeneous magnetic field and the varying Doppler shift along the atomic beam propagation play an important role in determining the final velocity of the Cs atomic beam. The numerical results of the atomic beam velocity on MOT parameters agree well with the measurements. (6 figures, 15 refs.)
DTIC
Atomic Beams; Atomic Clocks; Charged Particles; Low Speed

20040036575 Naval Postgraduate School, Monterey, CA
Laser Metrology System for Precision Pointing
Hospodar, Edward J., Jr; Dec. 2003; 81 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420554; No Copyright; Avail: CASI; A05, Hardcopy

Precision spacecraft payloads are driving the need for fine pointing control and vibration cancellation. One implementation that provides pointing and disturbance control is the Stewart-Gough platform equipped with active sensing and actuating elements. The Precision Pointing Hexapod (PPH) at Naval Postgraduate School (NPS) is exactly such a platform initially installed with voice coil actuators and accelerometers on each strut by CSA Engineering Inc. High pointing accuracy, however, requires an additional external sensing system that feeds back the accurate location and orientation information of the moving platform for control. The first implementation by NPS of such sensing system is the eddy current metrology system. Currently, that system only provides measurement of the two degrees of motion that define the pointing direction and has issues such as questionable absolute pointing accuracy and lower resolution. This thesis seeks to develop a new laser metrology system, utilizing diode lasers and position sensing detectors, to provide all six degree of freedom information of the platform motion at higher precision and accuracy. The tasks of developing the laser metrology system from theory to design, fabrication, implementation, and verification are documented in this thesis. Recommendations for future work and lessons learned are also captured.
DTIC
Pointing Control Systems; Points (Mathematics); Semiconductor Lasers

20040036597 Naval Postgraduate School, Monterey, CA
Flexible Multibody Dynamics and Control of the Bifocal Relay Mirror
Moore, Brian M.; Dec. 2003; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420577; No Copyright; Avail: CASI; A05, Hardcopy

In recent years, spacecraft have become increasingly flexible. The design requirements for the Bifocal Relay Mirror spacecraft include controlling jitter at the nanoradian level. Typically, tight pointing requirements require high structural stiffness, at the cost of increasing the on-orbit mass. To accomplish this, while minimizing the mass of the spacecraft, the structure will have some inherent flexibility. These flexible modes will interact with the pointing control, hence affecting the payload performance. The compensator design conducted in this thesis achieves order of magnitude improvements in controlling the rate error, hence jitter. This thesis starts with a rigid body dynamic model, and develops a flexible body dynamic model. Once the model is developed, the structure-controls interaction is discussed. Finally, compensators are applied to the rigid body controller to mitigate the performance losses present in the flexible body system. Through classical second-order compensators, the angular rate error was decreased by a factor of ten. Nonminimum phase notch filters and phase lag filters were used. Ultimately, the phase lag filters provided the best performance.
DTIC
Dynamic Control

20040037745 General Accounting Office, Washington, DC
Space Shuttle: Further Improvements Needed in NASA's Modernization Efforts
Jan. 2004; 36 pp.; In English
Report No.(s): PB2004-103805; GAO-04-203; No Copyright; Avail: CASI; A03, Hardcopy

The Columbia tragedy has accentuated the need to modernize the 20-year-old space shuttle, the only U.S. launch system that carries people to and from space. The shuttle will now be needed for another two decades. As it ages, the spacecraft's components will also age, and it may become increasingly unreliable. GAO examined the National Aeronautics and Space Administration's (NASA) plans to upgrade the shuttle through 2020, how it will identify and select what upgrades are needed, how much the upgrades may cost, and what factors will influence that cost over the system's lifetime.
NTIS
Space Shuttles; NASA Programs

20040040186 System Studies and Simulation, Inc., Huntsville, AL, USA
[Activities of System Studies and Simulation, Inc.]
February 14, 2004; 4 pp.; In English
Contract(s)/Grant(s): GS23F-0254K; NASA Order H-36729-D; No Copyright; Avail: CASI; A01, Hardcopy

Contents include the following: 1. Launch Vehicle Interface Work Performed: a. S3 provided to KSC the new launch inclination targets needed for the April '04 launch date. 2. Prelaunch operations work performed: a. S3 updated the staffing plan for MSFC on-console personnel\during the Final Countdown prior to launch. 3. Software Assessment Work Performed: a. S3 evaluated and recommended approval for Program Control Board (PCB) proposed change 649 for ground software changes, as well as change 650 and 650A for Stored Program Commands. 4. Education and Public Outreach Work Performed: a. S3 continues to coordinate the effort for the design and fabrication of scale models of the GP-3 for use at the launch site, education forums, and management/technical briefings. S3 also prepared a Change Request for additional funds needed for fabrication of additional scale models. S3 drafted the planned uses of these models, including the possibility of participation in the Boston, MA showings of the traveling Einstein Exhibit. 5. Program Management Support Work Performed: a. S3 prepared the input for and closed three MSFC Centerwide Action Item Tracking Systems (CAITS) actions during this period.
Derived from text
Launch Dates; Scale Models; Computer Programs; Education; Project Management

20040041302 NASA Langley Research Center, Hampton, VA, USA
Cryogenic Insulation Bondline Studies for Reusable Launch Vehicles
Johnson, T. F.; Weiser, E. S.; Duong, P. G.; November 19, 2003; 12 pp.; In English; JANNAF 39th Combustion/27th Airbreathing Propulsion/21st Propulsion Systems Hazards/3rd Modeling and Simulation Joint Subcommittee Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA
Contract(s)/Grant(s): 23-719-20-30; No Copyright; Avail: CASI; A03, Hardcopy

Cryogenic insulations bonded to metallic substrates were characterized under simulated mission conditions representative

for a reusable launch vehicle. The combined thermal and mechanical test consisted of 50 to a 100 cycles. These combined thermal and mechanical cycles simulated flight missions with temperatures ranging from -423 F to 450 F and a maximum mechanical tension load ranging from 20,000 lbs. to 97,650 lbs. The combined thermal and mechanical (uniaxial tension) test apparatus (1 ft. by 2 ft. Test Apparatus) developed at the NASA Langley Research Center, was used to perform cyclic tests on cryogenic insulations bonded to tank wall substrates. No visual delamination or degradation was observed in the cryogenic insulation-to-metallic substrate bondline or butt joints between cryogenic insulation panels. In addition, after cyclic testing was performed, residual property results from tension-pull and closed-cell content tests of the cryogenic insulations indicated a decrease in the bondline strength and closed-cell content.
Author
Cryogenics; Reusable Launch Vehicles; Insulation; Bonded Joints; Flight Mechanics

20040043751 Science Applications International Corp., San Diego, CA
NASCAP-2K Preliminary Documentation
Mandell, Myron J.; Davis, Victoria A.; Mikellides, Ioannis G.; May 22, 2002; 89 pp.; In English
Contract(s)/Grant(s): F19628-98-C-0074; Proj-2822
Report No.(s): AD-A420555; SAIC-02/2021; AFRL-VS-TR-2002-1676; No Copyright; Avail: CASI; A05, Hardcopy

This report is preliminary documentation for the three-dimensional Nascap-2k spacecraft-plasma environment interactions computer code. Nascap-2k is being developed as a successor to all the aforementioned codes as part of a program sponsored by the Air Force Research Laboratory and the NASA Space Environment Effects Program. Nascap-2k incorporates all the scientific modules of DynaPAC and uses the DynaPAC database. The following additional modules have been developed under the Nascap-2k program: (1) an Object Definition Toolkit (written in Java); (2) an analysis module (written in C++ and using the Boundary Element Method (BEM)2) for calculating surface charging in Geosynchronous Earth Orbit. Solar Wind or other tenuous plasma environments; (3) a graphical interface (written in Java) for setting up problems and examining results; and (4) a new GridTool program (Java) for building a DynaPAC multiply-nested grid structure.
DTIC
Boundary Element Method; Computer Programs; Computerized Simulation; Data Bases; Spacecraft Charging

20040043763 Naval Postgraduate School, Monterey, CA
Testing and Evaluation of the Configurable Fault Tolerant Processor (CFTP) for Space-Based Applications
Hulme, Charles A.; Dec. 2003; 269 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420621; No Copyright; Avail: CASI; A12, Hardcopy

With the complexity of digital systems, reliability considerations are important. In many digital systems it is desirable to continuously monitor, exercise, and test the system to determine whether it is performing as desired. Such monitoring may enable automatic detection of failures via periodic testing or through the use of codes and checking circuits (e.g., built-in self-testing). While any complex system requires testing to ensure satisfactory performance, satellite systems require extensive testing for two additional reasons: they operate in an environment considerably different from that in which they were built, and after launch they are inaccessible to routine maintenance and repair. Because of these unique requirements, a specific solution is needed: a self-contained, autonomous, self-testing circuit. The focus of this thesis is the design and development of a series of Built-In Self-Tests (BISTs) for use with the Configurable Fault Tolerant Processor (CFTP). The results of this thesis are two detailed designs for a Random Access Memory (RAM) BIST and a Read-Only Memory (ROM) BIST, as well as a conceptual design for a Field Programmable Gate Array (FPGA) BIST. These designs are stored on board the CFTP and are made to operate remotely and autonomously. Together, these BISTs provide a means to monitor, exercise, and test the CFTP components and thus facilitate a reliable design. (13 tables, 50 figures, 35 refs.)
DTIC
Computer Systems Design; Defects; Digital Systems; Fault Tolerance; Logic Circuits; Microprocessors

20040043834 Air Univ., Maxwell AFB, AL
Whither Space Power? Forging a Strategy for the New Century
Worden, Simon P.; Shaw, John E.; Sep. 2002; 157 pp.; In English
Report No.(s): AD-A420736; No Copyright; Avail: CASI; A08, Hardcopy

The influence of space power pervades almost every sphere and level of human existence, from politics to military affairs to commercial activities to cultural mindsets. Yet there is little to be found today in the way of coherent space power doctrine and strategy, particularly in national security circles. To what extent do our national interests rely on space? How shall we

defend our interests in space and, in times of conflict, how shall we deny our adversaries the benefits of space power? How can we control and exploit the space environment? How can we effectively wield space power against the full spectrum of threats from the lone terrorist to global peer competitors? What should be our long-range strategy and objectives if our goal is to achieve and maintain long-term space superiority? The purpose of this Fairchild Paper is twofold: first, to illuminate the historical and ever- increasing importance of space in modern society; and second, to prescribe, in view of this importance, the foundations of a strategy for achieving lasting space superiority and ensuring national and world security.
DTIC
Aerospace Systems; Forging; Military Operations; Strategy

16
SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety; 15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20040035727 Columbia Accident Investigation Board, Arlington, VA, USA
Columbia Accident Investigation Board, Volume 4
White, Donald J., Editor; Goodman, Patrick A., Editor; Reingold, Lester A., Editor; Kirchhoff, Christopher M., Editor; Simon, Ariel H., Editor, et al.; October 2003; 396 pp.; In English; Original contains color illustrations; No Copyright; Order hardcopy or CD-ROM from the U.S. Government Printing Office

Volume III of the Report contains appendices that were not cited in Volume I. These consist of documents produced by NASA and other organizations, which were provided to the Columbia Accident Investigation Board in support of its inquiry into the February 1, 2003 destruction of the Space Shuttle Columbia. The documents are compiled in this volume in the interest of establishing a complete record, but they do not necessarily represent the views of the Board. Volume I contains the Board's findings, analysis, and recommendations. The documents in Volume III through V are also contained in their original color format on the DVD disc in the back of Volume II.
Author
Columbia (Orbiter); Accident Investigation

20040035728 Columbia Accident Investigation Board, Arlington, VA, USA
Columbia Accident Investigation Board Report, Volume 5, Appendices G.1 - G.9
White, Donald J., Editor; Goodman, Patrick A., Editor; Reingold, Lester A., Editor; Kirchhoff, Christopher M., Editor; Simon, Ariel H., Editor; October 2003; 466 pp.; In English; Original contains color illustrations; No Copyright; Order hardcopy or CD-ROM from the U.S. Government Printing Office

Volume V of the Report contains appendices that were not cited in Volume I. These consist of documents produced by NASA and other organizations, which were provided to the Columbia Accident Investigation Board in support of its inquiry into the February 1, 2003 destruction of the Space Shuttle Columbia. The documents are compiled in this volume in the interest of establishing a complete record, but they do not necessarily represent the views of the Board. Volume I contains the Board's findings, analysis, and recommendations. The documents in Volume V are also contained in their original color format on the DVD disc in the back of Volume II.
Author
Columbia (Orbiter); Accident Investigation

20040035768 Columbia Accident Investigation Board, Arlington, VA, USA
Columbia Accident Investigation Board Report, Volume 5, Appendices G.10 - G.12
Barry, John L.; Jenkins, Dennis R.; White, Donald J., Editor; Goodman, Patrick A., Editor; Reingold, Lester A., Editor; Kirchhoff, Christopher M., Editor; Simon, Ariel H., Editor; October 2003; 474 pp.; In English; Original contains color illustrations; No Copyright; Order hardcopy or CD-ROM from U.S. Government Printing Office

Volume V of the Report contains appendices that were not cited in Volume I. These consist of documents produced by NASA and other organizations, which were provided to the Columbia Accident Investigation Board in support of its inquiry into the February 1, 2003 destruction of the Space Shuttle Columbia. The documents are compiled in this volume in the interest of establishing a complete record, but they do not necessarily represent the views of the Board. Volume I contains the

Board's findings, analysis, and recommendations. The documents in Volume V are also contained in their original color format on the DVD disc in the back of Volume II.
Author
Columbia (Orbiter); Accident Investigation; Reports; Spacecraft Launching; Spacecraft Breakup; Spacecraft Survivability

20040035841 Columbia Accident Investigation Board, Arlington, VA, USA
Columbia Accident Investigation Board Report, Volume 5, Appendix G.13
White, Donald J., Editor; Goodman, Patrick A., Editor; Reingold, Lester A., Editor; Kirchhoff, Christopher M., Editor; Simon, Ariel H., Editor; October 2003; 686 pp.; In English; Original contains color illustrations; No Copyright; Order hardcopy or CD-ROM from the U.S. Government Printing Office

This is Volume V, Appendix G.13 of the report from the Columbia Accident Investigation Board. Specifically, it is the Aero/Aerothermal/Thermal/Structures Team (AATS) Final Report.The approach used by the AATS Team was to postulate the approximate location and extent of damage experienced by Columbia during entry. The team would then formulate analyses or tests that would emulate the vehicle aerodynamic, thermal, or structural responses to the postulated hardware damage. The results of the analyses or tests were compared to anomalous MADS and OI measured data or offnominal aerodynamic increments associated with the STS-107 entry to determine if the postulated damage condition was feasible. Results were then integrated to ensure that the postulated damage condition could be supported across the technical disciplines. Where appropriate to ensure consistency, corresponding analysis of damage conditions were completed for the ascent phase of flight. Finally, postulated damage conditions were evaluated to ensure that they would not conflict with the condition of recovered hardware or other flight data. The AATS Team efforts were primarily focused on postulated damage conditions starting at entry interface (EI) and extending to approximately 615 seconds from EI. Evaluations of off-nominal indications during this time frame were expected to provide the best insight into identifying the initial damage condition. An evaluation of damage conditions consistent with aerodynamic increments just prior to loss of signal (LOS) was conducted for completeness.
Derived from text
Accident Investigation; Columbia (Orbiter); Aerothermodynamics

20040035842 Columbia Accident Investigation Board, Arlington, VA, USA
Columbia Accident Investigation Board Report, Volume 6
White, Donald J., Editor; Goodman, Patrick A., Editor; Reingold, Lester A., Editor; Kirchhoff, Christopher M., Editor; Simon, Ariel H., Editor; October 2003; 342 pp.; In English; Original contains color illustrations; No Copyright; Order hardcopy or CD-ROM from the U.S. Government Printing Office

In the course of its inquiry into the February 1, 2003 destruction of the Space Shuttle Columbia, the Columbia Accident Investigation Board conducted a series of public hearings at Houston, Texas; Cape Canaveral, Florida; and Washington, DC. Testimony from these hearings was recorded and then transcribed. This appendix, Volume VI of the Report, is a compilation of those transcripts. The transcripts are also contained on the DVD disc in the back of Volume II. The video recordings of these hearings are included in the records of the CAIB, held at the National Archives and Records Administration.
Author
Accident Investigation; Columbia (Orbiter)

20040040191 NASA, USA
NASA's Space Shuttle Columbia: Synopsis of the Report of the Columbia Accident Investigation Board
Smith, Marcia S.; September 02, 2003; 6 pp.; In English
Report No.(s): CRS-RS21408; No Copyright; Avail: CASI; A02, Hardcopy

NASA's space shuttle Columbia broke apart on February 1, 2003 as it returned to Earth from a 16-day science mission. All seven astronauts aboard were killed. NASA created the Columbia Accident Investigation Board (CAIB), chaired by Adm. (Ret.) Harold Gehman, to investigate the accident. The Board released its report (available at [http://www.caib.us]) on August 26, 2003, concluding that the tragedy was caused by technical and organizational failures. The CAIB report included 29 recommendations, 15 of which the Board specified must be completed before the shuttle returns to flight status. This report provides a brief synopsis of the Board's conclusions, recommendations, and observations. Further information on Columbia and issues for Congress are available in CRS Report RS21408. This report will not be updated.
Author
Columbia (Orbiter); Accident Investigation; Congressional Reports

20040041349 Columbia Accident Investigation Board, Arlington, VA, USA

Columbia Accident Investigation Board Report, Volume 3

White, Donald J., Editor; Goodman, Patrick A., Editor; Reingold, Lester A., Editor; Kirchhoff, Christopher M., Editor; Simon, Ariel H., Editor; October 2003; 360 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A16, Hardcopy

This report describes the results of an investigative analysis performed by the Air Force Research Laboratory Sensors Directorate at th the specific request of the Defense Columbia Investigation Support Team (DCIST) who was supporting the Columbia Accident Investigation Board (CAIB). The work was performed during the period February 20, 2003 through 20 July 2003. An interim release of measurement findings was provided the CAIB on 24 April 2003, and the information was released in public testimony to the CAIB on May 6, 2003 at the Hilton Hotel, Houston, Texas. The overall assessment and conclusions of this report are consistent with the CAIB 6 May 2003 testimony, with one notable exception discussed in Section VI. This report has been reviewed by the AFRL/SN Flight Day Two DCIST appointed assessment team, and is hereby released to the CAIB and DCIST for final disposition.

Author

Accident Investigation; Columbia (Orbiter); NASA Space Programs; Reports; Space Shuttle Missions

20040041358 NASA, USA

[Columbia Sensor Diagrams]

March 14, 2003; 78 pp.; In English; No Copyright; Avail: CASI; A05, Hardcopy

A two dimensional graphical event sequence of the time history of relevant sensor information located in the left wing and wheel well areas of the Space Shuttle Columbia Orbiter is presented. Information contained in this graphical event sequence include: 1) Sensor location on orbiter and its associated wire bindle in X-Y plane; 2) Wire bundle routing; 3) Description of each anomalous sensor event; 4) Time annotation by (a) GMT, (b) time relative to LOS, (c) time history bar, and (d) ground track; and 5) Graphical display of temperature rise (based on delta temperature from point it is determined to be anomalous).

CASI

Columbia (Orbiter); Sensors; Engineering Drawings; NASA Space Programs; Computer Graphics; Aircraft Accident Investigation

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information see also *04 Aircraft Communications and Navigation*; and *32 Communications and Radar*.

20040040094 NASA Goddard Space Flight Center, Greenbelt, MD, USA

TDRS-1 Going Strong at 20

April 03, 2003; In English; 10 mins., 19 sec. playing time, in color, with sound

Report No.(s): G03-029; No Copyright; Avail: CASI; V01, Videotape-VHS; B01, Videotape-Beta

This video presents an overview of the first Tracking and Data Relay Satellite (TDRS-1) in the form of text, computer animations, footage, and an interview with its program manager. Launched by the Space Shuttle Challenger in 1983, TDRS-1 was the first of a network of satellites used for relaying data to and from scientific spacecraft. Most of this short video is silent, and consists of footage and animation of the deployment of TDRS-1, written and animated explanations of what TDRS satellites do, and samples of the astronomical and Earth science data they transmit. The program manager explains in the final segment of the video the improvement TDRS satellites brought to communication with manned space missions, including alleviation of blackout during reentry, and also the role TDRS-1 played in providing telemedicine for a breast cancer patient in Antarctica.

CASI

Tdr Satellites; Satellite Transmission; Deployment; Satellite Networks; Spacecraft Communication

20040040122 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Achieving and Validating the 1-centimeter Orbit: JASON-1 Precision Orbit Determination Using GPS, SLR, DORIS and Altimeter data

Luthcke, Scott B.; Zelensky, Nikita P.; Rowlands, David D.; Lemoine, Frank G.; Williams, Teresa A.; [2003]; 1 pp.; In English; TOPEX JASON Science Working Team Meeting, 18-21 Nov. 2003, Arles, France; No Copyright; Avail: Other Sources; Abstract Only

Jason-1, launched on December 7, 2001, is continuing the time series of centimeter level ocean topography observations as the follow-on to the highly successful TOPEX/POSEIDON (T/P) radar altimeter satellite. The precision orbit determination (POD) is a critical component to meeting the ocean topography goals of the mission. Jason-1 is no exception and has set a 1 cm radial orbit accuracy goal, which represents a factor of two improvement over what is currently being achieved for T/P. The challenge to precision orbit determination (POD) is both achieving the 1 cm radial orbit accuracy and evaluating and validating the performance of the 1 cm orbit. Fortunately, Jason-1 POD can rely on four independent tracking data types including near continuous tracking data from the dual frequency codeless BlackJack GPS receiver. In addition, to the enhanced GPS receiver, Jason-1 carries significantly improved SLR and DORIS tracking systems along with the altimeter itself. We demonstrate the 1 cm radial orbit accuracy goal has been achieved using GPS data alone in a reduced dynamic solution. It is also shown that adding SLR data to the GPS-based solutions improves the orbits even further. In order to assess the performance of these orbits it is necessary to process all of the available tracking data (GPS, SLR, DORIS and altimeter crossover differences) as either dependent or independent of the orbit solutions. It was also necessary to compute orbit solutions using various combinations of the four available tracking data in order to independently assess the orbit performance. Towards this end, we have greatly improved orbits determined solely from SLR+DORIS data by applying the reduced dynamic solution strategy. In addition, we have computed reduced dynamic orbits based on SLR, DORIS and crossover data that are a significant improvement over the SLR and DORIS based dynamic solutions. These solutions provide the best performing orbits for independent validation of the GPS-based reduced dynamic orbits.
Author
Time Series Analysis; Oceans; Topography; Global Positioning System; Orbit Determination; Poseidon Satellite; Topex

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance; 39 Structural Mechanics*; and *16 Space Transportation and Safety*.

20040035806 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Study of Learning Curve Impact on Three Identical Small Spacecraft
Chen, Guangming; McLennan, Douglas D.; [2003]; 10 pp.; In English; 2004 IEEE Aerospace Conference, 6-13 Mar. 2004, Big Sky, MT, USA
Contract(s)/Grant(s): NAG5-13365; No Copyright; Avail: CASI; A02, Hardcopy

With an eye to the future strategic needs of NASA, the New Millennium Program is funding the Space Technology 5 (ST-5) project to address the future needs in the area of small satellites in constellation missions. The ST-5 project, being developed at Goddard Space Flight Center, involves the development and simultaneous launch of three small, 20-kilogram-class spacecraft. ST-5 is only a test drive and future NASA science missions may call for fleets of spacecraft containing tens of smart and capable satellites in an intelligent constellation. The objective of ST-5 project is to develop three such pioneering small spacecraft for flight validation of several critical new technologies. The ST-5 project team at Goddard Space Flight Center has completed the spacecraft design, is now building and testing the three flight units. The launch readiness date (LRD) is in December 2005. A critical part of ST-5 mission is to prove that it is possible to build these small but capable spacecraft with recurring cost low enough to make future NASA s multi- spacecraft constellation missions viable from a cost standpoint.
Author
Spacecraft Design; Learning Curves; Launch Dates; Flight Tests; Small Scientific Satellites

20040035911 Iowa State Univ. of Science and Technology, Ames, IA, USA, Lockheed Martin Space and Strategic Missiles, Denver, CO, USA
An Integrated Approach for Entry Mission Design and Flight Simulations
Lu, Ping; Rao, Prabhakara; [2004]; 12 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NAS8-01098
Report No.(s): AIAA Paper 2004-0702; No Copyright; Avail: CASI; A03, Hardcopy

An integrated approach for entry trajectory design, guidance, and simulation is proposed. The key ingredients for this approach are an on-line 3 degree-of-freedom entry trajectory planning algorithm and the entry guidance algorithm that

generates the guidance gains automatically. When fully developed, such a tool could enable end-bend entry mission design and simulations in 3DOF and 6DOF mode from de-orbit burn to the TAEM interface and beyond, all in one key stroke. Some preliminary examples of such a capability are presented in this paper that demonstrate the potential of this type of integrated environment.
Author
Flight Simulation; On-Line Systems; Degrees of Freedom; Trajectory Control; Trajectory Planning

20040040118 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Schuler Period in LEO Satellites
Carpenter, Russell J.; Bar-Itzhack, Itzhack Y.; January 2004; 9 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

This paper generalizes and extends the concept of the Schuler oscillation that occurs in the theory of inertial navigation systems, allowing one to see how the Schuler phenomenon affects inertial navigation systems operating in space. We show why a low earth orbit satellite's orbital period is identical to the period of the Schuler pendulum, which is the period of the errors for terrestrial inertial navigation systems. We also show that the generalized form of the Schuler oscillation takes the same form as the Hill-Clohessy-Wiltshire equations for satellite relative motion and that the period of the out-of-plane motion in neighboring satellite relative trajectories is the same as the Schuler period. Finally, we describe how INS gyro drift manifests itself in different coordinate systems for the orbital case. These results may assist orbital flight dynamics and attitude control systems engineers in the design and analysis of INS-equipped spacecraft
Author
Low Earth Orbits; Schuler Tuning; Oscillations; Inertial Navigation; Satellite Design

20040041355 NASA Marshall Space Flight Center, Huntsville, AL, USA
X-37 Flight Demonstrator: A Building Block in NASA's Future Access to Space
Jacobson, David; February 11, 2004; 13 pp.; In English; Space Technology and Information International Technology Forum, 11 Feb. 2004, Albuquerque, NM, USA; No Copyright; Avail: CASI; A03, Hardcopy

X-37 is a fully automated winged vehicle designed to go into low-Earth orbit, maneuver, reenter Earth's atmosphere, and glide back to a landing site. This viewgraph presentation gives an overview of the X-37 flight demonstrator, including cut-away diagrams of its interior, the phased approach to its orbital flight demonstrations, and the experience the program will give aerospace engineers. The presentation also lists X-37 applications, partners, and milestones.
CASI
X-37 Vehicle; Reusable Launch Vehicles

20040041357 NASA Marshall Space Flight Center, Huntsville, AL, USA
X-37 Flight Demonstrator: A Building Block in NASA's Future Access to Space; X-37 Flight Demonstrator: Orbital Vehicle Technology Development Approach
Jacobson, David; February 11, 2004; 18 pp.; In English; Space Technology and Information International Technology Forum, 11 Feb. 2004, Albuquerque, NM, USA; No Copyright; Avail: CASI; A03, Hardcopy

Project management issues and subsystems development for the X-37 flight demonstrator are covered in this viewgraph presentation. Subsystems profiled include: thermal protection systems, hot structures, and lithium-ion batteries.
CASI
X-37 Vehicle; Project Management; Aerospace Systems

20040043672 NASA Ames Research Center, Moffett Field, CA, USA
Estimates Of The Orbiter RSI Thermal Protection System Thermal Reliability
Kolodziej, P.; Rasky, D. J.; October 15, 2002; 21 pp.; In English; 36th AIAA Thermophysics Conference, 23-26 Jun. 2003, Orlando, FL, USA
Report No.(s): AIAA Paper 2003-3766; No Copyright; Avail: CASI; A03, Hardcopy

In support of the Space Shuttle Orbiter post-flight inspection, structure temperatures are recorded at selected positions on the windward, leeward, starboard and port surfaces. Statistical analysis of this flight data and a non-dimensional load interference (NDLI) method are used to estimate the thermal reliability at positions were reusable surface insulation (RSI) is installed. In this analysis, structure temperatures that exceed the design limit define the critical failure mode. At thirty-three positions the RSI thermal reliability is greater than 0.999999 for the missions studied. This is not the overall system level reliability of the thermal protection system installed on an Orbiter. The results from two Orbiters, OV-102 and OV-105, are

in good agreement. The original RSI designs on the OV-102 Orbital Maneuvering System pods, which had low reliability, were significantly improved on OV-105. The NDLI method was also used to estimate thermal reliability from an assessment of TPS uncertainties that was completed shortly before the first Orbiter flight. Results fiom the flight data analysis and the pre-flight assessment agree at several positions near each other. The NDLI method is also effective for optimizing RSI designs to provide uniform thermal reliability on the acreage surface of reusable launch vehicles.
Author
Estimates; Thermal Protection; Reliability; Statistical Analysis; Reusable Heat Shielding; Space Shuttle Orbiters

20040043718 NASA Ames Research Center, Moffett Field, CA, USA
Best of Breed
Lohn, Jason; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

No team of engineers, no matter how much time they took or how many bottles of cabernet they consumed, would dream up an antenna that looked like a deer antler on steroids. Yet that's what a group at NASA Ames Research Center came up with-thanks to a little help from Darwin. NASA's Space Technology 5 nanosatellites, which are scheduled to start measuring Earth's magnetosphere in late 2004, requires an antenna that can receive a wide range of frequencies regardless of the spacecraft's orientation. Rather than leave such exacting requirements in the hands of a human, the engineers decided to breed a design using genetic algorithms and 32 Linux PCs. The computers generated small antenna-constructing programs (the genotypes) and executed them to produce designs (the phenotypes). Then the designs were evaluated using an antenna simulator. The team settled on the form pictured here. You won't find this kind of antenna in any textbook, design guide, or research paper. But its innovative structure meets a challenging set of specifications. If successfully deployed, it will be the first evolved antenna to make it out of the lab and the first piece of evolved hardware ever to fly in space.
Author
Aerospace Engineering; Nanosatellites; Earth Magnetosphere; NASA Programs; Genetic Algorithms; Satellite Antennas

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20040040125 NASA Goddard Space Flight Center, Greenbelt, MD, USA
On-Orbit Cross-Calibration of AM Satellite Remote Sensing Instruments using the Moon
Butler, James J.; Kieffer, Hugh H.; Barnes, Robert A.; Stone, Thomas C.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

On April 14,2003, three Earth remote sensing spacecraft were maneuvered enabling six satellite instruments operating in the visible through shortwave infrared wavelength region to view the Moon for purposes of on-orbit cross-calibration. These instruments included the Moderate Resolution Imaging Spectroradiometer (MODIS), the Multi-angle Imaging SpectroRadiometer (MISR), the Advanced Spaceborne Thermal Emission and Reflection (ASTER) radiometer on the Earth Observing System (EOS) Terra spacecraft, the Advanced Land Imager (ALI) and Hyperion instrument on Earth Observing-1 (EO-1) spacecraft, and the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) on the SeaStar spacecraft. Observations of the Moon were compared using a spectral photometric mode for lunar irradiance developed by the Robotic Lunar Observatory (ROLO) project located at the USA Geological Survey in Flagstaff, Arizona. The ROLO model effectively accounts for variations in lunar irradiance corresponding to lunar phase and libration angles, allowing intercomparison of observations made by instruments on different spacecraft under different time and location conditions. The spacecraft maneuvers necessary to view the Moon are briefly described and results of using the lunar irradiance model in comparing the radiometric calibration scales of the six satellite instruments are presented here.
Author
Cross Correlation; Calibrating; Earth Observing System (Eos); Remote Sensing; Satellite Instruments; Satellite Observation; Sea-Viewing Wide Field-of-View Sensor; Moon

20040040128 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Gravity Models from CHAMP and other Satellite Data
Lemoime, Frank G.; Cox, C. M.; Chinn, D. S.; Zelensky, N. P.; Thompson, B. F.; Rowlands, D. D.; Luthdke, S. B.; Nerem, R. S.; [2003]; 1 pp.; In English; American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA
Contract(s)/Grant(s): NASA Order S-69186-G; No Copyright; Avail: Other Sources; Abstract Only

CHAMP spacecraft is the first of a series of new spacecraft missions that are revolutionizing our ability to model the Earth's geopotential. We report on the analysis of over 100 days of CHAMP data in 2001 and 2002, merged with tracking data of other satellites such as Jason, Topex, GFO, Starlette, Stella, Spot-2, as well as satellite altimetry. We find that the CHAMP-only component of these solutions is a significant improvement over pre-CHAMP satellite only models with respect to the high degree information expressed by the geopotential model coefficients. For example, the variance of the differences with altimeter-derived anomalies through degree 70 is 2.80 mGal(sup 2) for the CHAMP-only solution based on 87 days of data vs. 10.19 mGal(sup 2) for EGM96S. Nonetheless, in order to model properly the various resonances to which different satellites are sensitive, we must include other satellite data. We evaluate the performance of these new CHAMP derived solutions with EGM96 and the EIGEN series of solutions. We review carefully the performance of these models for altimetric satellites.
Derived from text
Geopotential; Space Missions; Mathematical Models; Earth Gravitation; Data Processing; Satellite Altimetry

20040043738 Minnesota Univ., MN, USA
Experiment S-1: Zodiacal Light Photography
Ney, E. P.; Huch, W. F.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 1-8; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A02, Hardcopy

The light of the moonless night sky as viewed from the ground consists principally of scattered light from cities, twilight and starlight, zodiacal light, airglow, and aurora. All of these contributing sources vary with either time or position in the sky, or both. The quantitative observation of any of these from the ground is further complicated by the effects of scattering and absorption within the atmosphere. For several years, the University of Minnesota has carried out a program aimed at separating and understanding the individual contributions to the night sky brightness. polarimeters, and special camera techniques. More recently, we have had the assistance of the manned space program in obtaining special photographs in earth-orbiting missions (MA-9 and Gemini V). In this study, we have used balloon-borne photometers, The principal purpose of this report is to describe the Gemini V observations in the context of their relation to ground-based and balloon experiments on dim-light phenomena.
Derived from text
Photography; Zodiacal Light; Balloon-Borne Instruments; Photometers; Gemini 5 Flight

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20040028039 NASA Glenn Research Center, Cleveland, OH, USA
System Mass Variation and Entropy Generation in 100-kWe Closed-Brayton-Cycle Space Power Systems
Barrett, Michael J.; Reid, Bryan M.; January 2004; 13 pp.; In English; Space Technology and Applications International Forum, 8-12 Feb. 2004, Albuquerque, NM, USA
Contract(s)/Grant(s): WBS 22-982-01-03
Report No.(s): NASA/TM-2004-212741; E-14266; No Copyright; Avail: CASI; A03, Hardcopy

State-of-the-art closed-Brayton-cycle (CBC) space power systems were modeled to study performance trends in a trade space characteristic of interplanetary orbiters. For working-fluid molar masses of 48.6, 39.9, and 11.9 kg/kmol, peak system pressures of 1.38 and 3.0 MPa and compressor pressure ratios ranging from 1.6 to 2.4, total system masses were estimated. System mass increased as peak operating pressure increased for all compressor pressure ratios and molar mass values examined. Minimum mass point comparison between 72 percent He at 1.38 MPa peak and 94 percent He at 3.0 MPa peak showed an increase in system mass of 14 percent. Converter flow loop entropy generation rates were calculated for 1.38 and 3.0 MPa peak pressure cases. Physical system behavior was approximated using a pedigreed NASA Glenn modeling code,

Closed Cycle Engine Program (CCEP), which included realistic performance prediction for heat exchangers, radiators and turbomachinery.
Author
Brayton Cycle; Entropy; Spacecraft Power Supplies; Feedback Control; Systems Engineering; Mathematical Models; Weight (Mass)

20040035760 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Restoring Redundancy to the Wilkinson Microwave Anisotrophy Probe Propulsion System
O'Donnell, James R., Jr.; Davis, Gary T.; Ward, David K.; [2004]; 40 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The Wilkinson Microwave Anisotropy Probe is a follow-on to the Differential Microwave Radiometer instrument on the Cosmic Background Explorer. Attitude control system engineers discovered sixteen months before launch that configuration changes after the critical design review had resulted in a significant migration of the spacecraft's center of mass. As a result, the spacecraft no longer had a viable backup control mode in the event of a failure of the negative pitch-axis thruster. A tiger team was formed and identified potential solutions to this problem, such as adding thruster-plume shields to redirect thruster torque, adding or removing mass from the spacecraft, adding an additional thruster, moving thrusters, bending thruster nozzles or propellant tubing, or accepting the loss of redundancy. The project considered the impacts on mass, cost, fuel budget, and schedule for each solution, and decided to bend the propellant tubing of the two roll-control thrusters to allow the pair to be used for backup control in the negative pitch axis. This paper discusses the problem and the potential solutions, and documents the hardware and software changes and verification performed. Flight data are presented to show the on-orbit performance of the propulsion system and lessons learned are described.
Author
Microwave Anisotropy Probe; Cosmic Background Explorer Satellite; Attitude Control; Design Analysis; Lateral Control; Center of Mass

20040035888 Helsinki Univ. of Technology, Espoo (Finland), Espoo, Finland
Support Vector Machines in Fault Diagnostics of Electrical Motors
Poeyhoenen, S.; Sep. 2002; 40 pp.; In English
Report No.(s): PB2004-103310; REPT-131; Copyright; Avail: National Technical Information Service (NTIS)

Support Vector Machine (SVM) is a novel machine learning method introduced in early 90's. It has been successfully applied to numerous classification and pattern recognition problems, and in many applications, SVM has shown to have better generalization properties than traditional classifier. Also, efficiency of SVM based classification does not depend on the number of features of classified entities, which makes it attractive for fault diagnostics applications. In this thesis, a SVM based fault classification scheme is designed for electrical machines, SVM is used to classify power spectrum estimates of different variables of the motor based on the motor condition. Also the fusion of output of 2-class SVMs to find the global classification decision is studied, and a so-called mixture matrix approach is found to be the most suitable method. Further result is that there exist better fault indicators than stator line current, which is currently widely used in fault diagnostics of electrical machines.
NTIS
Electric Motors; Diagnosis; Stators

20040036033 California Univ., San Diego, La Jolla, CA
Combustion Processes and Instabilities in Liquid- Propellant Rocket Engines
Williams, Forman A.; Jan. 29, 2004; 8 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0027; Proj-2308
Report No.(s): AD-A420091; AFRL-SR-AR-TR-04-0097; No Copyright; Avail: CASI; A02, Hardcopy

This research was directed towards developing new knowledge of combustion processes in liquid-propellant rocket engines. Attention was given to the combustion of different fuels, beginning with hydrogen-oxygen but ultimately including multicomponent hydrocarbon mixtures representative of RP fuels, and to nonlinear processes of importance in combustion instability. Effects of detailed chemical kinetics on performance and stability were addressed by introducing systematically reduced chemistry that enables theoretical analysis to be completed thoroughly and accurately. The interactions between chemistry and turbulence were addressed, including the effects of the heat release on the turbulence. The orientation of the work was fundamental and aimed at predicting not only performance and acoustic response but also intrinsic instability. The

results were intended to help to improve understanding of combustion mechanisms and combustion instabilities in liquid-propellant rocket motors. The most recent specific results concern induction times in hydrogen- oxygen mixtures and heal-release effects on turbulent missing.
DTIC
Burning Rate; Combustion Physics; Liquid Propellant Rocket Engines

20040037751 California Univ., Berkeley, CA, Lawrence Livermore National Lab., Livermore, CA
Equivalence Ratio-EGR Control of HCCI Engine Operation and the Potential for Transition to Spark-Ignited Operation
Martinez-Frias, J.; Aceves, S. M.; Flowers, D.; Smith, J. R.; Dibble, R.; 2001; 12 pp.; In English
Report No.(s): DE2003-15005548; UCRL-JC-144871; No Copyright; Avail: Department of Energy Information Bridge

This research investigates a control system for HCCI engines, where equivalence ratio, fraction of EGR and intake pressure are adjusted as needed to obtain satisfactory combustion. HCCI engine operation is analyzed with a detailed chemical kinetics code, HCT (Hydrodynamics, Chemistry and Transport), that has been extensively modified for application to engines. HCT is linked to an optimizer that determines the operating conditions that result in maximum brake thermal efficiency, while meeting the peak cylinder pressure restriction. The results show the values of the operating conditions that yield optimum efficiency as a function of torque and rpm. The engine has high NO(sub x) emissions for high power operation, so the possibility of switching to stoichiometric operation for high torque conditions is considered. Stoichiometric operation would allow the use of a three-way catalyst to reduce NO(sub x) emissions to acceptable levels. Finally, the paper discusses the possibility of transitioning from HCCI operation to SI operation to achieve high power output.
NTIS
Spark Ignition; Engines; Control; Hydrodynamics

20040040333 NASA Glenn Research Center, Cleveland, OH, USA
Development of an Experiment High Performance Nozzle Research Program
[2004]; 9 pp.; In English
Contract(s)/Grant(s): NCC3-814; No Copyright; Avail: CASI; A02, Hardcopy

As proposed in the above OAI/NASA Glenn Research Center (GRC) Co-Operative Agreement the objective of the work was to provide consultation and assistance to the NASA GRC GTX Rocket Based Combined Cycle (RBCC) Program Team in planning and developing requirements, scale model concepts, and plans for an experimental nozzle research program. The GTX was one of the launch vehicle concepts being studied as a possible future replacement for the aging NASA Space Shuttle, and was one RBCC element in the ongoing NASA Access to Space R&D Program (Reference 1). The ultimate program objective was the development of an appropriate experimental research program to evaluate and validate proposed nozzle concepts, and thereby result in the optimization of a high performance nozzle for the GTX launch vehicle. Included in this task were the identification of appropriate existing test facilities, development of requirements for new non-existent test rigs and fixtures, develop scale nozzle model concepts, and propose corresponding test plans. Also included were the evaluation of originally proposed and alternate nozzle designs (in-house and contractor), evaluation of Computational Fluid Dynamics (CFD) study results, and make recommendations for geometric changes to result in improved nozzle thrust coefficient performance (Cfg).
Author
Research and Development; Nozzle Design; Computational Fluid Dynamics; Nozzle Thrust Coefficients; Rocket-Based Combined-Cycle Engines

20040041300 Integrated Concepts and Research Corp., Washington, DC, USA
Fischer-Tropsch Fuels Production and Demonstration Project. Annual Report for Period July 20, 2001 to July 19, 2002
Bergin, S. P.; Apr. 2003; 20 pp.; In English
Report No.(s): DE2004-820557; No Copyright; Avail: Department of Energy Information Bridge

This project has two primary purposes: 1. Build a small-footprint (SFP) fuel production plant to prove the feasibility of this relatively transportable technology on an intermediate scale (i.e. between laboratory-bench and commercial capacity) and produce as much as 150,000 gallons of hydrogen-saturated Fischer-Tropsch (FT) diesel fuel; and 2. Use the virtually sulfur-free fuel produced to demonstrate (over a period of at least six months) that it can not only be used in existing diesel engines, but that it also can enable significantly increased effectiveness and life of the next-generation exhaust-aftertreatment emission control systems that are currently under development and that will be required for future diesel engines. Furthermore,

a well-to-wheels economic analysis will be performed to characterize the overall costs and benefits that would be associated with the actual commercial production, distribution and use of such FT diesel fuel made by the process under consideration, from the currently underutilized (or entirely un-used) energy resources targeted, primarily natural gas that is stranded, sub-quality, off-shore, etc.
NTIS
Fuel Production; Diesel Fuels; Sulfur; Fischer-Tropsch Process

20040042357 Lawrence Livermore National Lab., Livermore, CA
Density Distributions of Cyclotrimethylenetrinitramines (RDX)
Hoffman, D. M.; Mar. 19, 2002; 24 pp.; In English
Report No.(s): DE2003-15005557; UCRL-JC-147684; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Rdx; Light Scattering; Density Distribution

20040045191 NASA Marshall Space Flight Center, Huntsville, AL, USA
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures
Blevins, John A.; Gostowski, Rudy; Chianese, Silvio; [2003]; 2 pp.; In English; 42nd AIAA Aerospace Sciences Meeting, 5-8 Jan. 2004, Reno, NV, USA; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy
An experimental evaluation of decomposition and ignition delay of hydrogen peroxide at concentrations of 80% to 98% with combinations of hydrocarbon fuels, tertiary amines and transition metal chelates will be presented in the proposed paper. The results will be compared to hydrazine ignition delays with hydrogen peroxide and nitric acid mixtures using the same test apparatus.
Author
Hypergolic Rocket Propellants; Toxicity; Drop Tests; Hydrogen Peroxide

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20040035722 Lawrence Livermore National Lab., Livermore, CA
Pulse Frequency Effect on Neutron Damage in -Iron: A KMC Analysis
Perlado, J. M.; Lodi, D.; Dominquez, E.; Ogando, F.; Prieto, J.; May 2001; 12 pp.; In English
Report No.(s): DE2003-15005292; UCRL-JC-143812; No Copyright; Avail: Department of Energy Information Bridge
The pulsed nature of the irradiation and the high neutron dose are the critical factors in an Inertial Fusion Energy reactor (IFE). The damage that structural materials suffer under these extremes conditions require a careful study and assessment. The goal of our work is to simulate, trough the multiscale modelling approach, the damage accumulation in alpha-Fe under conditions relevant to a IFE Reactor. We discuss how the pulse frequency, 1 Hz, 10 Hz, and the dose rate of 10- and 10- dpa/s affect the damage production and accumulation. Results of the damage that this demanding environment can produce on a protected first structural exposed to 150 keV average recoil ion will be presented. A further comparison it has been made with the damage produced by a continuous irradiation at similar average dose.
NTIS
Iron; Radiation Damage

20040035832 California Univ., Berkeley, CA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Diluted Magnetic Semiconductors Formed by Ion Implantation and Pulsed-Laser Melting
Scarpulla, M. A.; Daud, U.; Yu, K. M.; Monteiro, O.; Liliental-Weber, Z.; 2003; 18 pp.; In English
Report No.(s): DE2003-817251; No Copyright; Avail: Department of Energy Information Bridge
Using ion implantation followed by pulsed-laser melting (PLM), we have synthesized ferromagnetic films of Ga(sub 1-x)Mn(sub x)As. Ion-channeling experiments reveal that these films are single crystalline and have high Mn substitutionality while variable temperature resistivity measurements reveal the strong Mn-hole interactions characteristic of carrier-mediated ferromagnetism in homogeneous DMS's. We have observed Curie temperatures (T(sub C)'s) of approximately 80 K for films

with substitutional Mn concentrations of x=0. 04. The use of n-type counter doping as a means of increasing Mn substitutionality and T(sub c) is explored by co-implantation of Mn and Te into GaAs. In Ga(sub 1-x)Mn(sub x)P samples synthesized using our technique, the implanted layer regrows as an epitaxial single crystal capped by a highly defective surface layer. These samples display ferromagnetism with T(sub c)(approx) 23 K.
NTIS
Semiconductors (Materials); Dilution; Ion Implantation; Pulsed Lasers; Melting

20040035869 National Inst. of Standards and Technology, Gaithersburg, MD
Effect of Bulk Lubricant Concentration on the Excess Surface Density During R134a Pool Boiling with Extensive Measurement and Analysis Details
Kedzierski, M. A.; Sep. 2003; 60 pp.
Report No.(s): PB2004-103363; NISTIR-7051; No Copyright; Avail: CASI; A04, Hardcopy

This paper investigates the effect that the bulk lubricant concentration has on the non-adiabatic lubricant excess surface density on a roughened, horizontal flat pool-boiling surface. Both pool boiling heat transfer data and lubricant excess surface density data are given for pure R134a and three different mixtures of R134a and a polyester lubricant (POE). A spectrofluorometer was used to measure the lubricant excess density that was established by the boiling of an R134a/POE lubricant mixture on a test surface. The lubricant is preferentially drawn out of the bulk refrigerant/lubricant mixture by the boiling process and accumulates on the surface in excess of the bulk concentration. The excess lubricant resides in an approximately 40 micrometers layer on the surface and influences the boiling performance. The lubricant excess surface density measurements were used to modify an existing dimensionless excess surface density parameter so that it is valid for different reduced pressures. The dimensionless parameter is a key component for a refrigerant/lubricant pool-boiling model given in the literature.
NTIS
Lubricants; Density Measurement; Flat Surfaces; Lubricant Tests

20040035921 National Inst. of Standards and Technology (MSEL), Gaithersburg, MD, Gaithersburg, MD, USA
NIST Recommended Practice Guide: Data Evaluation Theory and Practice for Materials Properties
Munro, R. G.; Jun. 2003; 134 pp.; In English
Report No.(s): PB2004-103349; NIST/SP-960-11; No Copyright; Avail: CASI; A07, Hardcopy

Data evaluation is the process by which collections of data are assessed with respect to reliability, completeness, and consistency. The present work addressed data evaluation for materials properties as a scientific discipline that evolves from the formal underpinnings of materials metrology. A theoretical foundation for data evaluation is developed and then illustrated in a practical application to the development of an operational protocol for materials property data. An extensive collection of examples is used to examine, in succession, the issues of accessibility, reproducibility, consistency, and predictability. Distinctions are made among definitive relations, correlations, derived and semiempirical relations, heuristic theories, and value estimates. Subtopics include the use of properties as parameters in models, the interpretation of ad hoc parameters, and the treatments of procedural properties, response dependent properties, and system dependent data.
NTIS
Data Processing; Mechanical Properties

20040035932 Lawrence Berkeley Lab., CA, Berkeley, CA, USA
Defocus Step Size of the LBNL One Angstrom Microscope
O'Keefe, M. A.; Nelson, E. C.; 2003; 10 pp.; In English
Report No.(s): DE2003-817235; LBNL/PUB-3170; No Copyright; Avail: Department of Energy Information Bridge

The change in focus of a high-resolution electron microscope is generally assumed to be linear with change in objective lens current. Thus the defocus step size should be constant for a constant step in lens current. Measurements on the LBNL One-Angstrom Microscope show that the step size increases with increasing underfocus (reduced lens current). Differentiation of the best-fit quadratic shows that the defocus step size varies linearly as defocus changes.
NTIS
Electron Microscopes; Defocusing

20040036261 Connecticut Univ., Storrs, CT
Study on Grindability of Thermo-Spray Coated Nanophase Materials
Zhang, Bi; Jul. 16, 2003; 118 pp.; In English
Contract(s)/Grant(s): N000140110187
Report No.(s): AD-A420288; No Copyright; Avail: CASI; A06, Hardcopy

This study is aimed at experimentally investigating grind ability of nanostructured materials coatings and theoretically developing a mechanical model to simulate the machining process of ceramics. Comprehensive microgrinding experiments are designed to study the effects of the grinding process parameters, such as abrasive grit size, wheel bond type, wheel depth of cut, and work piece feedrate, on surface finish, subsurface damage, and residual stresses of these coatings. The correlation between the grinding conditions and surface integrity, surface finish as well as wear performance of ground samples is explored. The glancing Incident Xray diffraction is Introduced to measure the depth profiles of residual stresses In the coatings. The experiment turns out: The effects of the microgrinding process are limited to the surface layer of ground coatings; The wheel depth of cut Is the most Influential parameter In the cup-type grinding; Ductile flow is the dominant material removal mechanism in grinding n-WC/12Co coatings under all grinding conditions used and in grinding n- AI203/13Ti02 at small material removal rate; The residual stresses induced by the microgrinding process are compressive, strongly depend on the grinding direction, and show strong gradient in thickness direction for both coatings.
DTIC
Thermodynamic Properties

20040036357 Greenwich Univ., London
ARO-ERO Phosphors for Marking, Coding and Information Storage
Vecht, A.; Silver, J.; Withnall, R.; Fern, G. R.; Oct. 2003; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-02-1-0453
Report No.(s): AD-A420359; ERO/ARL-R/D-9350-EE-01; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this preliminary study was to identify simple methods to improve marking and coding of soldiers to reduce the number of fratricide incidents among American and allied casualties. Previous studies showed that the use of powder phosphors had the potential to meet some of these marking and coding requirements, especially in conditions of low light and poor visibility. The use of phosphors is widespread in modern technologies; they can be mass-produced and are widely available, and no expensive equipment or control is needed to lay down large uniform layers of material. The recent availability of near- ultraviolet light emitting diodes in addition to infrared emitting systems has made the remote excitation of phosphors a practical possibility. The authors investigated the development of photoluminescent phosphors that could convert specific energies to specified infrared signals (e.g., visible to infrared, ultraviolet to infrared, infrared to infrared (Stokes), and infrared to visible (anti-Stokes). The authors were directed to using night vision sight (NVS) in the project. The use of NVS indicated that detection of a friendly signature would have to be observed in the infrared region to eliminate visible detection by the enemy. The suppression of visible emissions discounted the use of storage phosphors (infrared to visible) and anti-Stokes (infrared to visible). A long wave pass filter (LWPF) was used to eliminate the 'bloom' of NVS by blocking optical and near-infrared wavelengths below 900 nm. An assessment of possible phosphors showed that ZnCdS had the best infrared properties. Since enemy NVS devices could detect this phosphor's emission peak at 750 nm, the Zn and Cd ratios were adjusted so that only 900 nm wavelengths could be observed. To achieve this the ZnCdS phosphor was tested with various activators and co-activators, including copper, manganese, silver, gold, indium, and gallium. These test results are reported here. (2 tables, 3 figur7
DTIC
Data Storage; Infrared Detectors; Infrared Signatures; Night Vision; Remote Sensing

20040037711 National Inst. for Occupational Safety and Health, Cincinnati, OH
NIOSH Pocket Guide and Other NIOSH Databases 2003 (on CD-ROM with search and retrieval software)
Oct. 2003; In English
Report No.(s): PB2004-500092; No Copyright; Avail: National Technical Information Service (NTIS)

This CD-ROM contains the following NIOSH Databases: (1) Immediately Dangerous to Life and Health Concentrations (IDLHs): documents the criteria and information sources that have been used by the National Institute for Occupational Safety and Health (NIOSH) to determine immediately dangerous to life or health concentrations (IDLHs); (2) International Chemical Safety Cards (WHO/IPCS/ILO): summarizes essential health and safety information on chemicals for their use at the 'shop floor' level by workers and employers in factories, agriculture, construction and other work places; (3) NIOSH Manual of Analytical Methods (NMAM): a collection of methods for sampling and analysis of contaminants in workplace air, and in the

blood and urine of workers who are occupationally exposed; (4) NIOSH Pocket Guide to Chemical Hazards: presents key information and data in abbreviated or tabular form for chemicals or substance groupings (e.g. cyanides, fluorides, manganese compounds) that are found in the work environment; (5) OSHA Sampling and Analytical Methods; (6) Recommendations for Chemical Protective Clothing: describes a method for an industrial hygienist or equivalent safety professional to select appropriate chemical protective clothing; (7) Specific Medical Tests Published for OSHA Regulated Substances: lists the specific medical tests (recommendations included) published in the literature for OSHA regulated substances; (8) Toxicologic Review of Selected Chemicals; and 9. 2000 Emergency Response Guidebook.
NTIS
Chemical Compounds; Hazards; Cd-Rom; Health

20040037732
Adaptive Low Mach Number Simulations of a Premixed Turbulent Laboratory Burner
Day, M. S.; Bell, J. B.; Lijewski, M. J.; Johnson, M.; Cheng, R. K.; 2003; 10 pp.; In English
Report No.(s): DE2004-819977; No Copyright; Avail: Department of Energy Information Bridge
A parallel adaptive low Mach number model is used to study an experimental lean premixed turbulent methane V-flame that is stabilized on a rod spanning the exit plane of a circular nozzle. The fuel is turbulent due to an upstream perforated-plate, and the resulting flame extends downstream of the rod. We present three-dimensional time-dependent simulations of this configuration. The computations incorporate detailed reaction chemistry and transport using a dynamically adaptive block-structured grid algorithm and a time-split integration procedure. Flow field and flame surface statistics are gathered from the experiment and are compared to the computed results.
NTIS
Combustion; Turbulent Flow

20040037750 Lawrence Livermore National Lab., Livermore, CA
Characterization of Stainless Steel and Refractory Metal Welds Made Using a Diode-Pumped, Continuous Wave Nd:YAG Laser
Palmer, T. A.; Wood, B.; Elmer, J. W.; Westrich, C.; Milewski, J. O.; 2002; 46 pp.; In English
Report No.(s): DE2003-15005683; UCRL-ID-146005; No Copyright; Avail: Department of Energy Information Bridge
A series of laser welds have been made on several materials using a Rofin-Sinar DY-033, 3.3 kW, Diode-Pumped Continuous Wave (CW) Nd:YAG laser system, located at Los Alamos National Laboratory. Materials welded in these experiments include 21-6-9 stainless steel, 304L stainless steel, vanadium, and tantalum. The effects of changes in the power input at a constant travel speed on the depth, width, aspect ratio, and total melted area of the welds have been analyzed. Increases in the measured weld pool dimensions as a function of power input are compared for each of the base metals investigated. These results provide a basis for further examining the characteristics of diode pumped CW Nd:YAG laser systems in welding applications.
NTIS
Laser Welding; Stainless Steels; Refractory Metals

20040037756 Lawrence Livermore National Lab., Livermore, CA
Incubation Period for Void Swelling and its Dependence on Temperature, Dose Rate, and Dislocation Structure Evolution
Surh, M. P.; Sturgeon, J. B.; Wolfer, W. G.; Jun. 2002; 16 pp.; In English
Report No.(s): DE2003-15005693; UCRL-JC-148778; No Copyright; Avail: Department of Energy Information Bridge
Void swelling in structural materials used for nuclear reactors is characterized by an incubation period whose duration largely determines the usefulness of the material for core components. Significant evolution of the dislocation and void microstructures that control radiation-induced swelling can occur during this period. Thus, a theory of incubation must treat time-dependent void nucleation in combination with dislocation evolution, in which the sink strengths of voids and dislocations change in concert. We present theoretical results for void nucleation and growth including the time-dependent, self-consistent coupling of point defect concentrations to the evolution of both void populations and dislocation density. Simulations show that the incubation radiation dose is a strong function of the starting dislocation density and of the dislocation bias factors for vacancy and interstitial absorption. Irradiation dose rate and temperature also affect the duration

of incubation. The results are in general agreement with experiment for high purity metals.
NTIS
Irradiation; Swelling; Construction Materials; Microstructure; Temperature Dependence

20040037758 Lawrence Livermore National Lab., Livermore, CA
Cookoff Response of PBXN-109: Material Characterization and ALE3D Thermal Predictions
McClelland, M. A.; Tran, T. D.; Cunningham, B. J.; Weese, R. K.; Maienschein, J. L.; May 29, 2001; 24 pp.; In English
Report No.(s): DE2003-15005490; UCRL-JC-144009; No Copyright; Avail: Department of Energy Information Bridge

Materials properties measurements are made for the RDX-based explosive, PBXN-109, and initial ALE3D model predictions are given for the cookoff temperature in a U.S. Navy test. This work is part of an effort in the U. S. Navy and Department of Energy (DOE) laboratories to understand the thermal explosion behavior of this material. Benchmark cookoff experiments are being performed by the U.S. Navy to validate DOE materials models and computer codes. The ALE3D computer code can model the coupled thermal, mechanical, and chemical behavior of heating, ignition, and explosion in cookoff tests. In our application, a standard three-step step model is selected for the chemical kinetics. The strength behavior of the solid constituents is represented by a Steinberg-Guinan model while polynomial and gamma-law expressions are used for the Equation Of State (EOS) for the solid and gas species, respectively. Materials characterization measurements are given for thermal expansion, heat capacity, shear modulus, bulk modulus, and One-Dimensional-Time-to-Explosion (ODTX). These measurements and those of the other project participants are used to determine parameters in the ALE3D chemical, mechanical, and thermal models. Time-dependent, two-dimensional results are given for the temperature and material expansion. The results show predicted cookoff temperatures slightly higher than the measured values.
NTIS
Ordnance; Materials; Thermodynamic Properties; Thermal Expansion; Temperature Effects

20040041293 Tennessee Technological Univ., Cookeville, TN, USA
Development of On-Line Temperature Measurement Instrumentation for Gasification Process Control. Semi-Annual Technical Report for Period Ending March 31, 2003
Apr. 2003; 12 pp.; In English
Report No.(s): DE2004-820871; No Copyright; Avail: Department of Energy Information Bridge

This progress report covers continuing work to develop a temperature probe for a coal gasifier. A workable probe design requires finding answers to crucial questions involving the probe materials. We report on attempts to answer those questions. We designed, assembled, and tested a portable test fixture that can give relative quantitative data on the condition of phosphors. It needs a more-sensitive detector for optimum performance. We ordered an appropriate detector. A second experimental test of the survivability of thermographic phosphor in a high-pressure, high-temperature reducing environment showed no substantial deterioration of the phosphor. This very important result further confirmed the results reported last time. We arranged for one more test as evidence that there is no effect or, if there is, then the data will give us a deterioration rate. That third test is underway at the time of this report.
NTIS
Coal; Gasification; Measuring Instruments

20040041321 Queens Univ., Kingston, Ontario, Canada
Development of a Fracture Mechanics-Based Asphalt Binder Test Method for Low Temperature Performance Prediction
Hesp, S.; Jan. 2004; 152 pp.; In English
Report No.(s): PB2004-103344; No Copyright; Avail: CASI; A08, Hardcopy

This project developed and evaluated a test method based on fracture mechanics, for predicting low temperature performance of asphalt binders. A low-temperature yield test was developed and validated using asphalt binders modified with commercial polymer modifiers along with a simple low-temperature fracture toughness test for asphalt binders. The test measures fracture toughness and fracture energy values on three-point bend specimens with aluminum inserts. The use of inserts significantly reduced the sample amount requirement (less than 3 grams) and showed an improvement over the current SHRP procedures. The effect of sample width on fracture toughness was investigated to ascertain the plane strain condition. A survey of Highways 118 and 17 test sections collect data on pavement cracking for use in establishing tests and asphalt binder performance in the field was conducted and fracture tests on unaged binders and aged binders from these highways

were performed. Results indicate a significant improvement of the IDEA test over SHRP tests for fracture and cracking predictions.
NTIS
Binders (Materials); Asphalt; Fracture Mechanics

20040042362 Lawrence Livermore National Lab., Livermore, CA
Determining the Structure of Biomaterials Interfaces using Synchrotron-based X-ray Diffraction
McBride, M.; Jan. 24, 2002; 24 pp.; In English
Report No.(s): DE2003-15005554; UCRL-ID-146914; No Copyright; Avail: Department of Energy Information Bridge

The purpose of this project is to explore the feasibility of using surface X-ray diffraction (SXRD) to determine the structure of biomineral surfaces in electrolyte solutions and of the adsorbed layer of acidic amino acids that are believed to play a central role in the control of biomineral formation and function. The work is a critical component in the development of an integrated picture of the physical and chemical basis for deposition and dissolution at solid-liquid interfaces in biological systems, and brings a new and very powerful surface-sensitive capability to LLNL. We have chosen as our model systems calcium carbonate and calcium phosphate in aspartic and glutamic acid-bearing solutions. The calcium compounds are ubiquitous among biomineral structures, both those that are beneficial such as bones and teeth, and those that are pathological such as kidney stones, while the two acidic amino acids--both as simple and poly-amino acids--are the dominant constituents of protein mixtures implicated in the control of biomineralization. The goals of the work are: (1) to determine the surface structure of pure calcium phosphate and calcium carbonate surfaces in aqueous solution using SXRD; (2) to determine how those surfaces are modified by the presence of aspartic and glutamic acid, both as the simple amino acids and as poly-aspartate and poly-glutamate and (3) to model the interactions of acidic amino acids with calcite.
NTIS
X Ray Diffraction; Amino Acids; Acidity

20040043832 Stanford Univ., Stanford, CA
Experiments on Polymer Drag Reduction Using PIV and PLIF
Mungal, M. G.; Jan. 2001; 15 pp.; In English
Contract(s)/Grant(s): MDA972-01-C-0022; ARPA ORDER-K042/14/32
Report No.(s): AD-A420733; No Copyright; Avail: CASI; A03, Hardcopy

The structure of turbulence in a drag reduced flat plate boundary layer has been studied with particle image velocimetry (PlV) and planar laser induced fluorescence (PLIF). Drag reduction was achieved by injection of a solution of water-soluble polymer through a spanwise slot near the leading edge of the flat plate. Velocity and concentration data were obtained using PrV and PLIF, respectively, in planes parallel to the wall (x-z plane) and perpendicular to the wall (x-y plane). Measurements of velocity, vorticity and streak spacing were obtained and trends analyzed. For increasing drag reduction, damping of streak oscillations, suppression of streak splitting and merging, streak stabilization and coarsening of the low speed streaks was observed. PLIF measurements of the injected polymer solution showed that regions of high polymer concentration are correlated with the low speed streaks. PW measurements in the x-y plane showed that at Maximum Drag Reduction (MDR) there are sighificant differences in the statistics of turbulence between boundary layers with polymer injection and channel flow with an ocean of polymer suggesting that in this sense, the achievement of MDR in flows with polymer addition is not unique.
DTIC
Drag Reduction; Laser Induced Fluorescence; Particle Image Velocimetry

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COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20040035850 Lawrence Livermore National Lab., Livermore, CA
Development of Microstructure in A Metal Matrix Composite Using Nano-Materials
Popov, V. A.; Lesuer, D. R.; Kotov, I. A.; Ivanov, V. V.; Aksenov, A. A.; Sep. 10, 2001; 14 pp.; In English
Report No.(s): DE2003-15004790; UCRL-JC-144751; No Copyright; Avail: Department of Energy Information Bridge

Metal matrix composites (MMCs) containing matrices with nanometer grain sizes have been produced from pure aluminum nano-powders with SiC reinforcement. The pure Al nano-powders were produced using an exploding wire

technique. Dynamic loading using a magnetic impulse technique has been used to compact the MMC to high density. The dynamic compaction process results in excellent wetting of the SiC particles by the nanocrystalline Al powders, and the retention of a nano-crystalline grain size in the MMC. Microstructural analysis of the resulting MMC showed a highly uniform distribution of Sic particles with no visible defects or pores and the absence of deleterious phases (such as Al(sub 4)C(sub 3)) at the interfaces between the aluminum nano-grains and the SiC particles. The microstructures produced and the evolution of microstructure during dynamic compaction has also been studied using TEM and found to progress in three stages. These three stages are described.
NTIS
Metal Matrix Composites; Microstructure

20040035919 Morgan State Univ., Baltimore, MD, Baltimore, MD, USA
Experimental Investigations on Mechanical Behavior of Unsaturated Subgrade Soil with Lime Stabilization and Fiber Reinforcement. State Highway Administration Research Report
Li, J.; Nov. 2003; 106 pp.; In English
Report No.(s): PB2004-103568; MD-03-SP107B4J; No Copyright; Avail: CASI; A06, Hardcopy

In the present report, experimental investigations on mechanical behavior of unsaturated subgrade soil with fiber reinforcement and lime stabilization were conducted. The experiments were carried out to investigate physical and mechanical properties of subgrade soil that was mixed with geofiber and lime. The reinforced and stabilized soil with fiber and lime is considered as a composite material. Investigations in this study included two phases. In the first phase, the investigation was for static behavior of composite subgrade soil under the compressive shear loading. In the second phase, the investigation emphasized dynamic behavior of reinforced and stabilized soil under cyclic shear loading.
NTIS
Soil Mechanics; Composite Materials; Highways; Mechanical Properties; Calcium Oxides; Reinforcing Fibers; Unsaturation (Chemistry); Stabilizers (Agents)

20040035936 Lawrence Livermore National Lab., Livermore, CA
Matrix-Dominated Performance of Thick-Section Fiber Composites for Flywheel Applications
DeTeresa, S. J.; Allison, L. M.; Freeman, D. C.; Groves, S. E.; Jan. 17, 2001; 18 pp.; In English
Report No.(s): DE2003-15005425; UCRL-JC-141320; No Copyright; Avail: Department of Energy Information Bridge

An Achilles heel for the performance of thick-section, cylindrical fiber composite flywheels is the poor interlaminar properties of the material. Methods that have been used to minimize or eliminate radial tensile stresses include prestressing concentric cylinders and mass loading. There can also be significant interlaminar shear stresses at the edges of mass-loaded flywheels and in flywheels for high-power density applications where abrupt braking results in high torque levels. To specify adequate safety factors for thick-section flywheels used in these applications, the failure envelope and fatigue behavior under combined interlaminar stresses are required. Using a hollow cylindrical specimen, which was subjected to combined axial compression and torsion, results for fatigue and failure were generated for several flywheel material systems. Interlaminar compression resulted in significant enhancements to the interlaminar shear strength and results were compared to the predictions of proposed three-dimensional composite failure models. The interlaminar shear fatigue behavior of a carbodepoxy system was also studied and compression was found to greatly enhance fatigue life. The results demonstrate that radial compression stresses can yield improvements in the interlaminar shear strength and fatigue lifetimes of composite flywheel rotors.
NTIS
Flywheels; Fatigue (Materials)

20040035961 Army Research Lab., Aberdeen Proving Ground, MD
Viscoelastic Properties of Alkoxy Silane-Epoxy Interpenetrating Networks
Jensen, Robert E.; McKnight, Steven H.; Palmese, Giuseppe R.; Nov. 2003; 40 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0001
Report No.(s): AD-A420032; ARL-TR-3109; No Copyright; Avail: CASI; A03, Hardcopy

A model epoxy-silane interpenetrating network (IPN) was synthesized to simulate the molecular structure found at the fiber-matrix interphase. The Young's modulus (E) of the epoxy-silane IPN was determined% trough micromechanical analysis both quasi-statically and in the frequency domain. The epoxy-silane IPN was synthesized by diffusion of uncured diglycidyl

ether of bisphenol A (DGEBA) epoxy resin and bis (p- aminocyclohexyl) methane (PACM) curing agent into spherical particles of condensed and crosslinked 3- glycidoxypropyltrimethoxysilane (GPS). This IPN composition was chosen to simulate the typical properties of a silane modified interphase found in glass reinforced composites. Differential scanning calorimetry showed that the glass transition temperature (Tg) of the initial crosslinked siloxane network increased upon cure of the DGEBA and PACM, but was still significantly lower than that of the neat epoxy matrix. Additionally, dynamic mechanical analysis was used in conjunction with the micromechanical C-Combining Rule to show that the Young's modulus of the epoxy-silane IPN spherical inclusions (E sub i) was decreased in comparison to the Young's modulus of the matrix epoxy (E sub m) at all temperatures. The time-temperature superposition (tTsp) principle was successfully applied to the epoxy-silane IPN to determine viscoelastic properties at high frequencies. The viscoelastic properties of the epoxy-silane IPN may have implications with respect to the ballistic impact resistance of composite structures used for U.S. Army applications.
DTIC

Alkyl Compounds; Epoxy Matrix Composites; Epoxy Resins

20040035975 Imperial Coll. of Science and Technology, London

The Effects of Adhesion and Nano-Structure on the Toughness of Polymer Nano-Composites

Kinloch, A. J.; Taylor, A. C.; Jul. 2003; 33 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62558-02-M-5603

Report No.(s): AD-A420043; R/D-9270-CH-01; No Copyright; Avail: CASI; A03, Hardcopy

Epoxy nanocomposites have been manufactured using a range of modifiers, including organoclays, silica nanoparticles, carbon nanotubes and carbon nanofibres. The mechanical and fracture properties of these materials have been investigated, and the structure/property relationships discussed. Modelling methods have been used to predict the performance of these materials. Epoxy micro- and nano- composites have been manufactured using a range of inorganic modifiers, with exfoliated, intercalated and particulate morphologies. Indeed, by changing the surface treatment, and hence the interfacial adhesion, the type of morphology obtained could be varied. The modulus and fracture toughness of these composites increased with the weight fraction of modifier. The fracture toughness was increased by up to 150% with the addition of mica, but the material modified with the surface-treated clays generally showed only a small toughening effect. The modulii of the composites were in good agreement with predictions using the van-Es-modified Halpin-Tsai model. The fracture toughness of the clay-modified materials generally decreased as the degree of exfoliation increased, as the modifier acts like large particles rather than individual platelets, hence having a lower effective aspect ratio and a smaller toughening effect. The nanocomposites tend to behave in a similar manner to the microcomposites, and the same models can be applied to describe the performance of these systems.
DTIC

Nanostructure (Characteristics); Nanostructures (Devices)

20040036039 Georgia Tech Research Inst., Atlanta, GA

Multi-Body Approach to the Dynamic Analysis of Space Structures with Actuated Components

Bauchau, Oliver A.; Jan. 2001; 145 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0038

Report No.(s): AD-A420094; AFRL-SR-AR-TR-04-0099; No Copyright; Avail: CASI; A07, Hardcopy

High-fidelity, finite-element-based dimensionally reduced models have been constructed for composite plates and shells, including hydrothermal and piezoelectric effects, under the sponsorship of AFOSR. In these models, the smallness of the thickness has been used to advantage to rigorously reduce the original three-dimensional geometrically nonlinear elasticity theory to two-dimensional Reissner-Mindlin type theory for plates and shells. The resulting theory can achieve an accuracy comparable to higher-order layerwise theories at the cost of only a first-order shear deformation theory. The dimensional reduction process and the recovery relations for the original three-dimensional displacements/strains/stresses are implemented in a finite-element code, Variational Asymptotic Plate and Shell Analysis (VAPAS). This program is connected with DYMORE, a nonlinear finite-element based multi- body dynamic code to provide an efficient and accurate simulation capability for space systems involving composite and inflatable components with actuated elements which are required for current and future Air Force missions.
DTIC

Dynamic Structural Analysis; Finite Element Method; Large Space Structures; Spacecraft Structures

20040036213 Naval Air Warfare Center, China Lake, CA

Thermal Degradation Study of IM7/DMBZ-15 High Temperature Composite by TGA/ FTIR

Nadler, Melvin P.; Sep. 2003; 55 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420247; NAWCWD-TP-8568; No Copyright; Avail: CASI; A04, Hardcopy

(U) High temperature graphite composites such as IM7/8552 epoxy, IM7/5250 BMI, and IM7/DMBZ-15 polyimide show blistering and/or 'catastrophic' delamination when rapidly heated to temperatures above the glass transition temperature (T(sub g)).

DTIC

High Temperature; Infrared Spectra; Thermal Degradation

20040036385 Louisiana State Univ., Baton Rouge, LA

High Temperature Materials Simulations on Parallel Computers

Vashishta, Priya; Kalia, Rajiv K.; Nakano, Aiichiro; Apr. 30, 2003; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-99-1-0250; Proj-3484

Report No.(s): AD-A420385; AFRL-SR-AR-TR-04-0116; No Copyright; Avail: CASI; A03, Hardcopy

Final Progress (1 May 99 - 30 Apr 03): This project deals with properties and processes in high- temperature materials (HTMs) that are vital to the DoD technology base. In this project, molecular-dynamics (MD) simulations have been performed to investigate: i) sintering of nanostructured SiC and high-pressure structural transformation in SiC; ii) dynamic fracture in nanostructured systems; iii) structure of amorphous Al2O3; and iv) reactive wetting of Al2O3 surface by Al. Our joint MD/neutron- scattering study of nanostructured SiC exhibits the onset of sintering at temperature 1,500 K, which is much lower than the bulk sintering temperature. We have proposed a new transition path for the zinc-blende-to-rocksalt transformation of SiC at high pressures. This new mechanism involves no bond breakage and is characterized by a much lower activation barrier compared with previously proposed mechanisms. MD simulations of nanostructured amorphous silica (n-SiO2) reveal that the crack propagates through interfacial regions between silican nanoparticles. A reliable interatomic potential model has been developed for MD simulations of Al2O3. Simulation results for amorphous Al2O3 show predominantly tetrahedral coordination of Al atoms, which agrees with recent experimental results. Our MD simulations on reactive wetting reveal that oxygen atoms from the substrate diffuse into the droplet to form a continuous layer of reaction product at the interface.

DTIC

Aluminum Oxides; Amorphous Materials; Computerized Simulation; Parallel Computers; Refractory Materials

20040037706 Lawrence Livermore National Lab., Livermore, CA

Derived Interaction Parameters for the TSAI-WU Tensor Polynomial Theory of Strength for Composite Materials

DeTeresa, S. J.; Larsen, G. J.; Aug. 03, 2001; 14 pp.; In English

Report No.(s): DE2003-15004792; UCRL-JC-145041; No Copyright; Avail: Department of Energy Information Bridge

It is shown that the two interactive strength parameters in the Tsai-Wu tensor polynomial strength criterion for fiber composites can be derived in terms of the uniaxial or non-interacting strength parameters if the composite does not fail under practical levels of hydrostatic pressure or equal transverse compression. Thus the required number of parameters is reduced from seven to five and all five of the remaining strength terms are easily determined using standard test methods. The derived interactive parameters fall within the stability limits of the theory, yet they lead to open failure surfaces in the compressive stress quadrant. The assumptions used to derive the interactive parameters were supported by measurements for the effect of hydrostatic pressure and unequal transverse compression on the behavior of a typical carbon fiber composite.

NTIS

Composite Materials; Polynomials; Mechanical Engineering

20040037707 Lawrence Livermore National Lab., Livermore, CA

Molecular Dynamics Studies on the Effects of Water Speciation on Interfacial Structure and Dynamics in Silica-Filled PDMS Composites

Gee, R. H.; Maxwell, R. S.; Dinh, L. N.; Balazs, B.; Nov. 21, 2001; 12 pp.; In English

Report No.(s): DE2003-15004791; UCRL-JC-144790; No Copyright; Avail: Department of Energy Information Bridge

Significant changes in materials properties of siloxane based polymers can be obtained by the addition of inorganic fillers. In silica-filled polydimethylsiloxane (PDMS) based composites the mechanism of this reinforcing behavior is presumably hydrogen bonding between surface hydroxyls and backbone siloxane species. We have chosen to investigate in detail the effect

of chemisorbed and physisorbed water on the interfacial structure and dynamics in silica-filled PDMS based composites. Toward this end, we have combined molecular dynamics simulations and experimental studies employing DMA and Nh4R analysis. Our results suggest that the polymer-silica contact distance and the mobility of interfacial polymer chains significantly decreased as the hydration level at the interface was reduced. The reduced mobility of the PDMS chains in the interfacial domain reduced the overall, bulk, motional properties of the polymer, thus causing an effective ''stiffening'' of the polymer matrix. The role of the long-ranged Coulombic interactions on the structural features and chain dynamics of the polymer were also examined. Both are found to be strongly influenced by the electrostatic interactions as identified by the bond orientation time correlation function and local density distribution functions. These results have important implications for the design of nanocomposite silica-siloxane materials.
NTIS
Composite Materials; Siloxanes; Electrostatics

20040037731 Lawrence Livermore National Lab., Livermore, CA
Properties of Fiber Composites for Advanced Flywheel Energy Storage Devices
DeTeresa, S. J.; Groves, S. E.; Jan. 12, 2001; 20 pp.; In English
Report No.(s): DE2003-15005456; UCRL-JC-142020; No Copyright; Avail: Department of Energy Information Bridge

The performance of commercial high-performance fibers is examined for application to flywheel power supplies. It is shown that actual delivered performance depends on multiple factors such as inherent fiber strength, strength translation and stress-rupture lifetime. Experimental results for recent stress-rupture studies of carbon fibers will be presented and compared with other candidate reinforcement materials. Based on an evaluation of all of the performance factors, it is concluded that carbon fibers are preferred for highest performance and E-glass fibers for lowest cost. The inferior performance of the low-cost E-glass fibers can be improved to some extent by retarding the stress-corrosion of the material due to moisture and practical approaches to mitigating this corrosion are discussed. Many flywheel designs are limited not by fiber failure, but by matrix-dominated failure modes. Unfortunately, very few experimental results for stress-rupture under transverse tensile loading are available. As a consequence, significant efforts are made in flywheel design to avoid generating any transverse tensile stresses. Recent results for stress-rupture of a carbon fibedepoxy composite under transverse tensile load reveal that these materials are surprisingly durable under the transverse loading condition and that some radial tensile stress could be tolerated in flywheel applications.
NTIS
Fiber Composites; Flywheels; Composite Materials

20040040136 Plymouth Univ., Plymouth, UK
Proceedings of the ACMC/SAMPE Conference on Marine Composites
[2003]; 222 pp.; In English; ACMC/SAMPE Conference on Marine Composites, 11-12 Sep. 2003, Plymouth, UK; See also 20040040137 - 20040040147; Copyright; Avail: Other Sources

The following reports are presented for inclusion in the NA&SD database:Closed Mould Processing in the Marine Industry; The Means to Void Content Reduction in Vacuum Infusion Process; How Flow Analysis Technology Improves the Vacuum Infusion Process; Light Rigid Fire Blockers; Stress Analysis in Compression of NCF Composites with Large out-of-plane Misalignments; Structural Integrity Evaluation of Polymer Composites using Optical Strain Measurement (ARAMIS); Application of Optical Fibre Sensors for Marine Structural Monitoring; Rapid, Sensitive Inspection of Marine Composites using Laser Shearography; Performance of Automated Ultrasonic Inspection of Large-Scale Sandwich Structures in Naval Ships; Flexural Behaviour of Top Hat Stiffened GFRP Plate Panels; and Application of Fiber Reinforced Plastics (FRP) in Large Removable Bulkhead on Board.
CASI
Glass Fiber Reinforced Plastics; Composite Materials; Processing

20040040141 Institute of Natural Fibres, Poznan, Poland
Light Rigid Fire Blockers
Kozlowski, R.; Mieleniak, B.; Bujnowicz, K.; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 47-55; In English; See also 20040040136; Copyright; Avail: Other Sources

Fire barrier play an increasing role in fire prevention and fire fighting. They are useful in modem building industry as well as in different transport areas. They limit not only the fire loses and costs but what s the most important the victims of the fire. The role of fire barriers is specially important in case of transportation. Economic race among car and buses producers results

in use of cheaper materials when usually less expensive means higher flammability and fire risk. This unfortunately is the reason of human tragedies like in Egypt or India just to mention some of the last time. Fire was jumping from one carriage to another increasing number of victims dramatically. Building industry have to use fire barriers for fire walls and doors, smoke chimneys. This report shows fire barrier materials based on composites obtained from exfoliated vermiculite and special bonding system. As bonding agent product of silicate, borate and polyphosphate polycondensation were used. The reinforcing structure was build on base of mineral and modified lignocellulosic fibres. Up to the border of 1000 C such composite has a good thermo insulating property. The paper also discusses influence of different additives on fire barrier efficiency.
Author
Flammability; Composite Materials; Manufacturing

20040040142 Lulea Univ., Sweden
Stress Analysis in Compression of NCF Composites with Large Out-of-Plane Misalignments
Mattsson, D.; Joffe, R.; Varna, J.; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 59; In English; See also 20040040136; Copyright; Avail: Other Sources; Abstract Only

Non-crimp fabric (NCF) composites have become a very attractive alternative to prepreg composites in ship, and recently even in aerospace industry. Compression strength is one important problem where the present carbon fiber NCF and vinylester resins give lower data than prepreg-based composites used in aerospace applications. The main reason for this seems to be internal structure of NCF composite which contains many defects and irregularities introduced during the manufacturing process. Major identified structural disturbance is fiber bundle waviness. NCF composites contain individual fiber bundles rather than well dispersed fibers as in prepreg composites. Therefore, micro-mechanical strength theories developed for the fiberlmatrix medium should be applied to the misaligned bundle which together with surrounding resin zone forms an imperfect unit. Due to complicated geometry, analytical solutions are not possible. Combined micro-mechanics and numerical analysis is used in this study.
Author
Fiber Composites; Carbon Fibers; Stress Analysis

20040040143 Portsmouth Univ., Portsmouth, UK
Structural Integrity Evaluation of Polymer Composites using Optical Strain Measurement (ARAMIS)
Zhang, Z. Y.; Richardson, M. O. W.; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 99-106; In English; See also 20040040136; Original contains black and white illustrations; Copyright; Avail: Other Sources

This study deals with damage evaluation using an optical deformation and strain measurement system (ARAMIS). Damage was introduced using an Instrumented Falling Weight Impact Test (IFWIT) machine. The incident impact energy was controlled to low magnitude so that the specimen was not penetrated and only internal damage was introduced. This internal damage can have an adverse effect on structural integrity, and potentially lead to catastrophic failure. This paper presents the theoretical aspects involved with ARAMIS and its capability of evaluating the internal damage. Surface strain concentrations at different loading levels are used to indicate the location and geometrical characteristics of both external and internal damage.
Author
Composite Materials; Deformation; Imaging Techniques

20040040146 Southampton Univ., UK
Flexural Behaviour of Top Hat Stiffened GFRP Plate Panels
Eksik, O.; Shenoi, R. A.; Moy, S. S. J.; Jeong, H. K.; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 163-173; In English; See also 20040040136; Original contains black and white illustrations; Copyright; Avail: Other Sources

This paper outlines an experimental procedure devised to assess the strength of cross stiffened plate panels under uniform pressure load. Structural stiffness issues and their dependence on lay up have been explored. The progressive nature of failure, from matrix cracking through to final collapse are detailed. Included in the discussion is the nature of the failure modes and their linkage to lay up and topology. Particular attention is devoted to the fabrication process at the intersection of the two top hats at the centre of the plate panel. Finally, some suggestions are made for the incorporation of such procedures in design validation in a practical, industrial context.
Author
Stiffness; Reinforced Plastics; Composite Materials

20040040147 Technische Univ., Delft, Netherlands

Application of Fiber Reinforced Plastics in a Large Removable Bulkhead on Board of a Ship

Leenders, Wiard S.; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 175-188; In English; See also 20040040136; Original contains black and white illustrations; Copyright; Avail: Other Sources

FRP is a very common material in the maritime industry. Typical ships made of FRP are the mine counter measure vessels, fishing vessels and of course many leisure craft. Also some workboats and small ferries have been made out of FRP. FRP has a number of advantages but the material is, besides some non-structural details, hardly used in the more conservative conventional market of the maritime industry. Main causes are the assumed relatively high material and production cost and lack of regulation and structural knowledge related to FRP in this market. In 1996 an industrial-academic project has started to investigate the technical and economical feasibility of large load carrying structures on board of conventional ships. Structures of interest are a removable grain bulkhead and hatch covers. The FRP structure has to weigh 50% less than the steel structure, has to fulfil the same functions and last but not least has to be of the same cost level. This has resulted in a complete engineering of a grain bulkhead, used on some smaller vessels (2500 GT) meeting these boundary conditions. The dimensions of the bulkhead are 8,5x 1 1,l m. It is demonstrated that production of large composite structures can indeed be performed in a sufficient rational way. A superior performance of FRP (low weight) as compared to steel is obvious. Moreover, large FRP constructions can even compete with steel on a basis of cost, provided that producibility is recognised already during the design stage. Besides an extensive theoretical research programme also laboratory experiments have been conducted. The largest experiment involves a 1/3 part of the bulkhead containing the critical details.

Author

Reinforced Plastics; Ships; Spacecraft Design

20040040295 NASA Langley Research Center, Hampton, VA, USA

Single Wall Carbon Nanotube-Based Structural Health Sensing Materials

Watkins, A. Neal; Ingram, JoAnne L.; Jordan, Jeffrey D.; Wincheski, Russell A.; Smits, Jan M.; Williams, Phillip A.; [2004]; 4 pp.; In English; 2004 Nanotechnology Conference and Trade Show, 7-11 Mar. 2004, Boston, MA, USA

Contract(s)/Grant(s): 23-762-55-LB

Report No.(s): Paper 439; No Copyright; Avail: CASI; A01, Hardcopy

Single wall carbon nanotube (SWCNT)-based materials represent the future aerospace vehicle construction material of choice based primarily on predicted strength-to-weight advantages and inherent multifunctionality. The multifunctionality of SWCNTs arises from the ability of the nanotubes to be either metallic or semi-conducting based on their chirality. Furthermore, simply changing the environment around a SWCNT can change its conducting behavior. This phenomenon is being exploited to create sensors capable of measuring several parameters related to vehicle structural health (i.e. strain, pressure, temperature, etc.) The structural health monitor is constructed using conventional electron-beam lithographic and photolithographic techniques to place specific electrode patterns on a surface. SWCNTs are then deposited between the electrodes using a dielectrophoretic alignment technique. Prototypes have been constructed on both silicon and polyimide substrates, demonstrating that surface-mountable and multifunctional devices based on SWCNTs can be realized.

Author

Carbon Nanotubes; Lithography; Photolithography; Electrodes; Aerospace Vehicles

20040040360 Plymouth Univ., Plymouth, UK

Proceedings of the Fifth International Conference on Flow Processes in Composite Materials

July 1999; 371 pp.; In English; Fifth International Conference on Flow Processes in Composite Materials, 12-14 Jul. 1999, Plymouth, UK; See also 20040040361 - 20040040400; Copyright; Avail: Other Sources

The University of Plymouth and the International Technical Committee are honoured and pleased to welcome you to the Fifth International Conference on Flow Processes in Composite Materials. This conference is the fifth in the FPCM series of international meetings devoted to manufacturing of polymer matrix composites. Report topics include characterisation, fabriacation,moulding, simulation and modelling.

Derived from text

Composite Materials; Fabrication; Injection Molding; Reinforced Plastics

20040040361 Nottingham Univ., UK

Constitutive Equations for Fabric-Reinforced Viscous Fluids

Spencer, A. J. M.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 3-10; In English; See also 20040040360; Copyright; Avail: Other Sources

Constitutive equation are formulated for flow of fabric reinforced composite materials which show linear viscous response at forming temperature. The effect of symmetry of the fabric architecture is considered. The theory is applied to the analysis of the 'picture-frame' test, and the paradox of different responses in different shearing directions is explained qualitatively. Author

Constitutive Equations; Fabrics; Viscous Fluids; Reinforcing Materials; Mechanical Properties

20040040364 National Univ. of Ireland, Galway, Ireland

Fibre Network and Compression Molding of Polymer Composites

Dweib, M. A.; OBradaigh, C. M.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 343-354; In English; See also 20040040360; Copyright; Avail: Other Sources

Squeezing flow of glass-mat reinforced thermoplastics (GMT) material was carried out in this research study to investigate the structure and reorientation of the fibre reinforcement and to develop a better understanding of the material's rheological behaviour. Circular disks of GMT material were squeezed to different final thicknesses, always forming an elliptical shape, and three-point bending tests were carried out on each specimen in the two main directions. The mechanical properties of the specimens confirmed the fibre rotation predicted by Jeffery's equation. It is shown that the fibres rotate in a manner aligning themselves in the major direction of the flow, which makes the material less anisotropic as the flow proceeds.

Author

Composite Materials; Thermoplastic Resins; Mechanical Properties; Anisotropy

20040040365 Wales Univ., Aberystwyth, UK

Compression of Thermosetting Fabric Materials

Binding, D. M.; Fisher, K.; Jones, R. S.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 37-44; In English; See also 20040040360; Copyright; Avail: Other Sources

Most research into the behaviour of resin impregnated, stitched fabric materials deals with solid state properties. In this paper we report on a study which has been made of the deformation of a number of continuous carbon-fibre mats, both stitched and woven, when subjected to compressive forces normal to the plane of the fabric. The compressive forces were applied both at constant load and constant approach speed. Two significant features for the processing and manufacture of parts formed from these materials were the resin percolation and the elastic recovery when the load was removed, the latter being a possible source of distortion and residual stresses in cured components.

Derived from text

Thermosetting Resins; Fabrics; Deformation; Carbon Fibers; Composite Materials; Compression Loads

20040040366 Kaiserslautern Univ., Germany

Winding of Extruded Thermoplastic Tapes by Using a Hot Air Heat Source

Klein, P.; Reinicke, P.; Haupert, F.; Friedrich, K.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 63-69; In English; See also 20040040360; Copyright; Avail: Other Sources

The present paper deals with a winding technology which allows to process thermoplastic tapes that can be used for manufacturing of polymer covered metal rollers for the paper making industry. The specific feature of the tape winding process presented in this study is the ability to process extruded tape material whether it is reinforced with short/continuous fibers or not.

Author

Heat Sources; Manufacturing; Thermoplasticity; Filament Winding; High Temperature Air; Extruding

20040040370 Wales Univ., Bangor, UK

RTM Hemp Fibre-Reinforced Polyester Composites

Sebe, Gilles; Cetin, Nihat S.; Hill, Callum A. S.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 183-190; In English; See also 20040040360; Copyright; Avail: Other Sources

Hemp fiber-reinforced polyester composites were prepared using a Resin Transfer Molding (RTM) technique and the flexural and impact behavior investigated. Flexural stress at break and flexural modulus showed an increasing trend with fiber content. Impact strength was found to decrease at low fiber content, then gradually increase with further addition of fibers. A strong interfacial adhesion between hemp and polyester was obtained using chemically modified hemp. This modification consisted in introducing reactive vinylic groups at the surface of the fibres, via esterification of hemp hydroxyl groups, using

methacrylic anhydride. Increased bonding between fibers and matrix did not affect the flexural stress at break of the composite but was detrimental to toughness. This behavior was ascribed to a change in the mode of failure, from fiber pull-out to fiber fracture, resulting in a marked reduction in the energy involved in the failure of the composite, leading to a more brittle material.
Author
Fiber Composites; Polyester Resins; Resin Matrix Composites; Resin Transfer Molding

20040040376 Engineering System International, Krimpen a/d Ijssel, Netherlands
Hot Drape Forming of Thermoset Matrix Composites: Characterisation and Simulation
Simon, E. R.; Canavan, R. A.; Murray, P. J.; Geraghty, E.; OBradaigh, C. M.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 11-21; In English; See also 20040040360; Copyright; Avail: Other Sources

Hot drape forming of continuous fibre reinforced thermosetting composites is a process that is currently under development in the aerospace industry. Previous research work in continuous fibre reinforced sheet forming has focussed on the use of thermoplastic matrix composites, for which specialized finite element analysis codes and material characterisation experiments have been developed. This paper applies these characterisation techniques and numerical simulation methods for the first time to thermoset matrix composites. A picture frame shearing test is employed to characterize the intraply shearing viscosity of a 2x2 twill carbon fibre reinforced epoxy prepreg. A transversely isotropic power-law material model is used to characterise the material, with an Arrhenius law to represent the viscosity variation with temperature. Finally, the intraply sheafing viscosity law is incorporated, along with other material parameters, in a commercial finite element simulation of the hot drape forming process. A Linear Variable Differential Transformer is used to measure the displacement of a point in a structure during the forming process, and the result is compared to the output of the finite element code.
Author
Hot Working; Forming Techniques; Thermosetting Resins; Mechanical Properties; Epoxy Matrix Composites; Simulation

20040040377 Delaware Univ., Newark, DE, USA
Characterisation and Prediction of Compaction Force and Preform Permeability of Woven Fabrics During the Resin Transfer Moulding Process
Sozer, E. M.; Chen, B.; Graham, P. J.; Bickerton, S.; Chou, T.-W.; Advani, S. G.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 25-35; In English; See also 20040040360
Contract(s)/Grant(s): N00014-97-C-0415; Copyright; Avail: Other Sources

In resin transfer molding process, after a fabric mat is placed in a mold, the mold is closed and the fabric is compacted before resin is injected to impregnate the empty spaces between the fibers. Whether the resin will fill all the regions between the fiber will depend on the permeability of the compacted preform. The fiber mat permeability is a non-linear function of the degree of compaction. To model the resin impregnation process, one needs to know the mat permeability and the fiber volume fraction which depend on the compaction. A compaction model is formulated to estimate how the preform architecture deforms as a function of applied force. This result is coupled with a separate analytical model for permeability prediction, which is based on an approximated two-dimensional lubrication flow in open spaces between the fabric tows and the one-dimensional transverse Darcy's flow within the tows to predict the in-plane permeability of the compacted multi-layer fabric mat. The permeability model needs geometric information about the macroscopic architecture of the compacted and resin filled fabric mat which can be supplied from the compaction model or from experimental measurements. A unique experimental set-up was designed and fabricated to measure permeability of a preform as a function of compaction force and fiber volume fraction for the same preform.
Author
Permeability; Preforms; Resin Transfer Molding; Characterization; Compacting; Mathematical Models; Loads (Forces)

20040040378 Ecole Polytechnique Federale de Lausanne, Switzerland
Influence of Preform Compressive Behaviour in Liquid Composite Molding
Michaud, V.; Grajzgrund, H. J.; Manson, J.-A. E.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 45-52; In English; See also 20040040360
Contract(s)/Grant(s): SNFSR-20-52625.97; Copyright; Avail: Other Sources

In many cases of composite processing by liquid matrix impregnation, the fiber reinforcement is compressed when it comes in contact with the liquid and then relaxes as the matrix flows within its pores. This phenomenon can be analyzed in

terms of local fluid flow, mass conservation and mechanical equilibrium. A model is proposed to simulate the kinetics of impregnation, and the evolution of the fiber volume fraction profile as the resin front progresses, as well as after the front has reached the end of the mold. The predictions are compared with experimental results obtained using model systems such as polyethylene glycol and glass fiber mats, as well as industrially relevant systems such as polypropylene and glass fiber mats used in the production of Glass Mat Thermoplastic (GMT) blanks. It is shown that the time for preform relaxation in a viscous fluid may be much larger than that for full impregnation. As a result, an apparently well impregnated part may exhibit an inhomogeneous distribution of the reinforcement, in turn inducing a modification of the mechanical behavior and residual stress distribution.
Author
Compressibility; Mechanical Properties; Preforms; Reinforcing Fibers; Liquids; Molding Materials; Mathematical Models; Composite Materials

20040040379 Surrey Univ., Guildford, UK
Experimental Studies and Computer Simulations of the Draping of Woven Fabrics
Mohammed, U.; Lekakou, C.; Bader, M. G.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 53-60; In English; See also 20040040360; Copyright; Avail: Other Sources

Extensive experimental and theoretical analyses of the draping of woven fabrics have been carried out. The mould set up consists of a hemispherical dome sitting on a flat surface in order to investigate the double-curvature draping. Four types of woven fabrics were tested: a loose plain weave, a tight plain weave, a twill and a satin weave. The draped shape was photographed and image analysed to evaluate the local fibre orientation. The fabrics were compared in terms of formability and wrinkling. The draping was also modelled by using the solid mechanics theory of forming, the as_sumption of elastic shear deformation, experimental data for the material properties of fabric and a finite element analysis (LUSAS FEA software package). The interactions between the fabric and the mould were modelled by considering a 'soft air' volume between the two bodies.
Author
Computerized Simulation; Fabrics; Woven Composites; Mechanical Properties; Mathematical Models

20040040380 Georgia Inst. of Tech., Atlanta, GA, USA
Flow of Thermoplastics Through Fiber Assemblies
Muzzy, John D.; Zhang, Yi; Bradley, Jurron; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 71-78; In English; See also 20040040360; Copyright; Avail: Other Sources

The permeation of thermosetting resins through fiber assemblies has been characterized in depth. Can this knowledge be applied in processing thermoplastic composites? In order to address this question the permeation of a variety of thermoplastics through aligned and random fiber assemblies is being studied. For the permeation of random glass mats by polypropylene a Kozeny constant near 8 was obtained, which is consistent with similar studies using low viscosity resins. It was necessary to use a power law model for the polypropylenes investigated. Additional studies are in progress using polypropylene and nylon and aligned carbon and glass fiber beds. Both 'dry' and 'wet' aligned fibers are being studied in order to assess the importance of surface tension. In addition, the consolidation of partially impregnated fiber tows produced by powder coating is being evaluated for comparison with the model flow studies. The ultimate goal is to develop a model for permeation and consolidation in thermoplastic composites which has broad utility.
Author
Thermoplastic Resins; Reinforcing Fibers; Mathematical Models; Permeating; Flow Characteristics

20040040381 Ecole Polytechnique, Montreal, Quebec, Canada
Numerical Simulation of Mould Filling for Three-Dimensional Composite Parts
Remacle, J.-F.; Breard, J.; Trochu, F.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 81-89; In English; See also 20040040360; Copyright; Avail: Other Sources

The object of this paper is to present a finite element procedure to simulate mould filling in the three dimensional case. The method presented in the paper is div-conform i.e. the mass of injected fluid is proven to be perfectly conserved. For 2-D problem, classical finite element techniques give fine results event without ensuring the conservativity of the numerical scheme. In 3-D, we show that classical finite element approximation give such poor results that they cannot be considered as

acceptable. With the new method, we obtain good quality results event with coarse meshes.
Author
Finite Element Method; Three Dimensional Composites; Mathematical Models; Simulation; Injection Molding

20040040388 Loughborough Univ. of Technology, UK
Experimental Investigation and Flow Visualisation of the Resin Transfer Mould Filling Process for Non-Woven Hemp Reinforced Phenolic Composites
Richardson, M. O. W.; Zhang, Z. Y.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 199-207; In English; See also 20040040360; Copyright; Avail: Other Sources

Resin transfer molding (RTM) of glass fiber reinforced polymeric composites offers the advantages of automation, low cost and versatile design of fiber reinforcement. A replacement of glass fibers with natural plant fibers as reinforcement in polymeric composites provides additional technological, economical, ecological and environmental benefits. The resin transfer mold filling process has significant effects on different aspects, such as fiber wetting out and impregnation, injection gate design, 'dry patch' and void formation. Flow visualization experiments were carried out using a transparent RTM mold to develop a better understanding of the mold filling process for hemp mat reinforced phenolic composites. The mold filling of unreinforced phenolics was characterized by a 'quasi one dimensional steady state' flow. In the case of hemp nonwoven reinforced system, the mold filling process can be considered as the flow of fluids through porous media. 'Fiber washing' was a typical problem encountered during the injection process, leading to poor property uniformity. In addition, a preferential flow path was usually created near the edges and corners of the mold. The path exhibited low flow resistance and caused the resin flow front to advance much faster in these regions. The edge flow interrupted the steady flow state, leading to difficulties in venting arrangement and 'dry patch' formation. The edge flow and fiber washing were alleviated by reinforcement manipulation so steady state flow could be achieved. The relationships between the filling time and injection pressure, falling time and different fiber weight fractions have been established for certain specific injection strategies.
Author
Flow Visualization; Resin Transfer Molding; Reinforcing Fibers; Phenolic Resins

20040040399 DaimlerChrysler Aerospace A.G., Munich, Germany
Influence of the Sheet Forming Technique on the Drapability of Low Cost Textile Reinforced Thermoplastic Composites
Baeten, Sofie; Verpoest, Ignaas; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 355-364; In English; See also 20040040360
Contract(s)/Grant(s): CEC-BE7256-93; CEC-BRE2-CT94-0552; Copyright; Avail: Other Sources

The two main deformation modes of the composite during deep drawing are inter-ply slipping and intra-ply sheafing. They are both facilitated by applying a high re-heating temperature, low surface pressure and an appropriate deformation velocity and hold-down pressure during forming. The inter-ply slipping is dominated by the presence of a matrix rich layer in between the different plies. The fabric layers inside a laminate have to be separated first before the actual slipping is started. The presence of large areas of the viscous thermoplastic matrix mainly lubricates the shearing of fibre yams. The less good the impregnation and consolidation quality of fiat laminates, the easier the draping, resulting in a better shape conformity and lower forming forces (and energy).
Author
Textiles; Thermoplasticity; Low Cost; Composite Materials; High Temperature

20040041394 California Univ., Santa Barbara, CA, USA
NASA NCC2-1290 'Summary of Research' Report
Milstein, Fred; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NCC2-1290; No Copyright; Avail: CASI; A01, Hardcopy

Testing techniques for measuring the mechanical properties of SIRCA were refined and validated. These included tensile and compressive tests and stress-strain response. Analytic models were developed in order to explain initial experimental results.
Derived from text
Tensile Tests; Compressibility; Stress-Strain Relationships; Ceramic Matrix Composites

20040042488 NASA, Washington, DC, USA

Facesheet Delamination of Composite Sandwich Materials at Cryogenic Temperatures

Gates, Thomas S.; Odegard, Gregory M.; Herring, Helen M.; July 19, 2003; 12 pp.; In English; JANNAF 39th Combustion Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA

Contract(s)/Grant(s): 794-40--4K; Copyright; Avail: CASI; A03, Hardcopy

The next generation of space transportation vehicles will require advances in lightweight structural materials and related design concepts to meet the increased demands on performance. One potential source for significant structural weight reduction is the replacement of traditional metallic cryogenic fuel tanks with new designs for polymeric matrix composite tanks. These new tank designs may take the form of thin-walled sandwich constructed with lightweight core and composite facesheets. Life-time durability requirements imply the materials must safely carry pressure loads, external structural loads, resist leakage and operate over an extremely wide temperature range. Aside from catastrophic events like tank wall penetration, one of the most likely scenarios for failure of a tank wall of sandwich construction is the permeation of cryogenic fluid into the sandwich core and the subsequent delamination of the sandwich facesheet due to the build-up of excessive internal pressure. The research presented in this paper was undertaken to help understand this specific problem of core to facesheet delamination in cryogenic environments and relate this data to basic mechanical properties. The experimental results presented herein provide data on the strain energy release rate (toughness) of the interface between the facesheet and the core of a composite sandwich subjected to simulated internal pressure. A unique test apparatus and associated test methods are described and the results are presented to highlight the effects of cryogenic temperature on the measured material properties. Author

Polymer Matrix Composites; Fuel Tanks; Composite Structures; Cryogenic Temperature; Temperature Effects; Weight Reduction; Sandwich Structures

20040043945 Army Research Lab., Aberdeen Proving Ground, MD

The Effects of PMMA on Ballistic Impact Performance of Hybrid Hard/Ductile All-Plastic- and Glass- Plastic-Based Composites

Hsieh, Alex J.; DeSchepper, Daniel; Moy, Paul; Dehmer, Peter G.; Song, John W.; Feb. 2004; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420878; ARL-TR-3155; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Army Research Laboratory is focusing on utilizing the materials-by-design strategy in the development of transparent armor systems to achieve lightweight, mobility, enhanced survivability, and lower life cycle costs for the soldiers and ground vehicle protection. The focus of this research is to identify the material parameters that are critical for the ballistic performance of hybrid hard/ductile laminate systems. We evaluated the role of poly(methyl methacrylate), (PMMA), on the impact response of composites consisting of PMMA and polycarbonate, (PC), as well as on the PC-Class-PMMA-PC laminates against the .22-cal. fragment simulator projectile and the 124-gr 9-mm projectile. Increasing the thickness of PMMA improved the overall impact capability of these laminates. Incorporation of PMMA as an intermediate play between the glass and ductile PC appeared to be a very effective approach for the design of glass-plastic laminates. We attributed theses observation to the high strain- rate sensitivity charactenstics of the monolithic PMMA. Preliminary results obtained from the 9-mm projectile testing clearly indicated that the PMMA-based all-plastic laminates maintained a significant amount of residual visibility after impact, which was critical for transparent armor applications.

DTIC

Ballistics; Ductility; Glass; Impact; Laminates; Plastics; Polycarbonates; Terminal Ballistics

20040045169 Old Dominion Univ., Norfolk, VA, USA

Automated Tow Placement Processing and Characterization of Composites

Prabhakaran, R.; March 08, 2004; 5 pp.; In English

Contract(s)/Grant(s): NCC1-01052; ODURF Proj. 114241; No Copyright; Avail: CASI; A01, Hardcopy

The project had one of the initial objectives as automated tow placement (ATP), in which a robot was used to place a collimated band of pre-impregnated ribbons or a wide preconsolidated tape onto a tool surface. It was proposed to utilize the Automated Tow Placement machine that was already available and to fabricate carbon fiber reinforced PEEK (polyether-ether-ketone) matrix composites. After initial experiments with the fabrication of flat plates, composite cylinders were to be fabricated. Specimens from the fabricated parts were to be tested for mechanical characterization. A second objective was to conduct various types of tests for characterizing composite specimens cured by different fabrication processes.

Author

Carbon Fibers; Ethers; Fiber Composites; Ketones; Adenosine Triphosphate

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

20040035717 Lawrence Livermore National Lab., Livermore, CA
Effective Determination of Coexistence Curves using Reversible-Scaling Molecular Dynamics Simulations
de Koning, M.; Antonelli, A.; Yip, S.; Dec. 2000; 12 pp.; In English
Report No.(s): DE2003-15005279; UCRL-JC-141430; No Copyright; Avail: Department of Energy Information Bridge

We present a simulation technique that allows the calculation of a phase coexistence curve from a single nonequilibrium molecular dynamics (MD) simulation. The approach is based on the simultaneous simulation of two coexisting phases, each in its own computational cell, and the integration of the relevant Clausius-Clapeyron equation starting from a known coexistence point. As an illustration of the effectiveness of our approach we apply the method to explore the melting curve in the Lennard-Jones phase diagram.
NTIS
Molecular Dynamics; Melting

20040035755 Iowa State Univ. of Science and Technology, Ames, IA
Studies of Immobilized Homogeneous Metal Catalysts on Silica Supports
Stanger, K. J.; 2003; 174 pp.; In English
Report No.(s): DE2003-815768; No Copyright; Avail: Department of Energy Information Bridge

The tethered, chiral, chelating diphosphine rhodium complex, which catalyzes the enantioselective hydrogenation of methyl-(alpha)-acetamidocinnamate (MAC), has the illustrated structure as established by (sup 31)P NMR and IR studies. Spectral and catalytic investigations also suggest that the mechanism of action of the tethered complex is the same as that of the untethered complex in solution. The rhodium complexes, (Rh(COD)H)(sub 4), (Rh(COD)(sub 2))(sup+)BF(sub 4)(sup -), (Rh(COD)Cl)(sub 2), and RhCl(sub 3)(center-dot) 3H(sub 2)O, adsorbed on SiO(sub 2) are optimally activated for toluene hydrogenation by pretreatment with H(sub 2) at 200 degrees C.
NTIS
Catalysts; Silicon Dioxide; Homogeneity; Catalytic Activity

20040035823 Lawrence Livermore National Lab., Livermore, CA
Silica Scale Management: Lowering Operating Costs through Improved Scale Control, and Adding Value by Extracting Marketable By-Products
Burton, E. A.; Bourcier, W. L.; Wallace, A.; Bruton, C. J.; Leif, R.; Jun. 18, 2003; 20 pp.; In English
Report No.(s): DE2003-15005086; UCRL-JC-153721; No Copyright; Avail: Department of Energy Information Bridge

Silica scaling is a common problem in geothermal facilities. Geothermal operators need improved tools to evaluate and mitigate the impact of silica scaling. It is also proving feasible to develop technologies to economically convert silica and other dissolved elements in geothermal fluids from a problem to a resource. The benefits to a geothermal operation of controlling silica in geothermal fluids include: (1) Lower operating and maintenance costs, including mitigation costs associated with silica scaling; (2) Improved heat transfer performance; (3) Decreased costs and minimized environmental impact associated with chemical additives; (4) The addition of new revenue streams from mineral extraction, when appropriate.
NTIS
By-Products; Operating Costs; Silicon Dioxide; Geothermal Technology

20040035824 Lawrence Livermore National Lab., Livermore, CA
Deformation at Crystallite Interfaces
Field, D. P.; Mortensen, A. W.; Nowell, M. M.; Campbell, G. H.; Oct. 05, 2001; 9 pp.; In English
Report No.(s): DE2003-15005442; UCRL-JC-145737; No Copyright; Avail: Department of Energy Information Bridge

Deformation at grain boundaries is observed and a framework for bound specific constitutive laws based upon geometric considerations of slip transfer is developed. Orientation images of a pseudo-internal surface during interrupted channel die deformations of a Cu bi-crystal show the heterogeneity of lattice rotation near the grain boundary. The experiments demonstrate that a region near the boundary is strongly influenced by neighboring grain deformation and lend support to the

development of deformation models that include the effects of non-local slip system interaction.
NTIS
Crystallites; Deformation; Grain Boundaries

20040035830 Lawrence Livermore National Lab., Livermore, CA
Crystallization of Beryllium-Boron Metallic Glasses
Jankowski, A. F.; Wall, M. A.; Nieh, T. G.; Feb. 14, 2002; 22 pp.; In English
Report No.(s): DE2003-15005447; UCRL-JC-147456; No Copyright; Avail: Department of Energy Information Bridge

Prior studies of evaporation and sputter deposition show that the grain size of pure beryllium can be dramatically refined through the incorporation of metal impurities. Recently, the addition of boron at a concentration greater than 11% is shown to serve as a glassy phase former in sputter deposited beryllium. Presently, thermally induced crystallization of the beryllium-boron metallic glass is reported. The samples are characterized during an in-situ anneal treatment with bright field imaging and electron diffraction using transmission electron microscopy. A nanocrystalline structure evolves from the annealed amorphous phase and the crystallization temperature is affected by the boron concentration.
NTIS
Beryllium; Boron; Crystallization; Metallic Glasses

20040035918 Lawrence Livermore National Lab., Livermore, CA
Reaction of Phenyl Radical with O(sub 2): Thermodynamic Properties, Important Reaction Paths and Kinetics
Bozzelli, J.; Sebbar, N.; Pitz, W.; Bockhorn, H.; Apr. 12, 2001; 42 pp.; In English
Report No.(s): DE2003-15004774; UCRL-JC-142418; No Copyright; Avail: Department of Energy Information Bridge

The Phenyl + O2 association results in a chemically activated phenyl-peroxy radical which can dissociate to phenoxy radical + 0, undergo intramolecular addition of the peroxy radical to several unsaturated carbon sites or react back to phenyl + O2. The intramolecular addition channels further react through several paths to ring opening (unsaturated + carbonyl moieties) as well as cyclopentadieny radical + CO2. Enthalpy (DeltaHdegreesf(sub 298)), Entropy (S298), and heat capacities Cp(T) for species in the decomposition of the ring are evaluated using density functional and ab initio calculations and by comparisons to vinyl + O2 data of Mebel et al, and phenyl + O2 data of Hadad et al. Isodesmic reaction analysis is used to estimate enthalpy values of the intermediates and well depths of the adducts. High Pressure limit kinetic parameters are obtained from the calculation results using canonical Transition State Theory. Quantum RRK analysis is utilized to obtain k(E) and modified strong collision or master equation analysis is used for evaluation of pressure fall-off in this complex bimolecular, chemical activation, reaction system. Uncertainty in key barriers is discussed, resulting variations in important reaction product ratios are illustrated, and changes in these branching ratios are evaluated with a detailed reaction mechanism.
NTIS
Oxygen; Thermodynamics; Phenyls; Radicals

20040035924 Idaho National Engineering and Environmental Lab., Idaho Falls, ID
Thermodynamic Phase and Chemical Equilibrium at 0-110 deg C for the H(+) -K(+) -Na(+) -Cl(-) -H2O System up to 16 Molal and the HNO3-H2O System up to 20 Molal using an Association-Based Pitzer Model Compatible with ASPEN Plus
Nichols, T. T.; Taylor, D. D.; Sep. 2003; 124 pp.; In English
Report No.(s): DE2004-819868; INEEL/EXT-03-01167; No Copyright; Avail: Department of Energy Information Bridge

A status is presented of the parameterization during FY2003 of an association-based Pitzer model to simulate chemical and phase equilibria of acid-chloride-nitrate-mercury aqueous electrolyte systems. This work was funded by the Laboratory Directed Research and Development (LDRD) program at the Idaho National Engineering and Environmental Laboratory (INEEL). The Pitzer model was originally developed for the 0-6 molal range, so many of the Pitzer parameter values in the literature are not applicable to high ionic-strength, complex mixtures, such as 10 molal SBW. The objective of this project is to obtain association-based parameters for the Pitzer model that will allow practitioners to perform process design involving liquid speciation, vapor-liquid, and solid-liquid equilibria of high ionic-strength, complex, electrolyte mixtures at 0-100 degrees C within any process simulator where Pitzer's model has been implemented.
NTIS
Thermodynamics; Chemical Equilibrium; Chlorides; Nitric Acid

20040035931 Lawrence Livermore National Lab., Livermore, CA

Mapping Phase Transformations in the Heat-Affected-Zone of Carbon Manganese Steel Welds using Spatially Resolved X-Ray Diffraction

Elmer, J. W.; Wong, J.; Ressler, T.; Palmer, T. A.; Dec. 04, 2001; 12 pp.; In English

Report No.(s): DE2003-15004796; UCRL-JC-146627; No Copyright; Avail: Department of Energy Information Bridge

Spatially Resolved X-Ray Diffraction (SRXRD) was used to investigate phase transformations that occur in the heat affected zone (HAZ) of gas tungsten arc (GTA) welds in AISI 1005 carbon-manganese steel. In situ SRXRD experiments performed at the Stanford Synchrotron Radiation Laboratory (SSRL) probed the phases present in the HAZ during welding, and these real-time observations of the HAZ phases were used to construct a map of the phase transformations occurring in the HAZ. This map identified 5 principal phase regions between the liquid weld pool and the unaffected base metal for the carbon-manganese steel studied in this investigation. Regions of annealing, recrystallization, partial transformation and complete transformation to a-Fe, y-Fe, and 6-Fe phases were identified using SRXRD, and the experimental results were combined with a heat flow model of the weld to investigate transformation kinetics under both positive and negative temperature gradients in the HAZ.

NTIS

Radiochemistry; Nuclear Chemistry

20040035934 Lawrence Livermore National Lab., Livermore, CA

Chemical Kinetic Study of Toluene Oxidation

Pitz, W. J.; Seiser, R.; Bozzelli, J. W.; Seshadri, K.; Chen, C. J.; Dec. 17, 2001; 24 pp.; In English

Report No.(s): DE2003-15004794; UCRL-JC-145890; No Copyright; Avail: Department of Energy Information Bridge

A study was performed to elucidate the chemical-kinetic mechanism of combustion of toluene. A detailed chemical-kinetic mechanism for toluene was improved by adding a more accurate description of the phenyl + O 2 reaction channels, toluene decomposition reactions and the benzyl + 0 reaction. Results of the chemical kinetic mechanism are com- pared with experimental data obtained from premixed and nonpremixed systems. Under premixed conditions, predicted ignition delay times are compared with new experimental data obtained in shock tube. Also, calculated species concentration histories are compared to experimental flow reactor data from the literature. Under nonpremixed conditions, critical conditions of extinction and autoignition were measured in strained laminar flows in the counterflow configuration. Numerical calculations are performed using the chemical- kinetic mechanism at conditions corresponding to those in the experiments. Critical conditions of extinction and autoignition are predicted and compared with the experimental data. Comparisons between the model predictions and experimental results of ignition delay times in shock tube, and extinction and autoignition in nonpremixed systems show that the chemical-kinetic mechanism predicts that toluene/air is overall less reactive than observed in the experiments. For both premixed and nonpremixed systems, sensitivity analysis was used to identify the reaction rate constants that control the overall rate of oxidation in each of the systems considered. Under shock tube conditions, the reactions that influence ignition delay time are H + O 2 chain branching, the toluene decomposition reaction to give an H atom, and the toluene + H abstraction reaction. The reactions that influence autoignition in nonpremixed systems involve the benzyl + HOz reaction and the phenyl + O 2 reaction.

NTIS

Oxidation; Toluene; Reaction Kinetics

20040035951 Air Force Research Lab., Wright-Patterson AFB, OH

Solid State Thermochemical Decomposition of Neat 1, 3,5,5-Tetranitrohexahydropyrimidine (DNNC) and Its DNNC-d6 Perdeuterio-Labeled Analogue

Hendrickson, Scott A.; Shackelford, Scott A.; Jan. 26, 2004; 20 pp.; In English

Report No.(s): AD-A419990; No Copyright; Avail: CASI; A03, Hardcopy

The solid state exothermic thermochemical decomposition kinetics of neat 1, 3,5,5-tetranitrohexahydro- pyrimidine (DNNC) and its perdeuterlo DNNC-d6 deuterium labeled analogue were obtained by isothermal differential scanning calorimetry (IDSC) at 142, 145, and 148 deg C. Rate constants subjected to kinetic deuterium isotope effect (KDIE) criteria suggest that C-H bond rupture in either one or both types of the chemically inequivalent alternating -CH2- methylene groups of the DNNC ring structure constitutes the exothermic rate-controlling step. An energy of activation equal to 115 kJ/mole was determined for the exothermic DNNC-d6 decomposition, and from which 106 kJ/mol was calculated for unlabeled DNNC. The exothermic DNNC decomposition follows an extended endothermic induction period with a higher 128 kJ/mole activation

energy during which a catalytic species may form by a different rate-limiting step prior to initiating the exothermic decomposition and resultant energy release.
DTIC
Solid State

20040035953 Army Research Lab., Aberdeen Proving Ground, MD
Computationally Based Measures of Amine Azide Basicity and Their Correlation With Hypergolic Ignition Delays
McQuaid, Michael J.; Dec. 2003; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420016; ARL-TR-3122; No Copyright; Avail: CASI; A03, Hardcopy

To explore a hypothesis that hypergolic ignition delays for fuel-nitric acid combinations are a function of the fuel's basicity, measures of base strength are computed for various azides, amines, amine azides, and hydrazines and compared to ignition delay data. Measures of base strength considered include gas-phase proton affinities, heats of neutralization for reactions leading to ion pairs, and heats of reaction for fuel-nitric acid complexation. The measures quantify substituent-mediated basicity differences between sites with lone pair electrons, but they do not appear to be good predictors of ignition delay. The failure of the hypothesis is discussed.
DTIC
Azides (Inorganic); Azides (Organic); Time Lag

20040035955 BAE Systems, Nashua, NH
High Efficiency Active Matrix Liquid Crystal Displays (HEAMLCD)
Gunn, Thomas; Hicks, Rich; Halstead, Wes; Dionne, Charles; Craig, David; Nov. 2003; 91 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-95-C-1775; Proj-2003
Report No.(s): AD-A420027; AFRL-HE-WP-TR-2003-0131; No Copyright; Avail: CASI; A05, Hardcopy

This high efficiency active matrix liquid crystal display (HEAMLCD) effort examined several alternatives to increasing the total power efficiency of an AMLCD flat panel display (FPD). It was determined that the color filters passed just one-sixth of incident light and that a re-design of the addressed cell assembly (ACA) based on color separation physical phenomena represented the best new technology opportunity to improve overall display power efficiency. Current liquid crystal display (LCD) sub-pixels are covered by red, green, or blue absorptive color filters; this method discards two-thirds of available white light by structure while transmitting just 50% of the desired color. Micro- optical elements based on refractive, diffractive, or interferometric color separation, were selected for pursuit in this effort. A diffractive color separation filter (DCSF) was designed to separate the colors and focus the desired red, green, blue wavelength bands onto the subpixel apertures. The black matrix already used in AMLCD designs is used to block the spill-over of undesired wavebands from adjacent subpixels. Several prototypes of a DCSF were designed, fabricated, tested, analyzed, and reported. An alternative approach using reflective color separation (RCS) dichroic filters was also tested. Several other potential techniques for improving the efficiency of AMLCD displays, including inorganic light emitting diode (LED) backlight technology, were examined and are discussed.
DTIC
Display Devices; Liquid Crystals

20040035957 Software and Engineering Associates, Inc., Carson City, NV
Unified Computer Model for Predicting Thermochemical Erosion in Gun Barrels
Dunn, Stuart; Coats, Douglas; Nickerson, Gary; Sopok, Samuel; O'Hara, Peter; Jul. 12, 1995; 32 pp.; In English
Report No.(s): AD-A420028; AIAA-95-2440; No Copyright; Avail: CASI; A03, Hardcopy

The first known gun barrel thermochemical erosion modeling code is presented. This modeling code provides the necessary missing element needed for developing a generalized gun barrel erosion modeling code that can provide analysis and design information that is unattainable by experiment alone. At the current stage of code development, single-shot comparisons can be made of either the same gun wall material for different rounds or different gun wall materials for the same round. This complex computer analysis is based on rigorous scientific thermochemical erosion considerations that have been validated in the reentry nosetip and rocket nozzle community over the last forty years. The 155-mm M2O3 Unicannon system example is used to illustrate the five module analyses for chromium and gun steel wall materials for the same round. The first two modules include the standard gun community interior ballistics (XNOVAKTC) and nonideal gas thermochemical equilibrium (BLAKE) codes. The last three modules, significantly modified for gun barrels, include the standard rocket

community mass addition boundary layer (TDK/MABL), gas- wall chemistry (TDK/ODE), and wall material ablation conduction erosion (MACE) codes. These five module analyses provide recession, temperature, and heat flux profiles for each material as a function of time and axial position. In addition, this output can be coupled to PEA cracking codes. At the peak heat load axial position, predicted single-shot thermochemical wall erosion showed uncracked gun steel eroded by a factor of one hundred million more than uncracked chromium. For chromium plated gun steel, with its associated crack profile, it appears that gun steel ablation at the chromium cracks leaves unsupported chromium, which is subsequently removed by the high-speed gas flow,
DTIC
Computerized Simulation; Mathematical Models

20040035981 Miskolc Univ., Miskolc-Egyetemvarous
Electrochemical Synthesis of Carbon Nano- and Micro-Tubes from Molten Salts
Kaptay, George; Sep. 2003; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8655-02-M4076
Report No.(s): AD-A420051; SPC02-4076; No Copyright; Avail: CASI; A03, Hardcopy

This report results from a contract tasking University of Miskolc as follows: The objective of the research project is to produce carbon nanotubes using molten salt electrolysis. A series of experiments will be performed to determine the relationship between production conditions and morphology of carbon tubes. Potential, current density, duration, and electrolysis mode will be varied in different experiments. The experiments will be performed in a sealed high temperature cell, under argon atmosphere. The resulting carbonaceous material will be characterized using mainly scanning electron microscopy (SEM) and atomic force microscopy (AFM).
DTIC
Electrochemical Synthesis; Electron Microscopy; Molten Salts; Scanning Electron Microscopy

20040035987 Massachusetts Inst. of Tech., Cambridge, MA
Design and Construction of an Experimental Apparatus for Heat Transfer Studies in Dissociating Iodine Vapor
Christie, John D.; Brunner, Dietrich W.; May 1960; 93 pp.; In English
Report No.(s): AD-A420063; No Copyright; Avail: CASI; A05, Hardcopy

A closed loop tunnel and test section have been designed to enable the experimental determination of the heat transfer rate to a gas in laminar flow for varying degrees of dissociation. The iodine gas, circulated around the tunnel, enters the tubular two inch test section at a pressure between .001 and 1 atmosphere, a temperature between 250 deg and 400 deg F, and is subjected to a constant test section wall temperature which may be varied up to 1500 deg F. The apparatus is constructed principally of six inch porcelain coated steel pipe and fittings.
DTIC
Heat Transfer

20040035995 Army Armament Research, Development and Engineering Center, Watervliet, NY
Determination of Sandoz Black Aluminum Coloring Dye Olive Aluminum Coloring Dye and Sodium Dichromate Aluminum Sealing Solutions by UV-Visible Spectrophotometry
Sopok, Samuel; May 1992; 22 pp.; In English
Contract(s)/Grant(s): 61262H210.0; M70F0002M71A
Report No.(s): AD-A420067; ARCCB-MR-92022; No Copyright; Avail: CASI; A03, Hardcopy

The chemical literature lacks an acceptable method to determine and adequately control Sandoz black aluminum coloring dye, olive aluminum coloring dye, and sodium dichromate aluminum sealing solutions in aluminum finishing processes. Specific methods are presented here that provide acceptable finishing Processes. The optimum operating range of the Sandoz black aluminum coloring dye solution is 12.5 g/l maximum with resulting precisions in the 0.3 to 0.9.g/l range. The optimum operating range of the Sandoz olive aluminum coloring dye solution is 4.5 g/l maximum with resulting precisions in the 0.2 to 0.4g/l range. The optimum operating range of the Sandoz sodium dichromate aluminum sealing solution is 30.0 g/l maximum with resulting precisions in the 1.3 to 10-g/l range. These methods provided adequate control of the three processes supported by six years of testing.
DTIC
Ultraviolet Radiation

20040036101 Swedish Defence Research Establishment, Tumba
Transition Velocity Experiments on Ceramics
Lundberg, Patrik; Nov. 2003; 27 pp.; In English
Contract(s)/Grant(s): N62558-02-M-6377
Report No.(s): AD-A420132; FOI02-1367; No Copyright; Avail: CASI; A03, Hardcopy

ARL has awarded FOI a contract to assess the transition velocities of four silicon carbide (SiC) materials of potential interest for armor applications using a test method developed at FOI. These materials are produced by Cercom Inc. and have the designations SiC B, SiC N, Sic HPN and SiC-SC-lRN. FOI has fabricated the targets and carried out the tests required under the contract to supplement tests performed earlier at FOI. In this report, all primary data are accounted for and the penetration and erosion velocities are evaluated. The transition velocity intervals are obtained to within 50 m/s or better, enabling a ranking of the materials. SiC HPN has the highest transition velocity, above 1600 m/s, while the other materials have a transition velocity just above 1500 m/s. The transition from interface defeat to penetration is distinct and the complicated penetration behavior above the transition velocity is discussed. Suggestions for possible additional work are presented.
DTIC
Silicon Carbides

20040036165 Virginia Univ., Charlottesville, VA
Infrared Spectra of Aluminum Hydrides in Solid Hydrogen: AI2H4 and AI2H6
Wang, Xuefeng; Andrews, Lester; Tam, Simon; DeRosa, Michelle E.; Fajardo, Mario E.; Mar. 20, 2003; 43 pp.; In English
Contract(s)/Grant(s): Proj-2303
Report No.(s): AD-A420182; AFRL-PR-ED-TP-2003-037; No Copyright; Avail: CASI; A03, Hardcopy

The reaction of laser-ablated Al atoms and normal- H(sub 2) during co-deposition at 3.5 K produces AlM, AlH(sub 2), and AlH(sub 3) based on infrared spectra, and the results of isotopic substitution (D(sub 2), H(sub 2) + D(sub 2) mixtures, HD). Four new bands are assigned to Al(sub 2)H(sub 4) from annealing, photochemistry, and agreement with frequencies calculated using density functional theory. Ultraviolet photolysis markedly increases the yield of AlH(sub 3) and seven new absorptions for Al(sub 2)H(sub 6) in the infrared spectrum of the solid hydrogen sample. These seven vibrational frequencies include terminal Al-H(sub 2) and bridge Al-H-Al stretching and AlH(sub 2) bending modes, which are accurately predicted by quantum chemical calculations for dibridged Al(sub 2)H(sub 6), a molecule isostructural with diborane. Annealing these samples to remove the H(sub 2) matrix decreases the sharp AlM(sub 3) and Al(sub 2)H(sub 6) absorptions and forms broad 1720 plus or minus 20 and 720 plus or minus 20 /cm bands, which are due to solid (AlH(sub 3))n formed on the CsI window. Complementary experiments with thermal Al atoms and para-H(sub 2) at 2.4 K give similar spectra and most product frequencies within 2 /cm. Although many volatile binary boron hydride compounds are known, binary aluminum hydride chemistry is limited to the polymeric (AlH(sub 3))n solid. Our experimental characterization of the dibridged Al(sub 2)H(sub 6) molecule provides an important link between the chemistries of boron and aluminum.
DTIC
Aluminum Compounds; Aluminum Hydrides; Infrared Spectra

20040036183 North Carolina State Univ., Raleigh, NC
Studies in Buffered Chloroaluminate Ionic Liquids
Osteryoung, Robert A.; Jan. 2004; 22 pp.; In English
Contract(s)/Grant(s): F40620-00-1-0061
Report No.(s): AD-A420198; AFRL-SR-AR-TR-04-0093; No Copyright; Avail: CASI; A03, Hardcopy

Electrochemistry in ambient temperature ionic liquids was performed. A portion of the work was carried out in haloaluminate melts, mainly 1-ethyl-3-ethyl imidazolium chloride-aluminum chloride. This was to complete work initiated under prior grants and involved studies of buffering of these systems. The bulk of the work involved electrochemical studies in non-haloaluminate ionic liquids, mainly 1-butyl-3-methylimidazolium hexafluorophosphate. Alkali metal reduction potentials were measured, an apparent anomaly with a rotating disc electrode was found and explained, and turn-on potentials and conductivities of polypyrrole films in the non-haloaluminate ionic liquids were measured.
DTIC
Ionic Crystals; Aluminum Chlorides; Electrochemistry; Liquid Crystals

20040036293 Naval Research Lab., Washington, DC

Characterization of the Dynamic Surface Tension of Aqueous Film-Forming Foam

Hyland, Emily K.; Williams, Bradley A.; Feb. 9, 2004; 19 pp.; In English

Contract(s)/Grant(s): N00014-03WX-2-0398

Report No.(s): AD-A420320; NRL/MR/6180--04-8749; No Copyright; Avail: CASI; A03, Hardcopy

We have characterized the dynamic surface tension of several commercial varieties of aqueous film-forming foam (AFFF) using a maximum bubble pressure tensiometer. Dynamic surface tension governs the behavior of surfactant-containing solutions on short time scales before thermo-dynamic equilibrium can be achieved; this typically includes many aspects of AFFF use including foam formation. The approach to equilibrium surface tension is compared for the different products. Additionally, the effects of varying the dilution of the AFFF concentrate by water, variation of the salinity of the water and variations in ambient temperature on the dynamic surface tension are investigated. Noteworthy in the findings is that a sufficient lowering of surface tension of AFFF to form an aqueous film on typical hydrocarbon fuels does not occur for several seconds.

DTIC

Aqueous Solutions; Interfacial Tension

20040036445 Naval Postgraduate School, Monterey, CA

Numerical Study of the Effect of the Fuel Film on Heat Transfer in a Rocket Engine Combustion Chamber

Goh, Sing H.; Dec. 2003; 89 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420430; No Copyright; Avail: CASI; A05, Hardcopy

The combustion chamber of a liquid-fueled rocket engine with an injected fuel film on the wall has been numerically simulated. The engine has been modeled to operate on a RP-1/gaseous oxygen mixture at a chamber pressure of 35 atmospheres. The fuel is a hydrocarbon blend and is used for both engine operation and the fuel-film layer. The fuel layer acts as a flowing thermal insulating shield, reducing the amount of convective and radiative heat flux from the hot combustion gases to the chamber wall. This effort evaluates the effectiveness of the fuel layer in achieving a reduced heat flux to the chamber wall under varying emission/absorption conditions. The tendency of hydrocarbon fuels to produce soot precipitates at near 550K directly affects the optical properties of the fuel layer and the resulting heat transfer to the wall has been modeled and discussed.

DTIC

Combustion Chambers; Heat Transfer; Liquid Propellant Rocket Engines; Rocket Engines

20040036505 Nevada Univ., Reno, NV

Computations of the Power to Sustain Plasma in Air with Relevance to Aerospace Technology

Vidmar, Robert J.; Stalder, Kenneth R.; Feb. 19, 2004; 61 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0414

Report No.(s): AD-A420475; AFRL-SR-AR-TR-04-0123; No Copyright; Avail: CASI; A04, Hardcopy

Research on the air chemistry for plasma produced by an electron beam and sustained with an electric field quantified the power to generate plasma with a density of 1E10 /cu cm to 1E13 /cu cm from sea level to 300,000 ft. An air chemistry code was upgraded and optimized for air-plasma research with key reactions that are functions of the reduced electric field, E/N, with a maximum value of 2E-15 V-sq cm. A tabulation of all the reactions used and their reaction rates or graphical references document the air-code chemistry. The air code computes the concentration of electrons, all air species including water vapor and many byproducts such as O, many negative and positive ion species, oxygen singlet delta, oxygen vibrational states, energy deposited in the plasma, thermal expansion, the bulk gas temperature, and total power. Simulations suggest that a global minimum in power occurs as a function of E/N and roughly corresponds to a minimum in electron attachment to oxygen. Power reduction depends on the electron concentration, altitude, and duration of electron bombardment. Results suggest conditions where electron-beam bombardment converts air plasma into one where the excited- state concentrations are significant and influence the overall gas kinetics.

DTIC

Aerospace Systems; Electron Beams; Plasma Generators; Plasmas (Physics)

20040036531 Naval Postgraduate School, Monterey, CA

Preliminary Design Study of an Enhanced Mixing Eductor System for the LHA (R) Gas Turbine Exhaust

Dudar, Stephen W.; Dec. 2003; 79 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420499; No Copyright; Avail: CASI; A05, Hardcopy

A preliminary design study was conducted to determine the geometry for an enhanced mixing eductor system for the Landing, Helicopter Assault Ship Replacement (LHAR) program gas turbine exhaust. A one-dimensional analytical model, with a correction factor applied to the secondary mass flow, was developed to predict the secondary air mass flow rate and the exhaust temperature at the mixing tube exit plane. The resultant design consisted of a high aspect ratio lobed nozzle and a mixing tube. The model was also used to predict the backpressure developed by the ducting configuration. The proposed design resulted in a 50% reduction in exhaust temperature with only a 6 inch H2O increase in back pressure. A detailed design of the oval-to-rectangular transition duct is provided, based on empirical data from a similar duct design. The study also included a prediction of plume radiation intensity in the 3-5 micron band for various aspect ratio slots.
DTIC
Gas Turbines

20040037763 Swedish National Testing and Research Inst., Boras, Sweden
Calibration of the Electrochemical Methods for the Corrosion Rate Measurement of Steel in Concrete
Luping, T.; 2002; 62 pp.
Report No.(s): PB2004-102635; No Copyright; Avail: CASI; A04, Hardcopy

This report presents the results from the Nordtest project No. 1531-01. In this study, steel bars were embedded in concrete slabs with different chloride introductions (0%, 1.5%, 3% and 6% by mass of cement) in order to induce corrosion at different rates. The slabs were cast in one laboratory and distributed to three different laboratories for monitoring of corrosion rate over a period of one year. Four instruments representing two types of electrochemical pulse techniques, that is, linear polarization technique (GECOR instruments) and galvanostatic pulse technique (GalvaPulse and SP's instrument), were evaluated in the project through the comparative measurements. Finally, the standard gravimetric method ASTM G1 was used for calibration of the results measured by the non-destructive methods based on the electrochemical techniques.
NTIS
Calibrating; Concretes; Electrochemical Corrosion

20040041344 California Univ., Berkeley, CA, USA
Liquid-Solid Transportation Kinetics in Aluminum Oxide
Das, A. R.; Jul. 1964; 72 pp.; In English
Report No.(s): DE2004-4000007; UCRL-11513; No Copyright; Avail: Department of Energy Information Bridge

A direct-current-arc plasma torch was used to subject sized particles of synthetic sapphire in the range of 9 to 124 microns to rapid melting and resolidification. The spherical particles resulting from the solidification of completely molten droplets were separated from the partially melted particles in order to study the formation of metastable crystalline phases of alumina from the liquid droplets subjected to rapid cooling. various degrees of bubble formation. A fraction of these spheroidized particles showed The size and apparent density of the spheroidized particles and the ambient temperature conditions experienced by the liquid droplets during cooling were used as parameters in determining quenching rates. hypothesis based on the kinetics of nucleation of the crystalline solid phases from the supercooled liquid droplets is proposed to explain the ratio of metastable phases to the stable a phase. Experimental data relating this ratio with quench rates of the liquid droplets show reason- able agreement with the proposed hypothesis.
NTIS
Kinetics; Aluminum Oxides; Metastable State; Plasma Torches; Solid Phases; Solidification

20040041346 Lawrence Livermore National Lab., Livermore, CA
AFM Investigation of the Interaction of Chiral Amino Acids with the (104) Face of Calcite
Orme, C. A.; Noy, A.; McBride, M. T.; DeYoreo, J. J.; Oct. 01, 2000; 14 pp.; In English
Report No.(s): DE2003-15005426; UCRL-JC-141407; No Copyright; Avail: Department of Energy Information Bridge

In biomineralized tissue, Nature often uses a single crystal system to form tools with widely varied form and functionality. To accomplish this, organisms have developed methods to deterministically modify and control crystal habit, commonly creating shapes with lower symmetry than is possessed by the pure crystal. In this paper we use atomic force microscopy to investigate the effect of chiral amino acids on calcite growth. We show that the atomic steps and resultant macroscopic shape exhibit a lower symmetry that reflects the chirality of the amino acid. We use this result to constrain the possible stereospecific binding sites. We argue that the change in morphology is not due to the incorporation of the amino acid, but rather that it acts like a surfactant changing the energetics of the interface. These results suggest that the conventional paradigm for understanding the geometrical and chemical aspects of biomineralization in terms of stereochemical recognition should be

expanded to capture the energetic controls that determine the mechanisms of mineral modification by biomolecules.
NTIS
Composite Materials; Amino Acids; Mineralogy

20040043748 Naval Research Lab., Bay Saint Louis, MS
STARRS Calibration and Noise Issues for EuroSTARRS
Wesson, Joel C.; Burrage, Derek; Miller, Jerry; Apr. 2003; 7 pp.; In English
Contract(s)/Grant(s): Proj-BE-435-017
Report No.(s): AD-A420443; NRL/PP/7330/02/0069; No Copyright; Avail: CASI; A02, Hardcopy

The airborne microwave remote sensing was performed during EuroSTARRS using the Naval Research Laboratory STARRS instrument (Salinity, Temperature, and Roughness Remote Scanner). This leading edge passive L-Band instrument was acquired by NRL shortly before the campaign. Development of techniques for its use, and studies to understand its performance, are important parts of the acquisition process. In this paper we will examine instrument calibration and noise issues for STARRS which are associated with the flights conducted as part of the EuroSTARRS campaign, from November 16-23, 2001 in Germany, France and Spain. The issues we will address here are: pitch and roll improvements, L-Band absolute and ocean calibration, instrument stability, and environmental noise sources. A strong environmental noise source, located in the direction of Barcelona, was noticed during the Casablanca flight. A second environmental source was noted in the analysis later. The high altitude section of the Casablanca flight has elevated TB (most notably in all the outboard beams) relative to the low altitude section of the flight. The effects such environmental (presumably man-made) sources. Will have on satellite observations of L-Band brightness temperature may be significant.
DTIC
Calibrating; Noise (Sound)

20040043794 California Univ., Santa Barbara, CA
Inductively Coupled Plasma System (ICP)
Mishra, Umesh K.; Jan. 2001; 4 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0307
Report No.(s): AD-A420671; AFRL-SR-AR-TR-04-0131; No Copyright; Avail: CASI; A01, Hardcopy

This is the final technical report for contract number F49620-01-1-0307 with the Air Force Office of Scientific Research. The report provides information about the inductively coupled plasma system that was acquired under this contract. The system is a Unaxis Versalock 700, a production level cluster tool for dry etch and dielectric deposition. The tool provides up to 3 process chambers. Currently two of them are in function in our facility: chamber one has been arranged for dry etching of compound semiconductors and chamber two for dielectric deposition (SiN(x) and SiO2). We will describe the system and highlight the added value that the system brought to our cleanroom.
DTIC
Plasmas (Physics)

20040043836 Lehigh Univ., Bethlehem, PA
Tailoring of Grain Boundary Chemistry to Produce Super Creep-Resistant Alumina
Harmer, Martin P.; Chang, Helen M.; Rickman, Jeffrey M.; Sep. 2003; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0184
Report No.(s): AD-A420738; AFRL-SR-AR-TR-04-0133; No Copyright; Avail: CASI; A02, Hardcopy

The influence of multi-valent dopants in diffusion related phenomena is complex. For situations where grain boundary diffusion predominates, factors such as grain boundary segregation and compensating defects may have countervailing influences. These are highly pertinent issues when considering the efficacy of high temperature coatings, where failure of the underlying substrate is driven by oxidation. Accordingly, the influence of impurities on the rates of both inward diffusion of oxygen, and outward cation diffusion is critical. On this note, work has initiated on simulating the distribution of a diffusing species within a medium where both rapid and slow diffusion paths exist. In practice this could be a sintered polycrystal, a thermally sprayed coating, or a fibrous composite material. Once developed, it is believed that such a model would be a valuable tool in the lifetime prediction of components, as well as the design and selection of oxidation resistant coatings.
DTIC
Aluminates; Aluminum Oxides; Creep Strength; Grain Boundaries

20040043839 Air Force Research Lab., Wright-Patterson AFB, OH

Lithium Polymer Battery

Scanlon, Lawrence G., Jr.; Nov. 2003; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-3145

Report No.(s): AD-A420741; AFRL-PR-WP-TM-2003-2135; No Copyright; Avail: CASI; A03, Hardcopy

This report focuses on the development of a lithium-ion conducting channel as a solid-state electrolyte for rechargeable lithium batteries. Dilithium phthalocyanine (Li2Pc) has been used in this development since it can undergo molecular self-assembly to form the ionically conducting channel. The essential features of the channel are that it is designed such that the anion matrix of the unsaturated macrocycle forms the channel through which the lithium ion moves, thus making it a single-ion conductor for lithium ions; the ionic transport of lithium depends on the electric field gradient created by the electrodes, thereby minimizing temperature for ionic transport.

DTIC

Lithium Batteries; Solid State; Storage Batteries

20040043854 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Stochastic Intra-Cellular Modeling

Hopkins, Thomas; Sep. 2003; 113 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420764; AFIT/GAM/ENC/03S-1; No Copyright; Avail: CASI; A06, Hardcopy

Air Force personnel may sometimes comes into contact with potentially harmful chemicals while performing their duties. Of course the Air Force desires to keep any potential health risks to its members to a minimum. To this end the Air Force would like to identify which chemicals are toxic, their level of toxicity, and the processes by which these chemicals disrupt normal biological activities at the cellular level. The development of mathematical models can be of great benefit to toxicity studies. Because real world systems involve randomness, that is noise, and the desire is to create mathematical models to represent those systems, it is necessary to study approaches used to add noise to mathematical models. This document examines different methods for incorporating noise into biochemical systems. The various quantities involved in the reactions are treated as random variables. The methods can be separated into two categories: those which treat the random variable as having a continuous state space and those which treat the random variable as having a discrete state space. These different approaches are compared in order to better understand what type of method would be best used for adding noise to a model and how the model is affected.

DTIC

Mathematical Models; Random Variables; Risk; Stochastic Processes

20040043868 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Modeling Catalytic Destruction of Subsurface Contaminants in Recirculating Wells

Cadena, Kerry J.; Mar. 2003; 90 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420781; AFIT/GEE/ENV/03-02; No Copyright; Avail: CASI; A05, Hardcopy

Groundwater and soil contamination is a significant problem throughout the nation, with approximately 300,000 to 400,000 sites affected (National Research Council, 1994). Examples of groundwater contaminants of special interest to DoD and AF installations include fuel hydrocarbons, chlorinated hydrocarbons, and nitroaromatic compounds. Traditional remediation technologies, which include pump-and- treat, pen%permeable reactive barriers, and natural attenuation, have numerous drawbacks associated with them. These drawbacks have prompted researchers to look for innovative contamination clean-up methods. The technology investigated in this thesis, reticulating horizontal flow treatment wells (HFTWs) with in-well palladium (Pd) catalyst reactors, offers the potential for destruction of groundwater contaminants commonly found at USAF and DoD installations at less expense, more safely and effectively, and without the need to pump contaminated water to the surface, In this study, a numerical model was used to simulate application of the remediation technology under different site conditions for a number of contaminants of interest. It was found that the HFTW system with in-well Pd catalyst reactors had potential to remediate groundwater contaminants of DoD interest. Based only on this modeling study, however, it was unclear whether the technology could reduce contaminant concentrations enough to meet regulatory standards downgradient of the treatment system. Further experimental study is recommended, both in the laboratory and in the field, to quantify the efficacy of the technology in treating various contaminants of concern.

DTIC

Catalysis; Chemical Composition; Circulation; Concentration (Composition); Contaminants; Contamination; Destruction; Nitrogen Compounds; Wells

20040043954 Arizona State Univ., Tempe, AZ
Physical Chemistry of the PbO-MgO-Nb2O5-TiO2 System for Ferroelectric Relaxors
Petuskey, William T.; Feb. 29, 2004; 20 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0144
Report No.(s): AD-A420896; MPA-8945; AFRL-SR-AR-TR-04-0141; No Copyright; Avail: CASI; A03, Hardcopy

This project was devoted to evaluating the phase chemistry and thermochemistry of the quaternary lead-magnesium-niobium titanate system (PbO-MgO-Nb2O5-TiO2). It is technologically relevant to the development of ferroelectric relaxors with the perovskite crystal structure and of the general composition Pb(Mg(0.33-0.33)xNb(0.67-0.67x)Ti(x))O. This project also evaluated the phase chemistry of most of the remaining compositions of the system. The four ternary phase diagrams of PbO-MgO-Nb2O5, PbO-MgO-TiO2, PbO-Nb2O5-TiO2 and MgO-Nb2O5-TiO2 at 1000 degrees C were determined in some detail. The quaternary phase diagram was evaluated for relatively PbO-poor compositions. In addition, the thermochemistry of the overall system was also evaluated between about 800 and 1000 degrees C, characterized in the form of equilibrium vaporization rates of lead oxides. This was accomplished by Knudsen cell gravimetry on binary, ternary and quaternary phase states that were thermodynamically well defined. From this, the formation thermodynamics of a number of solid phase compositions were determined for the first time. Moreover, trends were evaluated of the equilibrium vapor pressures over perovskite solid solutions as a function of composition.
DTIC
Ferroelectric Materials; Ferroelectricity; Lead Oxides; Magnesium Oxides; Physical Chemistry; Titanium Oxides

26
METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20040035738 Swedish Defence Research Establishment, Tumba
Constitutive Modelling and Mechanical Properties of a Tungsten Heavy Metal Alloy
Skoglund, P.; Nov. 2002; In English
Report No.(s): PB2004-101808; FOI-R-0723; No Copyright; Avail: National Technical Information Service (NTIS)

The mechanical behavior of a tungsten heavy metal alloy (WHA) with potential use as a kinetic energy penetrator is investigated. From quasi-static experiments the deduced flow stress curves are discussed and the ultimate tensile stress is compared to the suppliers' data. Dynamic mechanical properties related to tensile loading are measured at strain rates up to 400s(sup -1) and at temperatures from 20 degrees C to about 500 degrees C. From the experimental data parameters for the constitutive equations developed by Johnson and Cook (J&C) as well as Zerilli and Armstrong (Z&A) are determined. The specific heat capacity is measured at temperatures from 20-200 degrees C and is used for calculations of the deformation induced temperature increase. From the extracted models isothermal and adiabatic flow stress curves are calculated and compared to experiments and available literature data.
NTIS
Tungsten Alloys; Models

20040035844 Lawrence Livermore National Lab., Livermore, CA
Superlattice Effects on the Amorphization of Ni-Ti Multilayers
Jankowski, A. F.; Feb. 10, 2000; 20 pp.; In English
Report No.(s): DE2003-15005422; UCRL-JC-136524; No Copyright; Avail: Department of Energy Information Bridge

A phenomenologica1 model is proposed to correlate the onset of solid-state amorphization with the loss of interfacial stability in Ni-Ti multilayers. Additionally, a temperature dependence to the onset of amorphization is attributed to the effect of interfacial coherency that varies with the Ni-Ti layer pair spacing.
NTIS
Nickel; Titanium; Superlattices; Amorphous Materials; Solid State

20040035894 Lawrence Livermore National Lab., Livermore, CA
LLNL PuPS Weld Qualification Plan
Riley, D.; Dodson, K. E.; Aug. 24, 2001; 30 pp.; In English
Report No.(s): DE2003-15005552; UCRL-ID-145764; No Copyright; Avail: Department of Energy Information Bridge

This plan ensures the quality of the Lawrence Livermore National Laboratory (LLNL) DOE 3013 Standard Plutonium

Packaging System (PuPS) can welds meet the requirements stipulated in the DOE Standard 3013-00 'Stabilization, Packaging, and Storage of Plutonium-Bearing Materials' (Reference 1) and G-ESR-G-00035, Revision 1 dated July 26, 2000, 'Savannah River Site Stabilization and Packaging Requirements for Plutonium Bearing Materials for Storage.' This plan also meets the requirements for a weld qualification plan as stipulated in the G-ESR-G-00035. The Outer Can weld must meet ASME VIII& IX. The Outer Can welds will be evaluated initially and during production. The initial evaluation will be done by performing the following: ASME IX welding procedure qualification, ASME IX operator qualification, and a 25 can Dummy Outer Can (DOC) verification run. During production, product cans and DOCs will be evaluated. Product cans will be evaluated by a combination of visual examination of the weld faces and the use of helium leak checking. The DOCs will be examined by visual examination, leak check, radiographic examination and metallographic examination. Appendix 2 summarizes the requirements of each of these evaluations. The Inner Can weld must meet the leak tightness requirements of DOE 3013. The Inner Can weld, while not required to meet ASME requirements, will be controlled as described in this plan to ensure a reliable leak path barrier and consistent production processing behavior. The product Inner Cans will be evaluated by a combination of visual examination of the weld faces and the use of helium leak checking.
NTIS
Plutonium; Qualifications; Welding; Radiography

20040035904 Helsinki Univ. of Technology, Espoo (Finland), Espoo, Finland
Seminar Course on Advanced Metallurgical Processes/2001
Kekkonen, M.; 2001; 64 pp.; In English
Report No.(s): PB2004-102784; TKK-MK-126; Copyright; Avail: National Technical Information Service (NTIS)
The basic aim of the Seminar Course on Advanced Metallurgical Processes is to improve the students' knowledge on the newest progress in metallurgical processes, new technologies and trends of metallurgical industry as well as new alternative to metals production. A holistic view into the process analysis and design is also emphasized. The course comprises of a series of lectures on selected topics e.g. direct reduction, direct smelting, novel refining processes and new progress in non-ferrous metallurgy.
NTIS
Metallurgy; Metals; Education

20040035929 Westinghouse Savannah River Co., Aiken, SC, Aiken, SC, USA
Evaluation of Hydrogen Embrittlement of SAFKEG 3940A Package in KAMS
May 2003; 20 pp.; In English
Report No.(s): DE2003-820087; WSRC-TR-2003-00196; No Copyright; Avail: Department of Energy Information Bridge
This report documents the evaluation of the potential for hydrogen embrittlement of the stainless steel of the inner containment vessel and the outer containment vessel components of the SAFKEG 3940A shipping package under transportation conditions and storage conditions in the K-Area Monitored Storage. The components are evaluated under a bounding scenario for hydrogen exposure.
NTIS
Stainless Steels; Hydrogen Embrittlement

20040035973
Low-Velocity Spall Testing of Ti-6Al-4V Alloy and a New Spall Critterion Based on Meso-Scale
Klepaczko, Janusz R.; Chevrier, P.; Boidin, X.; Aug. 2003; 44 pp.; In English
Contract(s)/Grant(s): N62558-02-M-5857
Report No.(s): AD-A420041; ARDSG-R/D-9314-AN-01; No Copyright; Avail: CASI; A03, Hardcopy
During the contract period the spall testing of Ti- 6Al-4V has been completed. The series of tests (total 11 tests) at different impact velocities (from 290 m/s to 460 m/s) have been performed and the level of the normal stress sigma (sub F) for the incipient spall as a function of the incident pulse duration tau(Sub C) has been determined. Such analysis has yielded the preliminary data in the form of the critical tensile stress versus the pulse duration, sigma(sub F). The Scanning Electron Microscopy (SEM) observation of the spalled surfaces was performed showing microdimples. Optical microscopy observation of the specimen cross-sections demonstrated presence on the me so-scale a combination of microcracks and adiabatic shearing. Those observations are very helpful to identify the physical mechanism of fracture development. The relief of the material separation leads to a new failure criterion on the mesoscale 1,2. The quantitative statistical analysis of the pictures needs more time and is in progress. A new model of spalling based on two meso- mechanisms of material separation has recently been

developed and verified for martensitic armor steel and hard aluminum alloy, 1,2, it confirms all findings by experiment. In order to gain more deep insight on the material behavior during spalling the initial microstructure of the Ti-6Al-4V alloy has been examined by microscopy observation, including chemical treatment of the surfaces. The literature survey on high strain rate behavior and spalling of Ti-6Al-4V alloy is included in this Report.
DTIC
Aluminum Alloys; Low Speed; Titanium Alloys; Vanadium Alloys

20040036179 Naval Air Warfare Center, Patuxent River, MD
Aircraft Carrier Exposure Testing of Aircraft Materials
Lee, Eui W.; Abourialy, N.; Kozol, J.; Jan. 9, 2004; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420195; NAWCADPZ/TR-2004/19; No Copyright; Avail: CASI; A03, Hardcopy

Previous studies have demonstrated that the aircraft carrier environment in the western Pacific Ocean is far more severe than other marine or industrial environments. Laboratory accelerated tests do not necessarily reproduce the real time corrosion behavior of materials on board an aircraft carrier on deployment. Test and control specimens were affixed on exposure racks and installed on aircraft carriers to compare adhesive bonding primers for aluminum and to determine the static property behavior of various aluminum alloys after shipboard exposure. Laboratory accelerated sulfur dioxide salt spray tests were conducted on three of the same aluminum alloys. After multiple deployments, significant reductions in ductility occurred for some aluminum alloys while slight changes occurred in static strength values. Peak aged 7075-T6 aluminum sustained as much as 87% reduction in ductility and overaged 7075-T7 sustained a 45% reduction in ductility.
DTIC
Aircraft Carriers

20040036237 Virginia Univ., Charlottesville, VA
Optimizing Mechanical Properties and Thermal Stability of Age Hardenable Aluminum Alloys through Theoretical Modeling, Alloy Modification and Thermal Mechanical Properties
Starke, Edgar A., Jr; Zhu, Aiwu; Gable, B. M.; Shiflet, G. J.; Dec. 31, 2003; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0090
Report No.(s): AD-A420271; 110765-101-GG10112-31340; FAS-5-25896; AFRL-SR-AR-TR-04-0107; No Copyright; Avail: CASI; A03, Hardcopy

This research was concerned with a practical approach to the design of an improved age-hardenable aluminum alloy for moderate temperature application. The process involved extensive empirical research, theoretical simulation and modeling, calculated phase diagrams and first principle calculations and analytical techniques. Microstructure characterization and analytical transmission electron microscopy were employed to refine the development of the quaternary Al-Cu-Mg-Ag phase diagram Differential scanning calorimetry and electron diffraction were implemented to investigate the microstructural evolution of the ternary alloys and to validate calculated equilibrium phase boundaries. Energy dispersive spectroscopy was also used to illustrate the effect of trace additions on the phase boundaries that are important for the thermal stability of this class of alloys. Computer simulation & modeling were used to identify the microstructure that will result in the optimal combination of mechanical properties. Unavailable parameters were calculated from first principle atomistic modeling. The major objective of this research program has been to illustrate the use of modeling and simulation in alloy design and therefore aid in the early insertion of new high performance materials.
DTIC
Aluminum Alloys; Mathematical Models; Mechanical Properties; Precipitation Hardening; Thermal Stability; Thermodynamic Properties

20040040179 Ladish Co., Inc., Cudahy, WI, USA
Assessment of NASA Dual Microstructure Heat Treatment Method for Multiple Forging Batch Heat Treatment
Gayda, John, Technical Monitor; Lemsky, Joe; February 2004; 14 pp.; In English
Contract(s)/Grant(s): NASA Order C-80000-A; WBS 22-728-30-09
Report No.(s): NASA/CR-2004-212950; No Copyright; Avail: CASI; A03, Hardcopy

NASA dual microstructure heat treatment technology previously demonstrated on single forging heat treat batches of a generic disk shape was successfully demonstrated on a multiple disk batch of a production shape component. A group of four Rolls-Royce Corporation 3rd Stage AE2100 forgings produced from alloy ME209 were successfully dual microstructure heat

treated as a single heat treat batch. The forgings responded uniformly as evidenced by part-to-part consistent thermocouple recordings and resultant macrostructures, and from ultrasonic examination. Multiple disk DMHT processing offers a low cost alternative to other published dual microstructure processing techniques.
Author
Heat Treatment; Microstructure; Thermocouples; Forging; Disks (Shapes)

20040040337 NASA Langley Research Center, Hampton, VA, USA
Arc Jet Results on Candidate High Temperature Coatings for NASA's NGLT Refractory Composite Leading Edge Task
Ohlhorst, C. W.; Vaughn, W. L.; Lewis, R. K.; Milhoan, J. D.; January 16, 2004; 10 pp.; In English; JANNAF 39th Combustion/27th Airbreathing Propulsion/21st Propulsion Systems Hazards/3rd Modeling and Simulation Joint Subcommittee Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA
Contract(s)/Grant(s): 23-794-40-45; No Copyright; Avail: CASI; A02, Hardcopy

In 2000, arc jet testing was conducted on thirteen material systems for possible use on the nose leading edge of the Hyper-X program s X-43A Mach 10 vehicle. Six material systems survived 3, 130- second cycles. To support NASA s Next Generation Launch Technology Programs (NGLT) need for passive refractory composite leading edges with multiple reuse capability at temperatures up to 3600 F, these six materials were subjected to an expanded arc jet test program. This expanded arc jet test program included three phases. The purpose of the first phase was to generate emissivity data as a function of temperature. The purpose of the second phase was to determine if the material systems had any thermal cycling durability, and the third phase was to determine whether the materials could survive an arc jet test of one hour duration. Some of the coating systems were found to have very low emissivities, suggesting that they would not be good candidates for leading edges coating. Other coating systems survived both the second and third phases of the test program and showed potential for use as an oxidation protection coating for leading edges. This presentation summarizes the test program results.
Author
Refractories; High Temperature; Hypersonic Speed; Emissivity; Thermodynamic Properties

20040040363 National Research Centre, Cairo, Egypt
Directional Solidification of Al-Cu In-Situ Composite
Youssef, T. H.; Moustafa, S. F.; Essawy, R. A.; Moustafa, I.; Sultan, E. A.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 191-198; In English; See also 20040040360; Copyright; Avail: Other Sources

Directional solidification was used to produce in-situ composite of an eutectic of Al-33% Cu alloy. The solidification process was achieved by isolating an ingot from all sides and cooling it from bottom only. Three cooling conditions were applied to obtain different temperature gradient, and various rates of growth, namely, direct water spray cooling, indirect water cooled Cu-chill, and conventional cooling (i.e. casting in rammed magnezite mold). The cast ingots were subjected to extensive metallographic studies, and to hardness and porosity measurements. Results showed that morphology, porosity content as well as hardness are greatly influenced by temperature gradient and growth rates.
Author
Aluminum Alloys; Copper Alloys; Eutectic Composites; Directional Solidification (Crystals)

20040041305 Denver Research Inst., Denver, CO, USA
Study of Factors Influencing Ductility of Iron-Aluminum Alloys. Fifth Monthly Letter for Period of March 1959 to March 1960
White, S. V.; Sep. 1959; 18 pp.; In English
Report No.(s): DE2004-4231009; No Copyright; Avail: Department of Energy Information Bridge

This informal letter report is the fifth of a series of monthly letter reports for the contract year, 15 March 1959 to 15 March 1960, describing the progress made on the research program, 'Study of Factors Influencing Ductility of Iron-Aluminum Alloys'. The objective of the program is to determine the effect of variations of aluminum content, heat treatment and basic slip mechanism upon the room temperature ductility of Fe-A1 alloys. Since alloys containing above 10% aluminum are characterized by an order-disorder transformation, heat treatment will provide the opportunity to study the effects of disorder, varying degrees of order, and incipient order upon the plastic flow mechanism. With a fundamental understanding of the deformation and fracture behavior of these alloys, it should then be possible to devise means to effect significant improvements

in their room temperature ductilities by a combination of heat treatment and minor alloying additions.
NTIS
Iron Alloys; Aluminum Alloys

20040041319 Lawrence Livermore National Lab., Livermore, CA
Phase Transformation Hysteresis in a Plutonium Alloy System: Modeling the Resistivity during the Transformation
Haslam, J. J.; Wall, M. A.; Johnson, D. L.; Mayhell, D. J.; Schwartz, A. J.; Nov. 14, 2001; 12 pp.; In English
Report No.(s): DE2003-15005392; UCRL-JC-144283; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Hysteresis; Phase Transformations; Electrical Resistivity

20040042435 NASA Ames Research Center, Moffett Field, CA, USA
Alternative Processing of High Temperature Hafnium and Zirconium Based Materials
Gasch, Matthew; Gusman, Michael; Ellerby, Don; Irby, Edward; Johnson, Sylvia M.; November 24, 2003; 1 pp.; In English; 106th Annual Meeting and Exposition of the American Ceramic Society, 18-21 Apr. 2004, Indianapolis, IN, USA; No Copyright; Avail: Other Sources; Abstract Only

The behavior of refractory hafnium and zirconium based materials are being investigated at NASA Ames as part of ongoing research aimed at developing superior heat resistant materials for aerospace applications. Hafnium and zirconium diboride based materials have shown high temperature capabilities in simulated reentry environments indicating that these materials may successfully operate as reusable oxidation resistant components for leading edge applications. Due to the refractory nature of these materials, processing of fine-grained uniform microstructures poses a number of challenges. To better understand the process-property-microstructure relationship, processing of these materials has been carried out with conventional hot pressing in addition to the novel approach of Spark Plasma Sintering (SPS). The two processing methods are compared and contrasted in an evaluation of the sintering behavior of high temperature diboride based materials and preliminary physical and mechanical properties are presented.
Author
Hafnium; Refractory Materials; Zirconium; Aerospace Engineering; Mechanical Properties

20040042496 NASA Langley Research Center, Hampton, VA, USA
Electron Beam Freeform Fabrication: A Rapid Metal Deposition Process
Taminger, Karen M. B.; Hafley, Robert A.; July 1, 2003; 6 pp.; In English; 3rd Annual Automotive Composites Conference, 9-10 Sep. 2003, Troy, MI, USA
Contract(s)/Grant(s): 23-762-30-61; No Copyright; Avail: CASI; A02, Hardcopy

Manufacturing of structural metal parts directly from computer aided design (CAD) data has been investigated by numerous researchers over the past decade. Researchers at NASA Langley REsearch Center are developing a new solid freeform fabrication process, electron beam freeform fabrication (EBF), as a rapid metal deposition process that works efficiently with a variety of weldable alloys. The EBF process introduces metal wire feedstock into a molten pool that is created and sustained using a focused electron beam in a vacuum environment. Thus far, this technique has been demonstrated on aluminum and titanium alloys of interest for aerospace structural applications nickel and ferrous based alloys are also planned. Deposits resulting from 2219 aluminum demonstrations have exhibited a range of grain morphologies depending upon the deposition parameters. These materials ave exhibited excellent tensile properties comparable to typical handbook data for wrought plate product after post-processing heat treatments. The EBF process is capable of bulk metal deposition at deposition rated in excess of 2500 cubic centimeters per hour (150 cubic inches per our) or finer detail at lower deposition rates, depending upon the desired application. This process offers the potential for rapidly adding structural details to simpler cast or forged structures rather than the conventional approach of machining large volumes of chips to produce a monolithic metallic structure. Selective addition of metal onto simpler blanks of material can have a significant effect on lead time reduction and lower material and machining costs.
Author
Fabrication; Solids; Deposition; Electron Beams; Metals; Aerospace Engineering; Structural Design; Rapid Prototyping

20040043769 Max-Planck-Inst. fuer Eisenforschung, Duesseldorf
Grain-Scale Crystal Plasticity Finite Element (FE) Simulations of Waspaloy during Hot Deformation
Raabe, Dierk R.; Jan. 7, 2004; 41 pp.; In English
Contract(s)/Grant(s): FA8655-02-M-4060
Report No.(s): AD-A420630; EOARD-SPC-02-4060; No Copyright; Avail: CASI; A03, Hardcopy

This report results from a contract tasking Max- Planck-Institute for Eisenforschung as follows: The project aims to understand and predict the mechanical, crystallographic, and topological behavior of gamma grains in Waspaloy during plastic deformation at high temperature. The study will be conducted by use of a crystal plasticity finite element method that updates the local crystallographic and hardening state of the material via integration of the evolution equations for the crystal lattice orientation and the critical resolved shear stress.
DTIC
Crystal Lattices; Crystals; Deformation; Finite Element Method; Plastic Deformation; Plastic Properties; Simulation; Waspaloy

20040043784 Naval Postgraduate School, Monterey, CA
Molecular Dynamics Simulation of Fatigue Damage in Metals
Lunt, William S.; Dec. 2003; 39 pp.; In English
Report No.(s): AD-A420653; No Copyright; Avail: CASI; A03, Hardcopy
Molecular dynamics simulation was conducted to better understand the mechanism of fatigue failure and to identity a parameter(s) that can indicated progressive damage due to cyclic loading. The Embedded Atom Method (EAM) was used for copper atoms subjected to cyclic loadings. Defective crystal structures including vacancies or impurities were considered for the study. The results showed that there was an increase in potential energy and kinetic energy, respectively, in the metal as the number of cycles increased. This means the metal becomes weaker, i.e., an indication of progressive damage. Therefore, the change of potential energy may be used as an indicator for fatigue damage accumulation. Furthermore, the relative distances between vacancies (or impurities) increased globally with fluctuation as the number of loading- unloading cycles increased.
DTIC
Fatigue (Materials); Fracture Mechanics; Metals; Molecular Dynamics; Simulation

20040043845 Universal Energy Systems, Inc., Dayton, OH
Processing, Microstructures, and Properties of Nb- Based Metal/Silicide Alloys
Mendiratta, Madan G.; Jul. 2003; 42 pp.; In English
Contract(s)/Grant(s): F33615-01-C-5214; Proj-2306
Report No.(s): AD-A420752; AFRL-ML-WP-TR-2004-4008; No Copyright; Avail: CASI; A03, Hardcopy
The Nb-Ti-Cr-Si-X alloys (X-Ht, Al, Sn, Fe, Ge) consisting of the solid solution Nb phase (Nb,s) in equilibrium with intermetallic phases ((NbTi)5Si3 and Cr2Nb) are potential candidates as hot-section materials for jet engines. The processing-microstructure-mechanical property relationship and damage/ fracture mechanisms of these alloys have been investigated. Processing methods have included induction skull melting, rapidly solidified powder production by rotating electrode and gas-atomization processes, and thermomechanical processing involving hipping and hot- extrusions. Tensile, compressive, and toughness properties have been determined from room temperature to 1100 C in laboratory air atmosphere. The alloys exhibited a brittle-to- ductile transition at temperatures above 800 C. Below this temperature, premature brittle tensile failure was caused by large silicide agglomerates at fracture stress values <390 MPa. At 1000 C, the yield strengths, depending upon composition, ranged from 185 to 372 MPa, while at 1100 C, they ranged from 138 to 219 MPa. The toughness values ranged from ^10 - 17 MPavm from room temperature to 1100 C.
DTIC
Alloys; Brittleness; Ductility; Failure; Metalloids; Microstructure; Niobium Alloys; Silicides; Silicon Alloys; Transition Points

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

20040035719 Lawrence Livermore National Lab., Livermore, CA
Properties of Aluminum Deposited by a High-Velocity Oxygen-Fueled Process
Chow, R.; Decker, T. A.; Gansert, R. V.; Gansert, D.; Lee, D.; Jun. 2001; 16 pp.; In English
Report No.(s): DE2003-15005978; UCRL-JC-142210; No Copyright; Avail: Department of Energy Information Bridge
Aluminum coatings deposited by a HVOF process have been demonstrated and relevant coating properties evaluated according to two deposition parameters, the spray distance and the oxygen-to-fuel flow ratio. The coating porosity, surface

roughness, and microhardness are measured. The coating properties are fairly insensitive to spray distance, the distance between the nozzle and the workpiece, and fuel ratios, the oxygen-to-fuel flow. Increasing the fuel content does appear to improve the process productivity in terms of surface roughness. Minimization of nozzle loading is discussed.
NTIS
Aluminum Coatings; Deposition; Hvof Thermal Spraying; Mechanical Properties

20040035754 Iowa State Univ. of Science and Technology, Ames, IA
Functionalized Materials from Elastomers to High Performance Thermoplastics
Salazar, L. A.; 2003; 262 pp.; In English
Report No.(s): DE2003-815764; No Copyright; Avail: Department of Energy Information Bridge

Synthesis and incorporation of functionalized materials continues to generate significant research interest in academia and in industry. If chosen correctly, a functional group when incorporated into a polymer can deliver enhanced properties, such as as adhesion, water solubility, thermal stability, etc. The utility of these new materials has been demonstrated in drug-delivery systems, coatings, membranes and compatibilizers. Two approaches exist to functionalize a material. The desired moiety can be added to the monomer either before or after polymerization. The polymers used range from low glass transition temperature elastomers to high glass transition temperature, high performance materials.
NTIS
Elastomers; Thermoplastic Resins; Refractory Materials

20040035833 Pennsylvania State Univ., University Park, PA, USA
Development of Activated Carbons from Coal Combustion By-Products
Schobert, H. H.; Maroto-Valer, M. M.; Lu, Z.; Jul. 2000; 24 pp.; In English
Report No.(s): DE2003-818152; No Copyright; Avail: Department of Energy Information Bridge

The increasing role of coal as a source of energy in the 21st century will demand environmental and cost-effective strategies for the use of coal combustion by-products (CCBPs), mainly fly ash containing unburned carbon. However, the carbonaceous residue in fly ash, unburned carbon (UC), is a potential precursor for the production of adsorbent carbons, since it has gone through a devolatilization process while in the combustor, and therefore, only requires to be activated. Accordingly, this research program focuses on the development of activated carbons from the unburned carbon present in fly ash. During the present reporting period (June 30, 1999--June 29, 2000), Task 1 'Procurement and characterization of CCBPs' was initiated and samples from various combustion systems were collected.
NTIS
Activated Carbon; Coal; Combustion; Cost Effectiveness

20040036241 Phillips Lab., Edwards AFB, CA
Investigating Cumulative Damage in a Highly Filled Polymeric Composite Material
Liu, C. T.; Tang, B.; Jul. 1993; 15 pp.; In English
Contract(s)/Grant(s): Proj-2302
Report No.(s): AD-A420273; PL-TP-93-3096; No Copyright; Avail: CASI; A03, Hardcopy

The effects of cyclic loading on cumulative damage, constitutive behavior, and residual strength of a highly filled polymeric composite material were investigated in this study. Uniaxial tensile specimens were used to study the accumulation of damage in the material subjected to different cyclic loading sequences. Loads, displacements, and ultra- sonic measurements made by transmitting sound waves through the thickness of the specimens were recorded during the tests. The recorded data were analyzed to determine the stress-strain curves and the relative acoustic attenuation coefficient DELTA alpha, which was used as a damage parameter of the determination of damage state of the material. The effects of different cyclic loading sequences on the material behavior of the highly filled polymeric material were discussed.
DTIC
Composite Materials; Crack Propagation; Cumulative Damage

20040036253 Pennsylvania State Univ., University Park, PA
Basic Studies on Templated Grain Growth of Relaxor Ferroelectric Crystals and Textured Ceramics
Messing, Gary L.; Trolier-McKinstry, Susan; Apr. 30, 2003; 19 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0098
Report No.(s): AD-A420282; AFRL-SR-AR-TR-04-0114; No Copyright; Avail: CASI; A03, Hardcopy

Templated grain growth (TGG) enables the relatively low cost fabrication of textured ceramics with single crystal-like properties, as well as single crystals. The resulting ceramics show texture levels up to 90%, and significant enhancements in the piezoelectric properties relative to randomly oriented ceramics with comparable densities. The piezoelectric coefficients of highly textured PMN-32.5PT ceramics were found to be ^1.2- 1.5 times greater than randomly-oriented samples. The unipolar strain-field measurements (<S kV/cm) of 90%-textured PMN-32.5PT ceramics produced piezoelectric coefficients as high as 1150 pC/N with relatively low piezoelectric hysteresis. Electrical and electromechanical property characterization of<001>pc textured sodium bismuth titanate - 5.5 mol% barium titanate rhombohedral ceramics showed 0.26% strain at 70 kV/cm, and large field piezoelectric coefficients over 500 pC/N were obtained for highly textured samples (f^90%). Reasons are given for why the high field dielectric and electromechanical properties are more hysteretic than those of single crystals.
DTIC
Ceramics; Dielectric Properties; Grain Size

20040036415 Colorado Univ., Boulder, CO
Photo-Stereo Lithography System for Polymer Derived Ceramic Microsystems
Raj, Rishi; Feb. 20, 2004; 16 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0201
Report No.(s): AD-A420403; AFRL-SR-AR-TR-04-0118; No Copyright; Avail: CASI; A03, Hardcopy

A photo-stereolithography system, Viper s12, sold by the company 3D systems, as described in the original proposal, was acquired in the summer of 2003. The system was delivered and installed by the vendor in June 2003. A graduate student, Tsali Cross, and a post-doctoral associate, Neil Cramer, from the College of Engineering at the University of Colorado received intensive training at the company site in California during Fall 2003. Since then the lithography system has been used to build single and multilayer pre-ceram1c polymer structures by UV-photopolymerization-lithography. The 'mask-less' computer interface and the vertical stepping of the tray holding the organic precursor is leading to novel applications in the fabrication of single, and multilayer ceramic microsystems. Examples of these applications are included in this report.
DTIC
Ceramics; Lithography

20040036535 Bioelastics Research Ltd., Birmingham, AL
Production of Elastomeric Polypeptides for Materials Characterizations
Urry, Dan W.; Feb. 24, 2004; 4 pp.; In English
Contract(s)/Grant(s): N00014-98-C-0279
Report No.(s): AD-A420503; BRL-0001Z; No Copyright; Avail: CASI; A01, Hardcopy

To prepare a family of designed elastic protein- based polymers for free energy transduction. Specifically, this effort is to provide 100 gram quantities of six and 10 gram quantities of an additional nine elastomeric polypeptides for conventional and specialized materials characterizations and for further development toward specific applications of potential use to the Navy.
DTIC
Elastic Properties

20040040166 NASA Langley Research Center, Hampton, VA, USA
Tensile Properties of Poly (N-vinyl caprolactam) Gels
Morgret, Leslie D.; Hinkley, Jeffrey A.; February 2004; 15 pp.; In English
Contract(s)/Grant(s): WU 23-762-55-MH
Report No.(s): NASA/TM-2004-212992; L-19015; No Copyright; Avail: CASI; A03, Hardcopy

N-vinyl caprolactam was copolymerized with ethylene glycol dimethacrylate using a free-radical initiator in alcohol/water solution. The resulting gels were thermally-responsive in water, undergoing an approximate fivefold reversible volume shrinkage between room temperature and ca. 50 C. Tensile testing showed that the stress-strain behavior was qualitatively different in the collapsed state above the temperature-induced transition. At the higher temperature, gels were stiffer, more ductile, and showed greater time dependence. Implications for the design of gel actuators are briefly discussed.
Author
Polymers; Tensile Properties; Elastomers; Actuators; Gels

20040040371 Manchester Coll. of Science and Technology, UK

Rheological Characterisation of Discrete Long Glass Fibre (LGF) Reinforced Thermoplastics

Bush, S. F.; Torres, F. G.; Methven, J. M.; Al-Araj, S.; Chin, G. Lik; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 219-226; In English; See also 20040040360; Copyright; Avail: Other Sources

In the study reported here two experimental techniques have been employed to assess the extensional behaviour of LGF reinforced thermoplastics : the Squeeze Load Test (SLT) and the Bubble Inflation Test (BIT). Both tests are analogues of extensional flows in important full-scale processes : compression molding (SLT), blow molding (BIT) and thermo-forming (BIT) in particular. For comparison shear flow results obtained from rotational viscometry are also reported, since such flows are invariably present at some point in all processes.

Author

Rheology; Glass Fibers; Thermoplastic Resins; Reinforced Plastics

20040040372 Manchester Coll. of Science and Technology, UK

Sheet Extrusion and Thermo-forming of Discrete Long Glass Fibre (LGF) Reinforced Polypropylene

Torres, F. G.; Bush, S. F.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 265-272; In English; See also 20040040360; Copyright; Avail: Other Sources

The present paper summarizes the main aspects and developments of sheet extrusion and thermo-forming of discrete LGF composites using the SAFIRE technology (Self Assembling Fibre Reinforcement). During extrusion the long glass fibres are organized into coherent fibre mats which persist into the solid state, and are able to withstand the deformation process that takes part during thermo-forming. A process analysis has been performed for extrusion and thermo-forming indicating the main individual processes and operations. Both processes have been studied with regard to their performance with the materials used in the studies, namely polypropylene homo-and copolymer, with and without LGF reinforcement. Significant improvements in mechanical properties relative to the unreinforced materials have been found for the extruded sheets and the thermo-formed products. Major improvements in processability relative to unreinforced PP have been found for the LGF materials. These are discussed in terms of the coherent fibre mat concept.

Author

Extruding; Mechanical Properties; Fiber Composites; Deformation

20040040373 Chalmers Univ. of Technology, Goeteborg, Sweden

Longitudinal Flows in Arrays of Parallel Fibres

Toll, Staffan; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 283-288; In English; See also 20040040360; Copyright; Avail: Other Sources

Estimating the longitudinal Darcy permeability of an aligned fibre bed, or the steady-state elongational viscosity of a fibre suspension, involves solving a longitudinal flow around a set of cylinders. This is usually done either by a computational effort, or analytically through a model geometry simplified to the extent that the many-body nature of the problem is eliminated (often involving just a single fibre). My present objective is to establish a mobility method for this type of many-body problem, which can generate closed-form analytical results as far as the complexity of the fibre arrangement allows, as well as numerical ones for more complex models.

Derived from text

Fibers; Permeability; Steady State; Viscosity

20040040385 Surrey Univ., Guildford, UK

Measurement of the Principal Components of the In-Plane Permeability of Woven Fabrics

Heardman, E.; Lekakou, C.; Bader, M. G.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 153-159; In English; See also 20040040360; Copyright; Avail: Other Sources

This study covers the evaluation of the principal components of the in-plane permeability of fabric reinforcements from experimental data using a resin transfer molding (RTM) machine. Various techniques are presented for the mathematical analysis of the flow data, including radial flow in an isotropic porous medium or in an orthotropic porous medium, with the material axes at a certain angle with respect to the experimental system of coordinates, and one-dimensional rectilinear flow. Inlet conditions may include either constant mould inlet pressure or transient inlet (changing pressure and flowrate) conditions. A differential and an integral numerical method are proposed for the analysis of flow data under transient inlet conditions. Two techniques are investigated for the monitoring of the flow progress: (a) monitoring of the moving flow front with a camera

and Co) measurement of the weight loss in the injection pot on a mass balance.
Author
Fabrics; Resin Transfer Molding; Flow Velocity; Mass Distribution; Permeability; Weight Measurement

20040040387 Brunel Univ., Uxbridge, UK
Creep and Recovery in a Bi-Polymer Composite
Rees, D. W. A.; Clayton, A.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 171-178; In English; See also 20040040360; Copyright; Avail: Other Sources

Two types of spring-dashpot models are applied to the creep observed from two dissimilar polymers connected in parallel to share an axial tensile load. An initial load is applied for 60 h. Then, following a 24 h period of recovery, the load is increased and sustained for a further 60 h. These interchanging periods of recovery and creep are repeated until the composite loses its load bearing capacity. A continuous record of displacement versus time is taken for the test duration. The forward creep strains show better agreement with the Burger model than the standard linear solid (SLS). The Boltzman superposition principle allows the recovered strain, arising from load removal, to be predicted within each model. Overlaying the predicted and experimental curves reveals how the theoretical errors accumulate with time. The greatest error was found from combining nylon with polypropylene, where the theory underestimated the 7.5% strain observed by 35% under a nominal stress of 17.5 MPa. The error was less for five further parallel polymer combinations at comparable stress levels. The model relies upon pre-requisite knowledge of each individual creep response to a similar load-unload sequence.
Author
Tensile Creep; Polymers; Axial Loads; Composite Structures

20040040389 Ecole Polytechnique, Montreal, Quebec, Canada
A Viscoelasticity Model for Deformable Reinforcement Material in Liquid Composite Molding
Breard, J.; Henzel, Y.; Trochu, F.; Cadinot, S.; Saouab, A.; Bouquet, G.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 199-207; In English; See also 20040040360; Copyright; Avail: Other Sources

In this paper, we are going to concentrate on the injection stage of the LCM process (Liquid Composite Molding), in fact on the flow through a fibrous structure. Before to make a numerical simulation, it is necessary to present the approach to describe the flow displacement through a saturated porous medium. We introduced the problem of the reinforcement's deformation in order to give the necessary elements for the interpretation of the mechanism of flow propagation through a porous medium. So, the medium will be considered as saturated, deformable, porous and the traditional tools of mechanics of continuous media will be used to describe the behaviour of this solid. We give a first approach relating to the local variation of the porosity problem from a thermodynamical analysis. The constitutive law of the viscoelasticity medium is obtained and is integrated in a global approach that allows us to explain the coupling between the fluid and the skeleton of the reinforcement material. Examples of experimental studies are presented introducing a unidimensional configuration in porous media. An experimental study allows us to analyse the local porosity variation's behaviour.
Author
Viscoelasticity; Deformation; Reinforced Plastics; Composite Materials; Molding Materials

20040040390 Centre National de la Recherche Scientifique, Cachan, France
Rheology of Non-Brownian Fibres with Adhesive Contacts
Chaouche, M.; Koch, D. L.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 227-232; In English; See also 20040040360; Copyright; Avail: Other Sources

An experimental investigation is undertaken into the shear thinning behaviour of non-Brownian rigid fibre suspensions in Newtonian fluids. In particular, we investigate the influence of the shear stress and the fibre concentration on the transient and steady shear viscosity of the suspension. The shear stress is adjusted by varying both the shear rate and the solvent viscosity. In the semi-dilute concentration regime (low collision frequency among the fibres), the suspension is found to be nearly Newtonian over the stress range we investigated. In the concentrated regime, the suspension becomes shear thinning below a certain shear rate. The shear thinning effects increase drastically with concentration and decrease with solvent viscosity. Although shear thinning behaviour of fibre suspensions has often been reported in the literature, its physical origins are not well understood. Here, our experiments are interpreted in the framework of formation and breaking of fibre flocs due to the competition between hydrodynamic and colloidal forces.
Author
Fibers; Stress Concentration; Shear Stress; Competition; Brownian Movements

20040040391 Auckland Univ., New Zealand

Analysis of Roll Forming Continuous Fibre-Reinforced Thermoplastics Sheets

Bhattacharyya, D.; Dykes, R. J.; Hunter, P. J.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 235-256; In English; See also 20040040360; Copyright; Avail: Other Sources

This paper details a roll forming study performed on sheets of continuous fiber-reinforced thermoplastic (CFRT) material. The deformation length, or transitional region over which the material deforms, is studied for various temperatures, laminate configurations, and roll settings using a surface grid strain technique. While the general shape adopted by the sheets is found to be largely independent of the laminate architecture and forming speed, the strain path would appear to be highly dependent on the way the individual layers of the sheet are orientated. The deformation is found to closely resemble that of a idealised trellis-type flow with negligible extension observed in the fibre directions. The geometric conformance of top-hat sections formed through the entire roll forming process is also analysed and compared to a simple numerical model. The kinematics of the process between two consecutive roll stations is also discussed.

Author

Roll Forming; Fiber Composites; Reinforced Plastics; Thermoplasticity

20040040392 Kaiserslautern Univ., Germany

Pultrusion of Braided Thermoplastic Commingled Yarn: Simulation of the Impregnation Process

Bechtold, G.; Kameo, K.; Laengler, F.; Hamada, H.; Friedrich, K.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 257-264; In English; See also 20040040360

Contract(s)/Grant(s): DFG-Fr-675/20-2; MBFSt-Kennziffer-1857; Copyright; Avail: Other Sources

Continuous fibre reinforced thermoplastic composites possess many advantages and potentials that are higher than presently utilized in actual applications . Nevertheless, owing to the problems of their impregnation, continuous processing methods for thermoplastic matrices are still difficult to establish for industrial purposes. In our former studies, we connected a thermoplastic pultrusion device with a braiding machine in order to realise a continuous manufacturing method for +/- 45 continuous glass fibre (GF) reinforced pipes with a Polypropylene (PP) matrix. The influence of the parameters preheating temperature and heating die temperature on mechanical and rheological properties was examined. In this paper, two different approaches for modelling of the impregnation process are presented.

Author

Fiber Composites; Glass Fibers; Impregnating; Manufacturing; Mechanical Properties; Polypropylene

20040040393 Chalmers Univ. of Technology, Goeteborg, Sweden

Modelling of the Permeability of Non-Crimp-Stitched Fabrics

Lundstroem, T. Staffan; Zetterberg, Markus; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 275-281; In English; See also 20040040360; Copyright; Avail: Other Sources

It is well established that the flow of resin through the reinforcing fibres during the manufacturing of composites by liquid moulding processes follows Darcy's law. This implies that the fibre reinforcements can be characterized by its permeability through measurements or by the usage of permeability models based on, for instance, the detailed fibre geometry. The fibre reinforcements used for composites manufactured by liquid moulding processes are, in most cases, formed by fibres which are gathered in bundles. This results in two types of flow: A microscale flow within the fibre bundles and a mesoscale flow between the bundles. Typical length scales for the two types of flow are less than 10 micron and greater than 100 microns, respectively. It has been shown that the relation between the microflow and mesoflow is important for flow front phenomena such as void formation while a number of studies have indicated that the overall flow rate through the material is, to a large extent, set by the mesoflow; cf., for instance. This is easily understood by noticing that the volumetric flow rate per unit area is proportional to the square of the characteristic length scale in Poiseuille flow. Hence, the flow rate per unit area on the mesoscale is as a rule of thumb, one hundred times higher or more than it is on the microscale as long as the geometry on the two scales is principally the same.

Author

Models; Permeability; Fabrics; Reinforcing Fibers; Flow Velocity

20040040394 National Inst. of Standards and Technology, Gaithersburg, MD, USA

Flow Prediction in Real Structures Using Optical Coherence Tomography and Lattice Boltzman Mathematics

Dunkers, Joy P.; Phelan, Frederick R.; Zimba, Carl G.; Flynn, Kathleen M.; Peterson, Richard C.; Li, Xing-De; Fujimoto, James G.; Parnas, Richard S.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 291-302; In English; See also 20040040360

Contract(s)/Grant(s): 70NANB6H0092; Copyright; Avail: Other Sources

The permeability tensor is a critical design parameter for liquid composite molding. Efforts over the past several years have demonstrated the difficulties in permeability measurement and multi-phase flow behavior. Microflow simulations based on lattice-Boltzmann methods have shown that the permeability and the unsaturated flow behavior can be estimated if the porous structure of the material can be characterized, but existing characterization methods are either too slow and difficult, have insufficient resolution, or are extremely expensive with limited availability. Optical coherence tomography can in many cases provide images with a spatial resolution of 15 microns, acquired nondestructively in less than one minute, for a cost near $60,000. The important issues of sample refractive index and image processing will be discussed to illustrate the limitations of this imaging technique. Predictions of permeability, images of damage accumulation, and the distributions of short fibers in a thermoplastic matrix will illustrate the potential of the technique.
Author
Thermoplasticity; Optical Activity; Lattice Parameters; Boltzmann Distribution; Permeability; Tensors; Molding Materials

20040040395 Plymouth Univ., Plymouth, UK
Improving the Resin Transfer Molding Process for Fabric-Reinforced Composites by Modification of the Fabric Architecture
Pearce, N. R. L.; Guild, F. J.; Summerscales, J.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 303-310; In English; See also 20040040360
Contract(s)/Grant(s): EPSRC-GR/J77405; EPSRC-GR/K04699; Copyright; Avail: Other Sources

The use of resin transfer molding (RTM) as an economic and efficient means of producing high-performance fibre-reinforced composites is critically limited by the permeability of the fabrics employed. Commercial fabrics are available where the architecture of their reinforcement is designed to cluster the fibres giving higher permeabilities than conventional fabrics. This has been shown to improve processing times, but there is evidence that such clustering is detrimental to the mechanical performance of the resulting composite material. The objective of this work was to relate variations in permeability, and in the laminate mechanical properties, to differences in microstructure. A series of experimental carbon fibre fabrics woven to incorporate novel flow enhancement concepts were used to manufacture plates by RTM in a transparent mould. The progress of the resin was recorded on video during injection, thus allowing the permeabilities of the fabrics to be calculated. The manufactured plates were subsequently sectioned for mechanical testing (moduli and strengths in tension and compression) and automated image analysis. Relationships were sought between measured permeabilities, mechanical properties and microstructures using a Quantimet 570 automatic image analyser to determine fractal dimensions from polished sections. It has been shown that variations in the microstructures can be related to the permeability and mechanical property values obtained.
Author
Composite Materials; Fiber Composites; Mechanical Properties; Carbon Fibers

20040040397 North Carolina Agricultural and Technical State Univ., Greensboro, NC, USA
Low Cost Manufacturing of Composite Integral Armour Using Resin Transfer and Resin Infusion Molding Processes
Kelkar, Ajit D.; Vaidya, Uday; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 321-328; In English; See also 20040040360
Contract(s)/Grant(s): DAAH04-95-1-0369; Copyright; Avail: Other Sources

The current generation of composite armored vehicle (CAV) uses an integral armor concept to provide a multi-functional multi-layered integrated structure in its upper hull and side skirts. The design of the armor serves multiple functions including, ballistic protection, multi-hit capability, fire protection, signature management, low radar visibility, easy repairability, survivability and deployment. The cross-section of the armor comprises a phenolic liner for fire protection, a EMI mesh for radar invisibility, a thick composite structural load bearing laminate for energy absorption, a rubber layer for multi-hit damage capability, ceramic plate for ballistic shock resistance, and a durability cover for wear and tear. Cost considerations are key in large scale manufacturing of thick composites and integral armor parts. In the current study, two low cost manufacturing approaches have been considered that hold promise to produce large size parts - Resin Transfer Molding (RTM) and Vacuum Assisted Resin Infusion Molding (VARIM). Paper also presents tension-compression fatigue performance of thick composite structural load bearing laminate manufactured by using RTM and VARIM techniques.
Author
Resin Transfer Molding; Costs; Energy Absorption; Shock Resistance; Resins; Armor

20040042385 Eloret Corp., USA

Evaluation of Ceramic Foams and Simulated Reentry Environments

Stackpoole, Mairead; December 09, 2003; 1 pp.; In English; National Space and Missiles Materials Symposium, 21-25 Jun. 2004, Seattle, WA, USA; No Copyright; Avail: Other Sources; Abstract Only

NASA and Ames is conducting ongoing research in lower density reusable TPS material for future reentry vehicles. Ceramic foams from pre ceramic polymer routes have potential for use in both acreage TPS and as tile leading edges for reentry vehicles. One of the key factors to investigate, when developing new materials for reentry applications, is their oxidation behavior in the appropriate reentry environment whrch can be simulated using ground based arc jet (plasma jet) testing. Studies have shown that oxidation rates of materials will differ when exposed to either monatomatic or molecular oxygen and the amount of monoatomic oxygen depends on the conditions particular to a given test situation. Monoatomic oxygen is always present in reentry environment, therefore arc jet testing is required to provide the appropriate conditions (stagnation pressures, heat fluxes, enthalpies, heat loads and atmospheres) encountered during flight. This preliminary work looks at the response of ceramic foams (Si systems) exposed to simulated reentry environments and investigates the influence of microstructure and composition on the materials response.

Author

Ceramics; Mechanical Properties; Microstructure; Stagnation Pressure; Reentry Vehicles; Oxygen

20040043671 NASA Ames Research Center, Moffett Field, CA, USA

Arc Jet Testing of Hafnium Diboride Based Ultra High Temperature Ceramics

Ellerby, Don; Beckman, Sarah; Irby, Edward; Squire, Tom; Olejniczak, Joe; Johnson, Sylvia M.; Gusman, Michael; Gasch, Matthew; December 08, 2003; 1 pp.; In English; National Space and Missiles Materials Symposium, 21-25 Jun. 2004, Seattle, WA, USA; No Copyright; Avail: Other Sources; Abstract Only

Hafnium Diboride (HFB,) based materials have shown promise for use in a number of high temperature aerospace applications, including rocket nozzles and as leading edges on hypersonic reentry vehicles. The stability of the materials in relevant environments is key to determining their suitability for a particular application. In this program we have been developing HfB2/SiC materials for use as sharp leading edges. The program as a whole included processing and characterization of the HfBJSiC materials. The specific work discussed here will focus on studies of the materials oxidation behavior in simulated reentry environments through arc jet testing. Four flat face models were tested to examine the influence of heat flux and stagnation pressure on the materials oxidation behavior. The results from arc jet testing of two HfB2/SiC cone models will also be discussed. Each cone model was run multiple times with gradually increasing heat fluxes. Total run times on a single cone model exceeded 80 minutes. For both the flat face and cone models surface temperatures well in excess of 2200 C were measured. Post test microstructural examination of the models and correlations with measured temperatures will be discussed.

Author

Hypersonic Reentry; Hafnium; Microstructure; Aerospace Engineering; Ceramics

20040043673 NASA Ames Research Center, Moffett Field, CA, USA, Eloret Corp., Moffett Field, CA, USA

Sintering Behavior of Diboride Based Materials

Gasch, Matt; Gusman, Michael; Irby, Edward; Ellerby, Don; Beckman, Sarah; Johnson, Sylvia; [2003]; 18 pp.; In English; 55th Pacific Coast Regional and Basic Science Division Fall Meeting, 19-22 Dec. 2003, Oakland, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy

A brief history of diboride research, an overview of processing, and sintering studies are covered in this viewgraph presentation. UHTCs are a family of ceramic materials, including diborides of Hf and Zr, with extremely high melting temperatures. Spark Plasma Sintering (SPS) is a novel processing technique useful in consolidating difficult materials. The presentation also contains microphotographs of the microstructure of HfB2 and ZrB2 processed in different ways.

Derived from text

Sintering; Borides; Hafnium; Zirconium

20040043795 Kentucky Univ., Lexington, KY

Fundamental Structure-Property Relationships for High-Temperature Ceramic Composites

Dickey, Elizabeth C.; Jan. 1999; 9 pp.; In English

Contract(s)/Grant(s): F49620-99-1-0266; Proj-3484

Report No.(s): AD-A420672; AFRL-SR-AR-TR-04-0132; No Copyright; Avail: CASI; A02, Hardcopy

Directionally-solidified oxide eutectics such as alumina-YAG and alumina-zirconia show promise as high- temperature structural materials because of their high temperature strength and creep resistance. 1-5 Compatibility constraints at the internal interfaces between the two constituent phases can lead to residual stresses upon thermal cycling and elastic interaction stresses under applied loads. The magnitudes and distributions of these stresses have important ramifications for the mechanical behavior of the composites. Here we investigate thermal stresses in alumina- YAG and alumina-zirconia directionally solidified eutectics (DSEs). First, the microstructure and crystallography are thoroughly characterized. X-ray diffraction is employed to measure the strain tensors in each phase, which are subsequently converted to stress tensors. Since the experimental measurements provide only average stresses in each phase, anisotropic finite element modeling (FEM) is used to investigate stress distributions in the materials. Comparisons between the experimental measurements and FEM results provide insight into possible stress relief.
DTIC
Ceramic Matrix Composites; Ceramics; High Temperature; Thermal Stresses

20040043909 Michigan Univ., Ann Arbor, MI
Microfabrication Techniques for Plastic Microelectromechanical Systems (MEMS)
Mastrangelo, C. H.; Jul. 2003; 147 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-2-0197; Proj-E117
Report No.(s): AD-A420836; AFRL-IF-RS-TR-2003-161; No Copyright; Avail: CASI; A07, Hardcopy

This report presents research and development of new micromachining techniques and fabrication technologies for the construction of plastic MEMS devices. Plastic MEMS are of major importance in the implementation of miniature chemical reaction systems, such as DNA diagnostic, bacteriophage, and other bio-assays chips. Further, because of their low temperature construction, plastic MEMS devices can be integrated with conventional electronic circuits easily and inexpensively. Three main technology directions were conducted. First, technology developments for implementing plastic microsystems using both surface and bulk micromachining techniques were investigated. Surface micromachining techniques include deposition of thin and thick polymer films using vacuum and spin-casting techniques. Bulk micromachining of plastics is used for creating a viable technology for system substrates. Bulk micromachining techniques include injection molding, embossing, casting, bonding and lamination. Secondly, the integration of surface and bulk micromachining technologies leads to a robust technology for creating complete plastic microsystems. The third development direction was in the implementation of the aforementioned developed plastic micromachining technologies as several demonstration devices including microactuators, microvalves, a micropump, a microdevice for polymerase chain reactions (PCR), a capillary electrophoresis (CE) microdevice for DNA separations, and devices for patterning protein doped conductive polymers using laminar flows.
DTIC
Microelectromechanical Systems; Plastics

20040043927 Massachusetts Inst. of Tech., Cambridge, MA
High Temperature Strengths and Deformation of Ceramics
Yip, Sidney; Dec. 15, 2003; 12 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0082; Proj-2306
Report No.(s): AD-A420857; AFRL-SR-AR-TR-04-0144; No Copyright; Avail: CASI; A03, Hardcopy

This project developed a computational modeling capability to study the theoretical strengths and deformation mechanisms of structural ceramics for high temperature applications. The approach adopted was molecular dynamics simulation based on appropriate interatomic potential models. The studies focused on ZrC that has excellent high-temperature properties, and to a lesser extent on SiC and SiO2. Strain-to- failure simulations were performed to observe the details of the structural instability and subsequent microstructural evolution. Besides single crystals, deformations in the amorphous and nanocrystalline phases were also investigated. In parallel elastic stiffness and other mechanical properties were calculated to correlate with and interpret the simulation results. The research performed in this project has demonstrated the feasibility of modeling the intrinsic mechanical and thermal properties of ceramics. The results obtained contribute to a database of structure-property correlation that provides a foundation for further computational studies of ceramics for high temperature applications. It appears that modeling and simulation at the atomistic level have reached a level of physical robustness that one can begin to develop detailed understanding of certain ceramics under conditions of practical interest.
DTIC
Ceramics; Deformation; High Temperature; Temperature Effects

20040043929 Toledo Univ., OH

Distributed Focused Manufacturing of Polymer Nanocomposites

Afjeh, Abdollah; Dismukes, John P.; Mar. 2, 2004; 116 pp.; In English

Report No.(s): AD-A420859; ARO-44906.1-MS; No Copyright; Avail: CASI; A06, Hardcopy

Nanocomposites based on polymeric matrices and inorganic fibers have tremendous potential for advances in material performance (strength, stiffness, conductivity) as well as manufacturing simplification and cost reduction. The proposed research focused on the development of distributed precision manufacturing technologies with application to advanced polymer nanocomposites. New structural parts that meet the demands of the U. S. Army are often composite materials. At high temperatures, ceramic-and mental-matrix composites can be used for high performance structures. Polymer nanocomposites have potentially more advantageous attributes due to improved formability of near net shape products, lower weight and cost, and environmental durability. This document reports on the progress of research in these areas during year 1 of the project. The report reflects modifications made to the first year's objectives and schedule of research activities to better reflect research priorities of the Army Research office (ARO) as discussed with the Project Manager, Dr. Bailey, and the Material Scientist, Dr. Wolter, of ARO during the project review meeting at The University of Toledo (UT) in February 2003 (Appendix A).
DTIC

Manufacturing; Nanocomposites; Nanostructures (Devices)

20040043940 Swinburne Univ. of Technology, Hawthorn

Scaling Relationships for Biomolecules Adhesion and Activity on Polymeric Surfaces

Nicolau, Dan; Myhra, Sverre; Jan. 2004; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-00-2-0614; Proj-E117

Report No.(s): AD-A420873; AFRL-IF-RS-TR-2003-304; No Copyright; Avail: CASI; A03, Hardcopy

The project focused on the understanding and engineering quantification of the attachment of biomolecules and cells on polymeric surfaces. The project delivered design tools and guidelines that can be used in the process of design, fabrication and operation of microfluidics devices, in particular plastic-based devices. The project comprised modeling/simulation and experimental modules. The classification results are contained in an online freely accessible database, http://www.bionanoeng.com/bad. This biomolecular adsorption database has over 500 entries, and has been utilized by -1000 clients/month (40% edu, 30% com & 20% gov). A modeling capability for protein adsorption on polymeric surfaces has also been developed. Experiments, based on atomic force microscopy, were conducted to measure forces between biomolecules. The database, combined with the experimental results and the modeling capability will allow for improved design of microfluidic devices.
DTIC

Adhesion; Biochemistry

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

20040036283 National Academy of Sciences - National Research Council, Washington, DC

A CBO STUDY: The Economic Costs of Fuel Economy Standards Versus a Gasoline Tax

Dec. 2003; 30 pp.; In English

Report No.(s): AD-A420312; No Copyright; Avail: CASI; A03, Hardcopy

Some Members of Congress and public interest groups have recently proposed raising the corporate average fuel economy (CAFE) standards for automobiles. Proponents of CAFE standards see them as a way to decrease the USA' dependence on oil and its emissions of carbon dioxide (the predominant greenhouse gas). In this study, the Congressional Budget Office (CBO) estimates the costs that raising CAFE standards would impose on automobile producers and consumers. This study also extends previous research by examining the potential cost savings from instituting a system in which producers could trade 'fuel economy credits.' Under that system, producers with high costs of complying with CAFE standards could meet the new standards by applying credits bought from producers that exceeded the standards. CBO also compares the costs of CAFE standards with those of a higher gasoline tax, an alternative policy for reducing gasoline consumption. Finally, CBO examines the available evidence on whether changing CAFE standards or the gasoline tax could improve social welfare, a general

measure of society's well- being that includes not only the value derived from the goods and services that people consume but also factors that diminish the quality of life, such as pollution and traffic congestion.
DTIC
Cost Effectiveness; Fuel Consumption

20040040236 Dayton Univ. Research Inst., OH, USA
Simulations of the Freezing of Jet Fuel
Ervin, J. S.; Atkins, D.; Obringer, C.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 12 pp.; In English; See also 20040040215; Original contains color illustrations
Contract(s)/Grant(s): F33615-97-C-2719; AF Proj. 0205; Copyright; Avail: CASI; A03, Hardcopy

The objective of this research is to obtain images of the freezing of hydrocarbon fuels within a simple flow to assist understanding of the interaction between the flow and phase change dynamics. Another objective is to describe a computational model of the freezing process. JPTS, Jet A, and additized Jet A samples were cooled in a rectangular, aluminum chamber with quartz viewing windows. Images and surface temperatures were recorded during the solidification process. The images tracked the advancing freezing front and the influence of the buoyancy-driven flow. Cooling of JPTS resulted in the lowest volume of solids. When cooled, Jet A fuel containing a low-temperature additive exhibited a smaller solid volume than did the neat fuel. In addition, the additized Jet A fuel developed a population of suspended particles that was greater than that of neat Jet A fuel.
Author
Freezing; Hydrocarbon Fuels; Jet Engine Fuels; Simulation; Mathematical Models; Fluid Flow

20040042477 California Univ., Berkeley, CA, USA
Turbulent Jet Flames Into a Vitiated Coflow
Holdeman, James D., Technical Monitor; Cabra, Ricardo; March 2004; 261 pp.; In English
Contract(s)/Grant(s): NAG3-2103; WBS 22-708-90-01
Report No.(s): NASA/CR-2004-212887; E-14301; No Copyright; Avail: CASI; A12, Hardcopy

Examined is the vitiated coflow flame, an experimental condition that decouples the combustion processes of flows found in practical combustors from the associated recirculating fluid mechanics. The configuration consists of a 4.57 mm diameter fuel jet into a coaxial flow of hot combustion products from a lean premixed flame. The 210 mm diameter coflow isolates the jet flame from the cool ambient, providing a hot environment similar to the operating conditions of advanced combustors; this important high temperature element is lacking in the traditional laboratory experiments of jet flames into cool (room) air. A family of flows of increasing complexity is presented: 1) nonreacting flow, 2) all hydrogen flame (fuel jet and premixed coflow), and 3) set of methane flames. This sequence of experiments provides a convenient ordering of validation data for combustion models. Laser Raman-Rayleigh-LIF diagnostics at the Turbulent Diffusion Flame laboratory of Sandia National Laboratories produced instantaneous multiscalar point measurements. These results attest to the attractive features of the vitiated coflow burner and the well-defined boundary conditions provided by the coflow. The coflow is uniform and steady, isolating the jet flame from the laboratory air for a downstream distance ranging from z/d = 50-70. The statistical results show that differential diffusion effects in this highly turbulent flow are negligible. Complementing the comprehensive set of multiscalar measurements is a parametric study of lifted methane flames that was conducted to analyze flame sensitivity to jet and coflow velocity, as well as coflow temperature. The linear relationship found between the lift-off height and the jet velocity is consistent with previous experiments. New linear sensitivities were found correlating the lift-off height to coflow velocity and temperature. A blow-off study revealed that the methane flame blows off at a common coflow temperature (1260 K), regardless of coflow or jet velocity. An explanation for this phenomenon is that entrainment of ambient air at the high lift-off heights prevents autoignition. Analysis of the results suggests that flame stabilization occurs through a combination of flame propagation, autoignition, and localized extinction processes. Proposed is an expanded view of distributed reaction combustion based on analysis of the distributions of probe volume conditions at the stabilization region of the lifted hydrogen and methane flames. Turbulent eddies the size of the flame thickness mix fuel and hot coflow across the flame front, thereby enhancing the reaction zone with autoignition of reactants at elevated temperatures; this is the reverse effect of turbulent flames in ambient air, where intense turbulence in cool mixtures result in localized extinction. Each of the three processes (i.e., flame propagation, autoignition and localized extinction) contributes to flame stabilization in varying degrees, depending on flow conditions.
Author
Jet Flow; Turbulent Jets; Flame Propagation; Combustion Physics; Fluid Mechanics

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy*.

20040035730 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Control Modes of the ST7 Disturbance Reduction System Flight Validation Experiment
Maghami, P. G.; Hsu, O. C.; Markley, F. L.; O'Donnell, J. R.; [2003]; 1 pp.; In English; Space Systems Optomechanics and Dynamics, 2-6 Aug. 2004, Denver, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

The Space Technology 7 experiment will perform an on-orbit system-level validation of two specific Disturbance Reduction System technologies: a gravitational reference sensor employing a free-floating test mass and a set of micro-Newton colloidal thrusters. The ST7 Disturbance Reduction System is designed to maintain the spacecraft s position with respect to a free-floating test mass to less than 10 nm/the square root of Hz over the frequency range of 1 to 30 mHz. This requirement will help ensure that the residual accelerations on the test masses (beyond gravitational acceleration) will be below the ST7 goal of 300 (1 + [f/3 mHz](sup 2)) pm/s(sup 2)/the square root of Hz. This paper presents the overall design and analysis of the spacecraft drag-free and attitude controllers being designed by NASA s Goddard Space Flight Center. These controllers close the loop between the GRS and the micro-Newton colloidal thrusters. The ST7 DRS comprises three control systems: the attitude control system to maintain a sun-pointing attitude, the drag free control to center the spacecraft about the test masses, and the test mass suspension control. There are five control modes in the operation of the ST7-DRS, starting from the attitude-only mode and leading to the challenging science mode. The design and analysis of each of the control modes are presented. An 18-DOF model is developed to capture the essential dynamics of the ST7-DRS package. It includes all rigid-body dynamics of the spacecraft and two test masses (three translations and three rotations for the spacecraft and each of the test masses). Actuation and measurement noise and major disturbance sources acting on the spacecraft and test masses are modeled.
Author
Space Technology Experiments; Mathematical Models; Attitude Control; Modes; Control Systems Design

20040043717 Science Applications International Corp., Huntsville, AL, USA
Integrated Testing of a Carbon Dioxide Removal Assembly and a Temperature-Swing Adsorption Compressor for Closed-Loop Air Revitalization
Knox, J. C.; Mulloth, Lila; Frederick, Kenneth; Affleck, Dave; [2003]; 1 pp.; In English; 34th International Conference on Environmental Systems, 19-22 Jul. 2004, Colorado Springs, CO, USA
Contract(s)/Grant(s): 131-20-10; No Copyright; Avail: Other Sources; Abstract Only

Accumulation and subsequent compression of carbon dioxide that is removed from space cabin are two important processes involved in a closed-loop air revitalization scheme of the International Space Station (ISS). The carbon dioxide removal assembly (CDRA) of ISS currently operates in an open loop mode without a compressor. This paper describes the integrated test results of a flight-like CDRA and a temperature-swing adsorption compressor (TSAC) for carbon dioxide removal and compression. The paper provides details of the TSAC operation at various CO2 loadings and corresponding performance of CDRA.
Author
Carbon Dioxide Removal; Adsorption; Air Purification

31
ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

20040035878 Brigham Young Univ., Provo, UT, Provo, UT, USA
Liquefaction Mitigation Using Vertical Composite Drains: Full Scale Testing
Rollins, K. M.; Anderson, J. K.; Jan. 2004; 108 pp.; In English
Report No.(s): PB2004-103340; No Copyright; Avail: CASI; A06, Hardcopy

This project involved performing full-scale field tests to investigate the use of vertical composite drains (EQ-Drains) in

dissipating pore pressure to prevent liquefaction during an earthquake. The EQ-Drains were evaluated at a test site in Vancouver, British Columbia, using controlled blasting technique to liquefy loose sand. Installing EQ-Drains using high vibration typically increased relative density by about 10% and produced volumetric strains of 2.5%. This effectively reduced the amount of settlement and increased the rate of pore pressure dissipation relative to untreated sites. Controlled basting also showed the potential to produce significant densification of liquefiable soils. Settlements of 2 to 4% of volume were produced for small charge masses and relative density was typically increased by 7-10%. The presence of EQ-Drains significantly increased the rate of excess pore water pressure dissipation relative to untreated areas. Even though drains did not prevent liquefaction for the high stress levels imposed by the blast tests, settlements in areas where drains were installed using conventional procedures was reduced to only about 60% of the settlement measured in untreated areas. Computer model analyses also successfully matched measured pore pressure and settlement response during blasting. Results of the computer model analysis indicate that the drains can prevent liquefaction and excessive settlement when drain diameter and spacing are properly designed for the expected earthquake.
NTIS
Liquefaction; Drainage; Computerized Simulation; Density (Number/Volume); Full Scale Tests

20040040235 Universitaet der Bundeswehr Muenchen, Neubiberg, Germany
Experimental Investigation of Heat Transfer in Separated Flow on a Highly Loaded LP Turbine Cascade
Wolff, Stefan; Homeier, Lars; Fottner, Leonhard; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 10 pp.; In English; See also 20040040215; Original contains color illustrations
Contract(s)/Grant(s): AITEB-G4RD-CT-1999-00055; Copyright; Avail: CASI; A02, Hardcopy

Today aerodynamic design tools and CFD-codes provide excellent quality in predicting 2D and 3D flows in turbine components. Nevertheless, correlation and numerical methods are not able to predict heat flux in a satisfactory accuracy for complex heat transfer problems, for example 3D film cooling mixing zones or areas of separated flow. In order to close part of these gaps in knowledge and to improve the understanding of the interaction between the flow pattern and the heat transfer phenomena, experimental investigations were carried out focused on 2D separated flow on the pressure side leading edge of the highly loaded low pressure turbine cascade named T106-300. The cascade was instrumented with pressure taps and glue-on hot-film sensors. The pressure taps provided the static profile pressure distribution. The hot-film anemometry technique normally is used to detect boundary layer development; moreover a procedure will be presented to evaluate the heat transfer coefficient as well. Supplementary boundary layer traverses with a 1D hot-wire probe were carried out at positions inside and downstream of the separation. The dimension of the separation up to 60% chord was varied by the incidence angle. By variation of Reynolds number and Mach number a data set is available which will be put down to a correlation.
Author
Experimentation; Heat Transfer; Separated Flow; Turbines; Velocity Measurement; Computational Fluid Dynamics

20040040277 Air Force Research Lab., Wright-Patterson AFB, OH, USA
90 deg Skew Leading Edge Film Cooling Effectiveness, Heat Transfer, and Discharge Coefficients for Cylindrical Film Holes at High Free Stream Turbulence
Ou, Shichuan; Rivir, Richard; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 18 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper studies the film effectiveness and heat transfer coefficients on a large scale symmetric circular leading edge with three rows of film holes. The film hole configuration focuses on a smaller injection angle of 20 deg. and a larger hole pitch with respect to the hole diameter (P/d = 7.86). The study includes four blowing ratios (M = 1.0, 1.5, 2.0 and 2.5), two Reynolds numbers (Re = 30,000 and 60,000), and two free stream turbulence levels (approximately Tu = 1% and 20% depending on the Reynolds number). The measured discharge coefficients of the film holes were 0.62 - 0.69 and 0.39 - 0.54 at the stagnation row and 0.54 - 0.59 and 0.47 0.52 at 21.5 deg. the row, for the range of blowing ratios investigated and Re's of 60,000 and 30,000 respectively. A transient liquid crystal technique was used to obtain the film cooling effectiveness and the heat transfer coefficients. The distributions of film effectiveness and heat transfer coefficient are obtained with spatial resolutions of 0.6 mm or 13% of the film cooling hole diameter. Results are presented for detailed and spanwise averaged values of film effectiveness and Floussling number. Blowing ratios investigated result in up to 2.8 times the lowest blowing ratio s film effectiveness. Increasing the Reynolds number from 30,000 to 60,000 results in increasing the effectiveness by up to 55% at high (20%) turbulence. Turbulence intensity has up to a 60% attenuation on effectiveness between rows at Re = 30,000. The turbulence intensity has the same order of magnitude but opposite effect as Reynolds number, which also has the

same order of magnitude effect as blowing ratio on the film effectiveness. A crossover from attenuation to improved film effectiveness after the second row of film holes is found for the high turbulence case as blowing ratio increases. The blowing ratio of two shows a spatial coupling of the stagnation row of film holes with the second row (21.5) of film holes, which results in the highest film effectiveness and also the highest Floussling numbers.
Author
Film Cooling; Heat Transfer Coefficients; Leading Edges; Reynolds Number; Skewness

20040040369 Kyoto Inst. of Tech., Japan
Assessment of Optimum Molding Conditions of Injection Molding Process by Discrete Optimum Technique
Yokoyama, Atsushi; Maki, Yoshinori; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 179-182; In English; See also 20040040360; Copyright; Avail: Other Sources

The numerical analysis methods have been developed to evaluate the behavior of the resin during a processing of the injection molding. These analysis codes adopt time incremental method to calculate a unsteady flow. In this study, the numerical method is developed to estimate the molding condition of the injection molding using the conventional fluid analysis. This numerical method is that adding a genetic algorithm of an optimum analysis to calculate the optimum conditions modifies the conventional fluid analysis for the injection molding. Finally, we aim to develop the global fluid analysis system, which can automatically estimate the molding conditions of the injection molding by means of an integration of the above optimum methods.
Author
Injection Molding; Optimization; Resins

20040040398 Technische Univ., Delft, Netherlands
Special Problems due to Vacuum Injection of Large Ship Structures
Leenders, W. S.; Marissen, R.; vanderDrift, L.; Boon, B.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 329-336; In English; See also 20040040360; Copyright; Avail: Other Sources

The most common production system for large composite structures in shipbuilding industry is still hand lay up. In order to improve and to reproduce quality of the products, attempts are undertaken to produce large structures by means of vacuum injection techniques. This and the new restrictions, ordered by the Dutch legislation on the amount of styrene evaporation is a major reason to explore and exploit the possibilities of this technique. The size and the complex 3-D shape of the (hull) structures and stacking sequence of the laminates to be injected are major obstacles. However, removable bulkheads may be rather fiat structures and only the size problems remains. Therefore, such bulkheads are chosen for first attempts, described in this paper. To overcome part of these problems several tests are undertaken to get a proper insight in the time needed for injection. Based on data obtained from injection tests of small flat panels the time needed for injection of larger laminates will be predicted based on the models of Darcy. Problems during injection are described and solutions are given.
Author
Vacuum; Marine Technology; Composite Structures; Injection

20040043754 Naval Postgraduate School, Monterey, CA
Design and Optimization of a Hypersonic Test Facility for Sub-Scale Testing
O'Kresik, Stephen R.; Dec. 2003; 87 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420606; No Copyright; Avail: CASI; A05, Hardcopy

The Rocket Propulsion and Combustion Laboratory at the Naval Postgraduate School was evaluated to determine if the currently installed systems could support the operation of a subscale hypersonic test stand. Trait analysis of existing lab support sub-systems was performed and an envelope of operation, defined by flight altitude and flight Mach number was determined. Calculations revealed that if the air supply volume was doubled to 160 ft(3), a hypersonic blow-down facility could generate conditions to perform testing in the dynamic pressure window of 500 to 2000 psf, from Mach 5 to 7.5 with a maximum system mass flow rate variation from 3 to 45 lbm/s. Additionally, a dynamic design process was outlined to assist other designers in producing similar test stands. Finally, a software analysis package was developed to analyze proposed changes in the support system architecture.
DTIC
Design Optimization; Hypersonics; Test Facilities; Test Stands

20040043777 Air War Coll., Maxwell AFB, AL

Simulation Based Acquisition (SBA) - Is It Taking Root in the Defense Acquisition Community?

Watson, Maryann P.; Dec. 28, 2001; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420640; No Copyright; Avail: CASI; A03, Hardcopy

Initially, this research was focused on the substance of simulation-based acquisition, or SBA, as it is called. However, it soon became clear there is much already written and available in government publications, trade journals, and on the web about the emphasis on using M&S to support the various stages of a new weapon system program. Rather than rehash existing information, this paper focuses on an evaluation and assessment of how well the message is being heard by professionals in government and industry. This paper describes an evaluation of the state of the art in using modeling and simulation in support of weapons systems acquisition. The research focused on two assessment areas: 1) the technology in vogue in the modeling and simulation community to communicate with acquirers to convince them of the value of M&S; 2) the maturity of the acquisition and user community with respect to knowledge of and investment in M&S during the acquisition cycle.

DTIC

Simulation

20040043871 Seaworthy Engine Systems, Inc., Essex, CT

An Assessment of Performance and Condition Monitoring Requirements of Foreign Marine Diesel Propulsion Systems

Feb. 1982; 205 pp.; In English

Contract(s)/Grant(s): MA-80-SAC-10004

Report No.(s): AD-A420785; MA-RD-920-82008; No Copyright; Avail: CASI; A10, Hardcopy

This report presents a synopsis of the requirements and recommended practices for diesel engine diagnostic, performance and condition monitoring systems for medium and slow speed diesel propulsion systems. The basis for the requirements, practices and recommendations presented is an extensive survey of foreign (European and Japanese) classification societies, diesel engine manufacturers, electronics systems manufacturers, and ship owners/operators. Included in the report are tabulated machinery parameters which are sensed for performance and condition monitoring purposes. The report concludes with recommendations for the application of performance and condition monitoring systems which can be used as a design guide by U.S. Flag owner/operators.

DTIC

Diesel Engines; Manufacturing; Marine Propulsion; Propulsion System Configurations; Propulsion System Performance

20040045185 Kyoto Univ., Japan

Kogaku Kenkyu: Summaries of Research Activities, Volume 66

October 2003; In English; In Japanese; Copyright; Avail: Other Sources

This CD-ROM lists areas of activity and faculty members from during the reporting period, and bibliographies of publications produced during that time. It is organized into the following sections: A) Current Research Fields; B) Original Articles; C) Review Articles; D) Books; E) Faculty Members; F) Researches supported (in part) by the Grant in Aid from the Ministry of Education, Science, Sports and Culture, Japan.

Author

Engineering; Universities; Japan

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see *03 Air Transportation and Safety*; and *16 Space Transportation and Safety*.

20040035753 Arkansas Univ., Fayetteville, AR, USA

Modeling and Analysis of Transportation Flows Created by E-Commerce Transactions

Ho, A.; Kutanoglu, E.; Cole, M.; Bartolacci, M.; Mar. 2003; 76 pp.; In English

Report No.(s): PB2004-102812; MBTC-2012; No Copyright; Avail: CASI; A05, Hardcopy

Most of the e-commerce research today focuses on one of two areas: the technical network infrastructure that allows e-commerce to be conducted by the marketing/logistics of order taking and fulfillment. There is no research currently being conducted that seeks to link the quantity of e-commerce being conducted with its implications for the physical transportation

networks in the U.S. At the proposal research, we seek to estimate the flows of commodities that are created by e-commerce transactions. First of all, this will help the transportation planners in industry and government in terms of how the increasing business-to-consumer (B2C) and business-to-business (B2B) transactions will affect the existing infrastructure. Second, there are many companies who would like to gather such aggregate and reliable estimates to strategically allocate their resources. This includes companies that are in the telecommunications/high-tech industry as well as transportation/distribution companies.
NTIS
Logistics Management; Computer Networks; Transportation Networks

20040035759 Maribor Univ., Maribor, Slovenia
Analog Subscriber Call Generator
Vlaovic, Bostjan; Brezocnik, Zmago; Electrotechnical Review; 2002; ISSN 0013-5852; Volume 69, No. 5, pp. 259-265; In English; Copyright; Avail: Other Sources

The paper describes the development of the analog subscriber Call Generator (CG) for the SI2000 V5 switch node. It provides developers with the test environment without the use of external testing units. The proposed architecture assures effective tests of program layers above the driver of analog subscriber circuits. This was accomplished with minimal changes of the existing program code and application of the existing communication procedures. Compared to external testing units, the software Call Generator possesses some limitations. Because of the software nature of its operation, electrical interfaces on analog subscriber line circuits are not tested for proper operation. Also, usual audio checks of the connection are not performed. The call generator can be extended with this functionality, but this would demand greater changes of the existing program code and an additional use of digital signal processing resources. This would impose unnatural performance of the switch node under test. Testing without using external testing units represents the main achievement for the developer. For the CG operation, only an IP connection between the developer's workstation and the tested switch node is required. Developers can control and monitor the execution of tests from their development workstation with any WWW (World Wide Web) browser.
Author
Analog Circuits; Switches

20040035925 Swedish Defence Research Agency, Linkoeping. Div. of Command and Control Warfare Technology, Linkoeping, Sweden
Authentication of Mobile Nodes and Mobile Code: Final Report
Bengtsson, A.; Dec. 2002; 30 pp.; In Swedish
Report No.(s): PB2004-102704; FOI-R-0713-SE; No Copyright; Avail: CASI; A03, Hardcopy

The project 'Authentication of Mobile Nodes and Mobile Code' ran between 2000-2002. This is the first report with a short summary and conclusions of the project. The project has focused on authentication in three areas-authentication in network based systems, mutual user and systems authentication and mobile code respectively. These have been viewed from a set of demands given by the version of the network based defense. We have studied three methods for authentication in network based systems-ticket based, certificate based and identity based methods respectively. Most flexible are certificate methods. Identity based methods can only be used in local groups. A model is presented for mutual user and systems authentication. It is further developed in another project. Different types of mobile code have been studied. Mobile agents are not yet ready for use. Mobile code for control of active networks is more likely. We have identified both pros and cons for security.
NTIS
Networks; Codes; Mobile Communication Systems; Nodes (Standing Waves)

20040035926
Analog Baseband Circuits for WCDMA Direct-Conversion Receivers
Jussila, J.; 2003; 268 pp.; In English
Report No.(s): PB2004-102810; REPT-37; Copyright; Avail: National Technical Information Service (NTIS)

This thesis describes the design and implementation of analog base band circuits for low-power single-chip WCDMA direct-conversion receivers. The reference radio system throughout the thesis is UTRA/FDD. The analog base band circuit of two similar channels, which contain analog channel-select filters, programmable-gain amplifiers and circuits that remove DC offsets. The direct-conversion architecture is described and the UTRA/FDD system characteristics are summarized. The

UTRA/FDD specifications define the performance requirement for the whole receiver. Therefore, the specifications for the analog base band circuit are obtained from the receiver requirements through calculations performed by hand. In this thesis, all the filter implementations use the opamp-RC technique to achieve insensitivity to parasitic capacitances and a high dynamic range. The adopted technique is analyzed in detail.
NTIS
Radio Receivers; Energy Conversion; Analog Circuits

20040035935 Foersvarets Forskningsanstalt, Linkoeping (Sweden), Linkoeping, Sweden
Mobile Ad Hoc Metworks: A Project Summary
Nilsson, J.; Dec. 2002; 36 pp.; In English
Report No.(s): PB2004-102699; FOI-R-0705-SE; No Copyright; Avail: CASI; A03, Hardcopy

One important component in future military communications is a high performance radio network that is independent of fixed communications infrastructures. Such a network, which we call a tactical ad hoc network, must be self-forming, self-healing and be able to support different types of services even in a high mobility scenario. Upholding the service requirements is usually denoted as Quality-of-Service (QoS) guarantees. A combination of QoS and high mobile requires careful design of the network protocols. This is one of the most challenging problems today in ad hoc network research. The QoS issue involves all protocol layers. In wireless communication, where the bandwidth is scarce, some sort of QoS control and adaptation to the situation will be needed. This report summarizes the two year long Mobile Ad Hoc Network Project. The project has focused on QoS issues and on the protocol layers Medium Access Control (MAC), Routing and TCP/IP.
NTIS
Communication Networks; Access Control; Telecommunication

20040035940 Helsinki Univ. of Technology, Espoo
Modeling and Characterization of Urban Radio Channels for Mobile Communications
El-Sallabi, H. M.; 2003; 188 pp.; In English
Report No.(s): PB2004-102809; REPT-261; Copyright; Avail: National Technical Information Service (NTIS)

Results of this thesis contribute in modeling and characterization of radio channels for future mobile communications. The results are presented mainly in three parts: (a) modeling of propagation mechanisms; (b) methodology of developing a propagation model; (c) characterization of urban radio channel. One of the main propagation physical phenomena that have an important role in diverting signals to non line of sight scenarios is the diffraction process. This thesis proposes diffraction coefficients that have better agreement with finite difference time domain solution and rigorous diffraction theory than the coefficient commonly used in propagation predictions for mobile communications.
NTIS
Radio Communication; Mobile Communication Systems; Cities; Models

20040036113 Naval War Coll., Newport, RI
Theater Variations in Naval Special Warfare Command and Control Violate Joint Doctrine
Houfek, John R.; Apr. 21, 2003; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420146; No Copyright; Avail: CASI; A03, Hardcopy

The debate surrounding forward-deployed Naval Special Warfare (NSW) Command and Control (C2) has been conducted since before 1987 when Special Operations Forces were organized under U.S. Special Operations Command. Why the NSW C2 debate continues today is a mystery considering the unambiguous doctrine and law that have been established on the subject. An examination of the variations in theater NSW C2 structures reveals there are doctrine and law offenders in a chain from the NSW community to the JCS staff. The CJCS approved doctrine governing NSW C2 and the law that supports it are apparently being ignored based on theater variations in NSW C2 structures. This paper identifies the issue's possible origin that manifests itself in each of the operational theaters, identifies additional issues related to NSW C2, and finally proposes a generic NSW C2 architecture that adheres to established doctrine and law.
DTIC
Command and Control; Military Operations

20040036119 Naval War Coll., Newport, RI
The Missing CoCom...Who's Fighting the GWOT?
Derenski, Bruce A.; May 16, 2003; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420150; No Copyright; Avail: CASI; A03, Hardcopy

To date, all Major Operations within the context of the Global War on Terrorism (GWOT) have been fought state- to-state within traditional geography command architecture. Some aspects of the GWOT dealing with precision strikes on remote terrorist facilities demand a degree of persistent surveillance, rapid response, and discriminatory firepower that is beyond the current capability of a theater commander. U.S. Strategic Command (STRATCOM), however, having recently incorporated all functions previously assigned to U.S. Space Command, is uniquely poised to function as a 'Global Commander' for this aspect of the GWOT. With unfettered access to military space-based surveillance and communications capabilities, STRATCOM can exercise rapid detection of targets and engagement of precise destructive effects through conventional Global Strike weapons to threaten remote installations. From a perspective of Operational Functions, STRATCOM is capable of acting completely independent of all other Combatant Commanders in this particular role. The relationship between STRATCOM in its GWOT role and traditional theater commanders requires close coordination and communication to ensure that the advantages of both are brought to bear in the roles they are most suited for. Some friction is inevitable in the assignment of missions, mechanical concerns such as air-space and water-space assignments, and impact of Global Strike missions on theater engagement plans. However, supporting a Global Strike platform in a geographic theater offers a regional commander a cooperative relationship with a vast array of capability at STRATCOM's disposal, and brings precious combatant resources to the theater to contribute to other areas of concern. (16 refs.)
DTIC
Command and Control

20040036167 Mississippi State Univ., Mississippi State, MS
Measurement and Evaluation of Animated Pedagogical Agents and Their Use in Training
Hosie, Thomas; Atkinson, Robert K.; Margaret Merrill, Mary; Feb. 16, 2004; 64 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0120
Report No.(s): AD-A420184; No Copyright; Avail: CASI; A04, Hardcopy

This project entailed a total of six experiments, five conducted in a laboratory and one implemented in a field setting. Across all six experiments, the multimedia computer- based instruction focused on fostering learners' proportional reasoning ability in the context of multi-step word problems. The experiments led to the recognition of four different effects: (a) a voice effect, which suggest that designers of multimedia learning environments should create life-like on- screen agents that speak in a human voice rather than a machine-synthesized voice; (b) an image effect, an agent's image fosters learning when it is programmed to explain complex visual information aurally; (c) an embodiment effect, which suggests that in a linear computer-based environment, the visual presence of an animated agent is a critical factor in optimizing learning outcomes whereas an agent's mobility is a less important factor; and (d) a sequential effect, which suggest that sequentially presented subgoals are superior to simultaneously presented subgoals in example-based instruction.
DTIC
Computer Assisted Instruction; Voice Communication

20040036207 Naval War Coll., Newport, RI
Maritime Command And Control For U.S. Coastline Protection Against Terrorists
Kelley, Roy J.; May 16, 2003; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420240; No Copyright; Avail: CASI; A03, Hardcopy

On September 11th 2001 the U.S. Navy, Coast Guard, Customs Service, Joint Forces Command, Pacific Command, Southern Command, North American Aerospace Defense Command, the Department of Defense (DoD), the Department of Treasury and the Department of Transportation found themselves lacking a structured command and control organization to protect 95, 000 miles of U.S. coastline. On that day the USA had too many government departments, branches of the military, unified commands, component commands, and federal agencies trying to protect the USA with minimal interaction, directed authority or prior planning. Although major changes have occurred with the establishment of the Department of Homeland Security and the establishment of Northern Command (NORTHCOM) within DoD, the question remains: what is the most efficient command and control organization for maritime protection of the U.S. coastline against terrorist threats?
DTIC
Command and Control

20040036225 Defence Science and Technology Organisation, Salisbury
Network-Centric Warfare-Its Nature and Modelling
Fewell, M. P.; Hazen, Mark G.; Sep. 2003; 67 pp.; In English
Report No.(s): AD-A420257; DSTO-RR-0262; DODA-AR-012-876; No Copyright; Avail: CASI; A04, Hardcopy

This study examines the concept of network-centric warfare with the aims of characterising network centricity as clearly as possible and identifying metrics for level of net- centricity'. Properties of network-centric systems, as expounded in the literature, were critically examined to derive examples of suitable metrics. This examination suggests that, except for the provision of reachback, none of the properties is clearly diagnostic of network centricity: it is possible to conceive of systems displaying one or more of them despite not being net-centric as we understand the term. This means that metrics for these properties are not well correlated with the degree of network centricity of the system. Another list of properties was compiled, derived from characteristics of the internet and other effective networks, that is better suited to the identification of network centricity. Consideration of this led to the conclusion that access to a high-capability network is not sufficient for a system to be network-centric, it is also necessary that the network be used in an appropriate manner-a manner supporting the force as a whole, rather than being focused on the needs of a particular unit or platform. Not only must the right information be available to the right person at the right time in the right form, but also it must be put to the right use. This emphasis on motivation in the definition of network centricity parallels, though is distinct from, recent work emphasising human aspects in command and control (C2). As with C2, network centricity is not just about hardware. The question of defining a general metric that faithfully indicates level of network centricity is examined with the aid of a specific example, but remains open. DTIC

Command and Control; Computer Networks; Information Systems; Military Operations

20040036229 Naval War Coll., Newport, RI

Information Sufficiency and the Operational Commander: A Cautionary Tale

Kamradt, Hank; May 16, 2003; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420262; No Copyright; Avail: CASI; A03, Hardcopy

The rapid military victory of U.S. and Coalition forces during Operation Iraqi Freedom (OIF) is already being hailed as evidence for the validation of the Secretary of Defense's vision of a transformed military: a force that is lighter, more mobile, more agile, more precise, more joint, more interoperable, and more lethal. A military heavily empowered by 'information superiority' and 'dominant battlespace awareness.' The emergence of network-centric warfare as the USA' preferred style of war, together with the associated quest for information superiority, is fueling a growing demand for an ever-increasing amount of detailed, real-time, data by theater and national level commanders. While superior battlespace awareness is arguably better than inferior battlespace awareness, there are potential hazards in operational concepts and command schemes that depend too heavily on the reliable flow of immense quantities of timely, complete, accurate, relevant, and actionable information. Already the U.S. military collects, processes, and disseminates a greater quantity of data than any other military, friend or foe. It relies heavily on a small number of low-density, high-demand assets for the collection of intelligence, and regularly saturates its analysts, communications links, and commanders attempting to process, move, and absorb that data. Further, the U.S. military is totally dependent on a fragile space-based network, the Global Positioning System (GPS), for vital precision navigation and timing data. As it transforms itself into a leaner, smarter force these challenges will likely grow worse unless it manages its information expectations, tailors information appropriately for each level of command, develops backups to the existing information architecture, and continues its traditional focus on fault-tolerant, flexible, operational planning. (64 refs.) DTIC

Communication Networks

20040036353 Naval War Coll., Newport, RI

Operational Artists or Micromanagers: Some Propositions on the Future of Generalship in Net-Centric Warfare

Nugent, Robert P.; May 16, 2003; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420354; No Copyright; Avail: CASI; A03, Hardcopy

The USA military is reviewing command and control (C2) as part of a larger transformation process underway in the Department of Defense. A key question for future C2 design is: who should make decisions for forces engaged in war? Net-centric theory questions the current concentration of decision-making authority in the hands of operational level leaders traditional generalship. Theorists of Information Age warfare contend that decision-making power should increasingly shift from operational to tactical level commanders to fully realize the potential of net-centric organization. Classic theory on war, modern decision sciences and case studies of recent net-centric environments suggest a different conclusion. Operational level commanders continue to provide a unique value added' to decisions in war. This value is a product of intuitive grasp Clausewitz's 'genius for war' and the wisdom derived from experience and education. Drawing on this intuition and experience, operational commanders are better able to perceive and act on campaign-level opportunities or dangers missed at

the tactical level. Future command and control designs that reduce the scope generalship at the operational level in favor of self-synchronization.
DTIC
Command and Control; Decision Making

20040036439 Naval Postgraduate School, Monterey, CA
The Effects of China Entering the World Trade Organization on the USA' Wireless Telecommunication Industry
Conner, William J.; Dec. 2003; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420425; No Copyright; Avail: CASI; A05, Hardcopy

This thesis investigates the effects of China entering the World Trade Organization on the USA wireless telecommunication industry. This thesis explores whether the American wireless telecom industry will benefit from China's accession into the WTO. The working hypothesis of the thesis is that American wireless telecom companies will receive far-reaching economic benefit from China's entry into the WTO. Additionally, this thesis explores the effects the entry in the WTO will have on China's telecom policy toward allowing foreign companies to own and operate parts of the wireless telecom network.
DTIC
United States; Wireless Communication

20040036447 Naval Postgraduate School, Monterey, CA
Analysis of Effectiveness of CEC (Cooperative Engagement Capability) Using Schutzer's C2 Theory
Hwang, Jong S.; Dec. 2003; 75 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420432; No Copyright; Avail: CASI; A04, Hardcopy

Information superiority can be obtained by enhancement of the command and control system. While weapon systems may have been developed to a point of decreasing returns regarding firepower, command and control (C2) systems can be developed further. The force that has superior C2 may win the fight in the future by information superiority. Currently, there is no appropriate methodology to assess the contribution from the C2 system to improved combat outcomes. This thesis develops a methodology to address Cooperative Engagement Capability (CEC) by modifying C2 theory developed by D. M. Schutzer. I address the time line that Schutzer suggested as the key to addressing C2 improvements concretely and modify the MOE he designed. Based on this modified MOE, developed through simulation analysis of an air defense scenario, I quantify the improvement in command and control systems by the CEC system.
DTIC
Command and Control

20040036483 Naval Postgraduate School, Monterey, CA
Free Space Optics Communication for Mobile Military Platforms
Neo, Soo S.; Dec. 2003; 109 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420460; No Copyright; Avail: CASI; A06, Hardcopy

Free Space Optics (FSO) is widely regarded as the next-generation high-speed wireless communication technology. FSO has demonstrated its capability to deliver data faster than any other state-of-the-art wireless communication technology. Today, terrestrial FSO links are able to reach 150 kilometers; unmultiplexed data rates of 2.5 Gbps have been achieved; Acquisition, Pointing, and Tracking (APT) systems have been successfully deployed between communication satellites; and carrier-class availability are being offered by FSO vendors. However, FSO has not seen widespread use in the military. This is attributed to the fact that military platforms are largely mobile, while the progress in the commercial arena has largely been confined to links between fixed sites. This thesis analyzes the features of FSO technology while being mindful of how these apply to the military. These features include the bandwidth, spectrum use, bit error rates, communications security, free-space loss, and power consumption. The limitations and challenges presented by atmospheric effects, directional precision, line-of-sight obstructions, and laser safety are also studied. A final section will look at the acquisition, pointing, and tracking mechanisms that are necessary for deploying FSO on mobile platforms.
DTIC
Optical Communication; Space Communication

20040036517 Air Univ., Maxwell AFB, AL
Airpower's Role in Homeland Defense: A Western Hemisphere Perspective
Witek, Roger J.; Jun. 2002; 140 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420490; No Copyright; Avail: CASI; A07, Hardcopy

This study analyzes airpower command and control issues for USA homeland defense at the level of international relations. The author assesses hemispheric historical cases such as antisubmarine warfare during World War II, the development of NORAD during the Cold War, and counterdrug operations during the last two decades. Sovereignty, cooperation, and capability issues remain at the forefront of combined, joint, and interagency homeland defense operations as they relate to airpower. As the new homeland defense command takes shape, it needs to increase and improve bi-lateral relations with Canada, Mexico, and other Latin American countries such as Colombia; appreciate the counterdrug/counterterrorism nexus and combat it with a small wars mindset; revise the Posse Comitaus statute; increase and dedicate Reserve Forces to homeland defense by relieving Active Duty and Guard personnel on deployment schedules; and envision the possibility of an Americas Command.
DTIC
Command and Control; Western Hemisphere

20040036551 Air Command and Staff Coll., Maxwell AFB, AL
Planning and Conducting Offensive Counterinformation Operations
Swentkofske, Virginia G.; Apr. 2002; 54 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420522; AU/ACSC/112/2202-04; No Copyright; Avail: CASI; A04, Hardcopy

This paper examines the problems a joint force commander (JFC) faces when employing USAF OCI capabilities in his campaign plan. The intention is to address concerns as to how synchronized, interdependent events impact OCI operations conducted in a rapidly changing and highly compartmentalized environment. The focus is upon the command and control (C2) relationships and operational considerations such as formally established and documented procedures, target development, integration, synchronization and execution with the required intelligence and communications support. Execution is expected to occur under Title 10 authorities and from any point of access to the target with the intended effects occurring within the JFC's area of operations as an integrated and synchronized part of his campaign plan.
DTIC
Command and Control

20040037705 National Telecommunications and Information Administration, Washington, DC
Receiver Spectrum Standards. Phase 1-Summary of Research into Existing Standards
Joiner, B.; Nov. 2003; 58 pp.
Report No.(s): PB2004-103889; NTIA-03-404; No Copyright; Avail: CASI; A04, Hardcopy

As part of the overall spectrum management process, the National Telecommunications and Information Administration (NTIA) and the Federal Communications Commission (FCC) have developed radio regulations to help ensure that the various radio services operate compatibly in the same environment without unacceptable levels of radio frequency interference.In recent years, there have been a growing number of cases of non-cochannel interference that has been caused by inadequate performance of receivers instead of by transmitter performance.The objective of this task is to undertake a broad review of receiver spectrum standards to characterize their status and to explore needs and options for promoting the use of more interference-robust receivers. The first phase includes the identification of existing standards, both mandatory and voluntary. This report presents the results of this first phase. The second phase will examine the underlying requirements, assess trade-offs among potential regulatory approaches and develop appropriate recommendations.
NTIS
Standards; Radio Frequency Interference; Spectra

20040037709 General Accounting Office, Washington, DC
U.S. International Broadcasting: Enhanced Measure of Local Media Conditions Would Facilitate Decisions to Terminate Language Services
Feb. 2004; 44 pp.
Report No.(s): PB2004-103965; GAO-04-374; No Copyright; Avail: CASI; A03, Hardcopy

In its fiscal year 2004 budget request to Congress, the Broadcasting Board of Governors (the Board) proposed the elimination of 17 Central and Eastern European language services managed by the Voice of America and Radio Free Europe/Radio Liberty (RFE/RL) in order to free resources for higher-priority initiatives such as the war on terrorism. GAO was asked to examine (1) how the Board determines which language services should be proposed for reduction or termination and (2) the extent to which local media conditions are considered before a termination proposal is made. In addition, GAO's

report provides summary analysis and conclusions relating to the media conditions in three countries impacted by the Boards language service termination decisions.
NTIS
Broadcasting; Central Europe

20040037741 Texas Railroad Commission, Austin, TX, USA
Electronic Compliance and Approval Project (ECAP) Annual Technical Progress Report, November 2002
Morgan, H.; Varela, R. A.; LaHood, D.; Cisco, S.; Benavides, M. A.; Nov. 2002; 30 pp.; In English
Report No.(s): DE2003-819028; No Copyright; Avail: Department of Energy Information Bridge

The Texas Railroad Commission (RRC), working in partnership with the USA Department of Energy and the oil and gas industry it regulates, is implementing a strategy for improving efficiency in regulations and significantly reducing administrative operating costs through the Electronic Compliance and Approval Process (ECAP). The project will streamline regulatory compliance and reporting by providing the ability to electronically submit, process, and query oil and gas applications and reports through the Internet-based ECAP system. Implementation of an ECAP drilling permit pilot project began September 1999 after funding resources were secured--a $700,000 grant from the U.S. Department of Energy and an appropriation of $1.4 million from the Texas Legislature. The pilot project involves creating the ability to file, review, and approve a well's drilling permit application through a completely electronic process. The pilot project solution will ultimately provide the infrastructure, technology, and electronic modules to enable the filing of all compliance permits and performance reports through the internet from a desktop computer. The pilot project was conducted in three phases. The first phase, implemented May 2000, provided the infrastructure that allows the electronic filing and approval of simple drilling permit applications, associated fees, and attachments. The official 'roll-out' of ECAP and the first electronically filed drilling permit application occurred on May 11, 2000 in Dallas in conjunction with an Internet Workshop sponsored by the Petroleum Technology Transfer Council. After the completion of Phase I, the ECAP team conducted an extensive review of progress to date and analyzed requirements and opportunities for future steps. The technical team identified core infrastructure modifications that would facilitate and better support future development and expansion of the ECAP system and work began on database structure modifications. The second phase of the pilot project was implemented in October 2002. Phase II was the complete rewrite of the ECAP core system and included internal workflow processing capabilities and the ability to process more complex new drill permits such as horizontal, directional, pooled acreage and non-concurrent production restrictions all with additional attachments and reports. Phase III, completed in August 2003, concluded the ECAP pilot project. It allowed the processing of all types of drilling permits and completed the integration with existing geographic information systems, mainframe and electronic document management systems as well as the state payment portal. This report contains detailed information documenting accomplishments and problems encountered during the ECAP pilot project and plans for future steps.
NTIS
Geographic Information Systems; Central Processing Units; Management Systems

20040037774 TeleNomic Research, LLC, Herndon, VA, USA
Survey of Small Businesses' Telecommunications Use and Spending
Pociask, S. B.; Mar. 2004; 124 pp.; In English
Report No.(s): PB2004-102516; No Copyright; Avail: CASI; A06, Hardcopy

Small businesses use a considerable amount and a wide variety of telecommunications services in the USA. Considering the many technological changes affecting the industry, as well as intense legislative and regulatory debates dealing with industry competition and high-speed Internet services, public policymakers require extensive information on how these changes affect consumers. However, public data on the small businesses use of telecommunications services are not well documented. Without adequate data on small businesses use of telecommunications services, the effects of technological and regulatory changes on small businesses cannot accurately be measured and understood. In order to address this deficiency, this report provides new data on small businesses, including the use of and expenditures for telecommunications services. This report defines a small business as one having fewer than 500 employees.
NTIS
Commerce; Internets; Telecommunication

20040040050 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Distributed Data Storage for P2P and Ad-hoc Networks
Morris, Robert; Kaashoek, M. Frans; Nakamura, Motonori; Inoue, Tomohiro; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 29-36; In English; See also 20040040049; Copyright; Avail: Other Sources

Future ubiquitous services will be provided in ubiquitous network environments like peer-to-peer (P2P) or ad-hoc networks and will require highly efficient storage systems that are available anytime and anywhere. This paper presents an overview of one such storage system, DHash/Chord, which was developed at MIT LCS within the framework of the MIT-NTT collaboration. We also overview another storage system, CAOSS, being developed at NTT that is flexible in managing the consistency of data in ad-hoc networks environments. They make it easy to provide ubiquitous services and will be effective if used together.
Author
Data Storage; Communication Networks

20040040051 Nippon Telegraph and Telephone Public Corp., Chiba, Japan
RENA Transmission System Architecture
Okumura, Yasuyuki; Esaki, Shuji; Suzuki, Kazuhiko; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 52-56; In English; See also 20040040049; Copyright; Avail: Other Sources

The underlying concept of the resonant communication network architecture (RENA) is to achieve safe, secure, and simple communication. This article examines the architecture of its transmission system, which consists of user, access, and core networks, in some detail from the standpoints of quality control, enhanced reliability, and cost-effectiveness.
Author
Communication Networks; Architecture (Computers); Transmission

20040040053 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Building Japanese Conversational Systems based on the Galaxy Architecture
Nakano, Mikio; Minami, Yasuhiro; Glass, James; Seneff, Stephanie; Zue, Victor; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 15-20; In English; See also 20040040049; Copyright; Avail: Other Sources

This paper reviews research on multi-lingual conversational systems conducted during the five-year collaboration between NTT and MIT. It describes the development of Mokusei, a telephone-based Japanese conversational system in the weather domain, and Japanese SpeechBuilder, a toolkit that enables nonexperts to build Japanese conversational systems. Both are based on the Galaxy conversational systems architecture. The experience gained by developing these systems demonstrates that the Galaxy architecture is a viable framework for multi-lingual conversational system research.
Author
Voice Communication; Telecommunication; Architecture (Computers)

20040040056 Nippon Telegraph and Telephone Public Corp., Chiyoda, Japan
Resonant Communication Network Architecture (RENA)
Nagayama, Kazuhiro; Hanazawa, Takashi; Watanabe, Nobuyuki; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 48-51; In English; See also 20040040049; Copyright; Avail: Other Sources

This article gives an overview of NTT's resonant communication network architecture (RENA), which provides superior usability-a key aspect of NTT's vision of a new optical generation-and opens the way to a genuinely realistic communication environment, which was impossible with the narrowband transmission capabilities of the past.
Author
Communication Networks; Architecture (Computers)

20040040061 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
RENA Service/Network Control Platform Architecture
Kobayashi, Toru; Okamoto, Tsukasa; Hayashi, Hideki; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 57-61; In English; See also 20040040049; Copyright; Avail: Other Sources

The service/network control platform for RENA (resonant communication network architecture) is located between service applications and the core transmission network and plays a critical role in the implementation of the RENA concept. This article provides an overview of the architecture and highlights the position of the platform, the functions it provides, and the technologies used to implement those functions.
Author
Communication Networks; Architecture (Computers); Network Control

20040041327 Helsinki Univ. of Technology, Espoo
Helsinki University of Technology Networking Laboratory Annual Report 2001
Haenninen, A.; 2002; 42 pp.
Report No.(s): PB2004-102909; Copyright; Avail: National Technical Information Service (NTIS)

The research and teaching area of the Networking laboratory focuses on communication networks, including upper layer issues, and on teletraffic theory. Currently the central research problem of the field is leveraging the Internet into a service network. This requires providing Quality of Service to data transfer with new protocols, improved security features and easy-to-use service platforms. The teaching curriculum of the Networking laboratory includes courses on IP technology, circuit-switched networking, teletraffic theory and on service and protocol development. In 2001, the laboratory staff published five journal papers and 12 papers in conferences. In 2001, one Doctor dissertation, five Licentiate degrees and 34 M.Sc degrees were awarded to the students of our laboratory.
NTIS
Communication Networks; Computer Networks

20040041340 Swedish Defence Research Establishment, Linkoeping, Sweden
Distributed Decision-Making in a Dynamic Military Environment
Lindoff, J.; Dec. 2002; In Swedish
Report No.(s): PB2004-102113; FOI-R-0767-SE; No Copyright; Avail: National Technical Information Service (NTIS)

People have to make decisions every day. Decision-making in dynamic or natural environments is very demanding. Often, there is a lot at stake, the problems are not well defined, the environment can change and the decisions have to be made under time pressure. When several people have to make decisions together they can organize their decision-making in different ways, for example, the group can have a democratic or a hierarchical structure. This report examines if a hierarchical structure is better, for experts and novices, during decision-making in a dynamic military domain. An experimental study was performed with students and officers in a micro world that was created through a commercial strategic war-game. In groups of four, the subjects got two military assignments that they had to solve. The results show that the students eliminated significantly more enemies than the officers. No other significant differences were acquired. The results may have been influenced by a number of factors; the students had, for example, more experience with computers, PC-games and strategic games than the officers.
NTIS
Decision Making; Command and Control; Communication

20040041348 Swedish Defence Research Establishment, Linkoeping
Broadband 2-6 GHz Polarization Circuit for Dual Polarized Phased Array Antenna
Wahab, Q. U.; Samuelsson, C.; Ouacha, A.; Sep. 2003; In English
Report No.(s): PB2004-102192; FOI-R-0940-SE; Copyright; Avail: National Technical Information Service (NTIS)

Modern phased array antennas need polarization diversity for much improved performance. In this report, an active polarization circuit for circular polarization of a broadband antenna array in the frequency band 2-6 GHz has been investigated and designed. The polarization circuit makes use of an active power splitter and two 90 degree phase shifters to provide an independent control of the amplitude and phase of the signal at each antenna element. These circuits were simulated using software Libra from Agilent Corp. and designed using a specific fabrication process from OMMIC foundry (ED02ah).
NTIS
Antennas; Microwave Circuits; Antenna Arrays; Circuits

20040043722 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
SDM-COFDM Technologies for Broadband Wireless Access over 100 Mbit/s
Sugiyama, Takatoshi; Kurosaki, Satoshi; Uchida, Daisei; Asai, Yusuke; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 21-28; In English; See also 20040043721; Copyright; Avail: Other Sources

This paper describes a simple SDM-COFDM (space division multiplexed, coded orthogonal frequency division multiplexing) scheme for MIMO (multiple input multiple output)-based broadband wireless access. The proposed scheme reduces inter-channel interference with a simple feed-forward canceller by using a new space-time coding preamble. Moreover, the proposed likelihood weighting based on the signal-to-noise power ratio improves the soft decision error correction performance. The proposed SDM- COFDM scheme with 2x2 antennas can double the transmission bit rate to more

than 100 Mbit/s per 18 MHz by using 64QAM with a coding rate of 3/4 in frequency selective fading environments.
Author
Selective Fading; Mimo (Control Systems); Error Analysis; Electromagnetic Interference; Coding

20040043723 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
Mesh-type Broadband Fixed Wireless Access System
Uchida, Daisei; Sugita, Makoto; Toyoda, Ichihiko; Atsugi, Takeo; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 44-54; In English; See also 20040043721; Copyright; Avail: Other Sources

The mesh-type fixed wireless access (FWA) system, which uses directional antennas and forms a wire- less mesh network, is an attractive way of providing broadband services because it offers significantly enhanced frequency utilization efficiency and makes service area expansion easy. This paper outlines the mesh-type broadband FWA system and evaluates by computer simulation its frequency utilization efficiency under free-space loss propagation conditions and user station accommodation rates in Shinjuku ward, Tokyo. Results are compared with conventional point-to-multipoint FWA systems.
Author
Broadband; Wireless Communication; Computerized Simulation; Frequencies

20040043724 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
Research and Development of Broadband Wireless Access Technologies
Umehira, Masahiro; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 12-20; In English; See also 20040043721; Copyright; Avail: Other Sources

This paper describes research and development of broadband wireless access technologies aiming at mobile/nomadic/fixed broadband wireless access systems. It introduces key technologies detailed in the other selected papers in this issue, including SDM-COFDM (space division multiplexed, coded orthogonal frequency division multiplexing) over MIMO (multiple input multiple output) channels, broadband wireless access systems using quasi-millimeter wave, mesh-type wireless systems, and a ubiquitous net- work concept for economical public LAN services.
Author
Research and Development; Broadband; Wireless Communication; Coding

20040043728 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
Broadband Wireless Access Technologies Using the Quasi-Millimeter Wave Band
Toyoda, Ichihiko; Nuno, Fusao; Uchida, Daisei; Sugiyama, Takatoshi; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 29-35; In English; See also 20040043721; Copyright; Avail: Other Sources

This paper describes quasi-millimeter wave band wireless access systems for high-capacity broadband wireless communications. The 25- and 27-GHz bands have been allocated for nomadic wireless access systems in Japan to increase their system capacity and provide a transmission rate higher than 100 Mbit/s. After describing the application areas and regulatory requirements of the 25/27-GHz-band systems, we examine the experimental transmission performance of 25-GHz systems based on orthogonal frequency division multiplexing (OFDM). The issues to be resolved before 25/27-GHz-band systems become feasible are also discussed.
Author
Broadband; Wireless Communication

20040043729 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
Active Integrated Antenna Technique
Seki, Tomohiro; Nuno, Fusao; Nishikawa, Kenjiro; Cho, Keizo; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 36-43; In English; See also 20040043721; Copyright; Avail: Other Sources

We clarified the mounting precision for the active integrated array antenna for 25-GHz-band wireless access communication systems and confirmed that wirebonding is useful in constructing such antennas for the quasi-millimeter-wave frequency band, resulting in low-cost antenna systems. We also present an active integrated antenna configuration designed for broadband mobile wireless access systems using the 25-GHz band, The antenna and RF circuits are integrated into each side of a thick copper backing plate and they are connected through microstrip line/slot transitions. The antenna exhibited output power of 14.6 dBm and a noise figure of less than 5 dB. A wireless system using this antenna showed a 6 dB improvement in packet error rate compared with one using a passive antenna with the same array design. Furthermore, we

obtained the first license for an active integrated antenna for high-speed wireless communication systems in Japan.
Author
Antenna Arrays; Antenna Design; Telecommunication; Millimeter Waves

20040043730 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
A Cost-effective Ubiquitous Wireless Access Network
Nakayama, Masayoshi; Yoshino, Shuichi; Shimizu, Masashi; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 55-63; In English; See also 20040043721; Copyright; Avail: Other Sources

Public wireless LAN service businesses, if they are to be a success, will have to be able to expand their service areas. This paper describes a cost-effective public wireless access system that combines low-cost private wired access links with wireless LAN networks. For this purpose, we propose an authentication scheme with certificates for public terminals and a link-sharing scheme including bandwidth control. The two-stage authentication scheme protects the access link from unauthorized users. The multiple wireless LANs making up the wireless network can provide several service classes. We evaluated the proposed system by computer simulation and the results indicate that it effectively utilizes the access links. Some equipment for this system has been developed and successfully tested.
Author
Cost Effectiveness; Wireless Communication; Computerized Simulation; Bandwidth

20040043781 Air Command and Staff Coll., Maxwell AFB, AL
Command & Control Structures for Space and Information Operations in a Joint Command
White, Randall L.; Apr. 2002; 43 pp.; In English
Report No.(s): AD-A420647; AU/ACSC/124/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

This research develops two products for aiding a Joint Force Commander (JFC) tasked with developing command and control (C2) structures for space and information operation (IO) capabilities within a joint force. The first product is a decision matrix based upon two ideas essential to command and control. The first idea is that knowing the level of desired effect, that is, a strategic, operational, or tactical effect produced by space or IO functions is critical to the C2 structure. The second idea is that the JFC must determine which is more important, the integration of functional capabilities into a single mission oriented team or the preservation of functional identities due to high demand/ low density resources, the need to preserve critical functional expertise, or other related reasons which drive functional organizations. The second product of this research is a proposed core set of C2 structures across the three levels of command that can be adapted to the situation confronting a JFC. The core C2 structures lean toward the idea that space and IO be integrated with service capabilities in all Defense Departments rather than segregated into combatant commands or functional components independent from existing service organizations. The decision matrix and core C2 structures are based upon my analysis of service and joint doctrine and a case study I conducted on CENTCOMs employment of forces while conducting Operation Enduring Freedom in Afghanistan.
DTIC
Command and Control; Military Operations

20040043783 Air Command and Staff Coll., Maxwell AFB, AL
Increasing Time Sensitive Targeting (TST) Efficiency Through Highly Integrated C2ISR
Waite, Mark K.; Apr. 2002; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420652; AU/ACSC/121/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

Recent conflicts in Kosovo and Iraq have demonstrated that there is an urgent need for C2ISR platforms to work together synergistically to prosecute objectives outlined by the CINC Coordination of C2ISR assets under JTF command is necessary to maintain unity of effort in support of the overall campaign plan. It is also necessary for C2 and ISR to work as one to support the Mission Commander (MC). Maximum effort needs to be taken to ensure friendly radar, collection, electronic warfare support (ES), command and control (C2), and communications assets are employed to their fullest potential. This paper explores procedural solutions to integrate C2 and ISR. Horizontal integration of C2 and ISR assets can enhance Time Sensitive Targeting operations. This paper examines the current structure of C2 and ISR, and the problems therein, focusing specifically on why having each work for a different directorate inside the AOC produces inefficiencies, Recent exercises utilized different architectures and organizational structures to make the process more efficient. I explore what can be done procedurally to fix the problem with current technologies, to focus the efforts of the C2 and ISR communities at the tactical level. This thesis utilizes lessons learned from recent exercises such as JEFX 99, JTFEX 01, and two C2 Red Flags. Additionally, it analyzes data from recent contingency operations, such as Operations ALLIED FORCE (OAF)and ENDURING FREEDOM (OEF).

Having done that, I will explore the impacts of using the current system. Since C2ISR is a system of systems, the objective is to produce an integrated, executable C2ISR plan to support to the Mission Commander and Time Sensitive Targeting.
DTIC
Command and Control; Intelligence; Reconnaissance; Sensitivity; Surveillance; Targets

20040043864 Academy of Health Sciences (Army), Fort Sam Houston, TX
Leveraging Technology: Using Voice Recognition to Improve Medical Records Production at Walter Reed Army Medical Center
Novakoski, William L.; Aug. 1999; 54 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420777; HCA-9-99; No Copyright; Avail: CASI; A04, Hardcopy

Medical records documentation is burdensome for health care providers in terms of both the time and costs involved in their production. Recent advances in voice recognition technology have made it an alternative to transcription services. This pre-implementation study, conducted within the Department of Pathology and Area Laboratory Services at Walter Reed Army Medical Center, sought to determine if voice recognition technology could be leveraged to improve the production of its anatomic pathology reports. Work process analyses, a transcription services satisfaction survey, and a financial analysis were performed to determine if the time and costs to produce these reports could be reduced. The work process analyses showed the voice recognition system could substantially simplify the process of producing these reports from twelve to four steps. The satisfaction survey showed the pathologists were dissatisfied with the current transcription services. The foreign-born pathologists with accents were particularly dissatisfied with the accuracy, and younger pathologists were dissatisfied with the timeliness of producing the transcribed reports. Use of the voice recognition system could result in a cost savings of $520,000 over five years by eliminating the need for six medical records transcriptionist positions. These results indicate voice recognition could be used to reduce the time and costs involved in the production of the pathology reports, however, the results need to be confirmed following the implementation of the voice recognition system.
DTIC
Speech Recognition; Voice Communication

20040043891 Massachusetts Inst. of Tech., Cambridge, MA
Stakeholder Collaboration in Air Force Acquisition: Adaptive Design Using System Representations
Dare, Robert E.; Jun. 2003; 334 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420811; No Copyright; Avail: CASI; A15, Hardcopy

This research, conducted under the auspices of the Lean Aerospace Initiative, sought to determine how Air Force development programs could achieve high levels of adaptability during the design phase of acquisition while maintaining effective management of program risk. Due to the tremendous uncertainty faced by many development programs in such areas as requirements, technology, and funding, traditional planning and measurement efforts, with their emphasis on stability, must be complemented by efforts to promote adaptability. The thesis of this research is that the quality and nature of the collaboration between stakeholders during the design phase of weapon system development programs determines how effectively they share knowledge, which in turn drives the level of program adaptability. To gain insight into the phenomena of stakeholder collaboration and adaptability, this research undertook retrospective studies of eight development programs, focusing on the design phase. During design, changes are typically more affordable than they are during the ensuing test period because they involve less rework. Command and Control (C2) systems were selected for the eight studies because of their acute need to manage change over time, which arises from the rapid rate of technology change in the areas of communications and computers. The research focused on collaboration between three major stakeholders who contribute unique knowledge and fill different roles during the design phase. The first stakeholder is the user community or warfighter - the eventual operators of the system. Second is a government acquisition agency, or System Program Office (SPO), whose role is to establish and oversee one or more contracts with private industry to perform the development work within established programmatic constraints. The third major stakeholder is a prime contractor who develops the system in accordance with the government contract. (54 tables, 16 figures)
DTIC
Command and Control; Procurement

20040043919 Intelligent Systems Technology, Inc., Santa Monica, CA
I-WFM for Real-Time C4I Process Management
Madni, Azad; Lin, Weiwen; Madni, Carla; Dec. 2003; 61 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-C-0293; Proj-TCOM
Report No.(s): AD-A420849; AFRL-IF-RS-TR-2003-292; No Copyright; Avail: CASI; A04, Hardcopy

Ongoing advances in globally netted C4ISR systems have ushered in a new era in which information technologies (IT) can be exploited to create unprecedented capabilities that will allow dispersed military forces to operate synchronously with great agility and superior situation awareness. The realization of such capabilities will inevitably be accompanied with changes in command processes, organizational structures and doctrine. In particular, IT holds great promise in the rapid design, re-engineering, automation aiding, and management of command processes. The focus of this three-year R&D effort is to develop, demonstrate, and transition components of Intelligent Process Management (IPM) technology in support of C4ISR. The R&D performed in Phase I of this three-year effort is the subject of this report. The overall goal of this three-year effort was to develop, demonstrate, and transition intelligent process management technology. The objectives of Phase I of this effort were to: a) develop a conceptual framework for creating the major building blocks of intelligent process management; b) create a command process (re)design and analysis capability; c) model representative command processes for a target application; d) create a command process monitoring and visualization capability; and e) demonstrate the evolving IPM capabilities at DARPA program workshops and Principal Investigator meetings.
DTIC
Command and Control; Real Time Operation

20040044170 Department of the Navy, Washington, DC
A Data Communication and Power Transmission System for Sensing Devices
Kasper, Rolf G., Inventor; Aug. 25, 2003; 24 pp.; In English
Patent Info.: Filed 25 Aug. 2003; US-Patent-Appl-SN-10652085
Report No.(s): AD-D020129; No Copyright; Avail: Defense Technical Information Center (DTIC)

A-wireless power transmission and communication network that provides efficient interrogation and powering of sensors for use on undersea vehicles. The present invention employs a wave-guide that allows the propagation of electromagnetic waves through a dielectric material that covers the exterior of an undersea vehicle's hull. Embedded within the dielectric material is an N dimensional array of Micro Electronic Mechanical Systems sensing devices coupled with radio frequency (RF) decoders and transceivers, and strips of conductive metal tape. Electromagnetic waves such as microwaves propagate through the dielectric material both powering the sensor network and addressing and interrogating individual sensing devices. The sensing devices take readings and then format and transmit the data results back across the wave-guide where they are received and processed by a digital processor within the hull of the undersea vehicle.
DTIC
Communication Equipment; Communication Networks; Data Transmission; Detection; Patent Applications

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20040035724 Swedish Defence Research Establishment, Linkoeping
Modelling Photonic Band Structures
Rung, A.; Mar. 2003; In English
Report No.(s): PB2004-101805; FOI-R-0838-SE; No Copyright; Avail: National Technical Information Service (NTIS)

A software package has been used to calculate and compare the photonic band structures for two structures: one structure consisting of dielectric cylinders in a square lattice, and the inverse: a structure with air columns in a dielectric matrix. The appearance of and differences between TE- and TM-gaps are compared. Transmittance for normal incidence was calculated for both structures, with a material thickness of 8 micrometers. The photonic band gap width at the X-point of the band structure as a function of the packing fraction of cylinders was investigated for the two cases.
NTIS
Photonics; Applications Programs (Computers)

20040035747 Ljubljana Univ., Ljubljana, Slovenia
Basic Characteristics of FIFO Packet Switches
Homan, Peter; Bester, Janez; Slivnik, Tomaz; Kos, Andrej; Electrotechnical Review; 2002; ISSN 0013-5852; Volume 69, No. 5, pp. 247-252; In English; Copyright; Avail: Other Sources

In this paper we compare characteristics of different FIFO packet switch types. In accordance with our expectations, the best results are obtained by using the output-queued packet switches. The main drawback of these switches is the need for a fast switching fabric. This can be avoided by using the input-queued packet switches, whose performance depends upon individual packet sizes. Characteristics of the input-queued packet switches are similar to those of the output-queued packet switches; if fixed-size packets are transferred, the consequences of the output-contention problem are relatively small. Transfer of the variable-size packets in the input-queued switches is more complicated. Practically, a 100% throughput can be achieved if an a synchronous switching fabric is applied. Packet delays are in this case comparable to those in the output-queued packet switches. The drawback of such switches is the inability to differentiate among multiple service classes. On the other hand, by using a synchronous switching fabric, a 100% switch throughput cannot be achieved. Another disadvantage of the synchronous packet switches are relatively high packet delays. However, usage of such switches enables a differentiation between multiple service classes, that is one of the conditions for enabling quality of service.
Author
Packets (Communication); Packet Switching; Switches; Queueing Theory

20040035752 Helsinki Univ. of Technology, Espoo
Influence of Supply Harmonics and Voltage Unbalances on the Useful Life of Electric Motors
Oraee, H.; Oct. 2001; 74 pp.
Report No.(s): PB2004-102798; Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
Electric Motors; Electromechanics

20040035765 Maribor Univ., Maribor, Slovenia
Design of Protective Spark Gap of Composite Insulators by means of Electric Field Calculation
Erjavec, Benjamin; Pihler, Joze; Triep, Mladen; Electrotechnical Review; 2002; Volume 69, No. 5, pp. 273-278; In Slovene; Copyright; Avail: Other Sources
Composite insulators are increasingly gaining importance in the Slovenian electric power system. They are gradually replacing conventional glass and porcelain insulators on the high voltage lines. They are used both in new lines and as a replacement of old conventional insulators in line reconstructions. A composite insulator consists of a supporting core that provides an adequate mechanical strength; protecting covering that assures an adequate creeping distance; and metal terminals that allow fixing the insulator to the tower and the conductor to the insulator. Protective spark gaps are used for protection of the insulator material against overvoltages, while protective horns and rings at the same time ensure an adequate distribution of the electric potential preventing corona and radio-frequency disturbances. Since there is no consensus among the experts about their necessity, the paper deals with an analysis of the electric field distribution around the insulator. The results of this analysis will make easier the decision about the necessity of protective spark gaps. The subject of the analysis was a 110 kV composite insulator. Electric field calculations were performed using the POLJE program package developed by the Faculty of electrical engineering and computer science of the University of Maribor. The calculations were made for normal operating conditions and for conditions with the presence of overvoltages. The results indicate that there is no need for protective spark gaps under normal operating conditions.
Author
Spark Gaps; Composite Materials; Electrical Insulation; Electric Fields

20040035772 Ljubljana Univ., Ljubljana, Slovenia
Mathematical Model and Steady-State Operational Characteristics of a Unified Power Flow Controller
Papic, Igor; Zunko, Peter; Electrotechnical Review; 2002; Volume 69, No. 5, pp. 285-290; In English
Report No.(s): ISSN 0013-5852; Copyright; Avail: Other Sources
The paper presents a mathematical model and steady-state operational characteristics of a Unified Power Flow Controller (UPFC). The mathematical description is based on the transformation of a three-phase system into an orthogonal synchronously rotating coordinate system, in which, under steady-state conditions. all the system quantified are constant values. Thus, at given parameters, it is generally possible to determine the dimensions of the device. The analysis of the steady-state operational characteristics resulted in key findings enabling derivation of control algorithms and further examination of the device operating under dynamic conditions.
Author
Controllers; Mathematical Models; Steady State; Electric Power; Flow Characteristics

20040035776 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Considerations on the Utilization of Electronic Microcircuits Encapsulated in Plastic on the High Reliability Applications

CavalcantideBrito, Alfrio; 2003; 183 pp.; In Portuguese; Original contains black and white illustrations

Report No.(s): INPE-10001-TAE/56; Copyright; Avail: Other Sources

This monograph presents considerations on using of Plastic Encapsulated Microcircuits (PEMs) in the high reliability applications, particularly, in the space applications. A discussion of both advantages and disadvantages of PEMs is also presented. Basic PEM construction features and processes are discussed with focus on the quality and reliability issues. For example, common defects, associated with certain processing steps, are listed together with failure modes and mechanisms, which can result from these defects. Quality evaluation, screening and qualification tests, which can be used to reduce the risk of installing defective items into hardware are discussed. Special handling and storage precautions, which must be taken for these moisture-sensitive devices, are also discussed.

Author

Encapsulated Microcircuits; Plastic Properties; Technology Utilization; Reliability Analysis

20040035785 Defence Science and Technology Organisation, Edinburgh, Australia

Photonic Radio Frequency Memory: Design Issues and Possible Solutions

Nguyen, Linh V. T.; December 2003; 39 pp.; In English

Report No.(s): DSTO-TR-1491; DODA-AR-012-890; Copyright; Avail: Other Sources

False target generation, range and velocity gate pull-off are Elec.:onic A..xk (EA) techniques in which received radar pulses are stored, then read out and retransmitted back to the source radar after the desired length of time. The memory can be either a recirculating delay line or a digital radio-frequency (RF) memory (DRFM). The DRFM stores a digitized sample of each received pulse, which can provide high fidelity if the analogue-digital conversion process has sufficient dynamic range. The speed of digital signal processing and memory plays a critical role in DRFM design. The analogue-digital conversion process and bit-rate limit the range of frequencies that DRFMs can cover. I Photonics is currently being investigated to implement EA techniques such as false target generation, range and velocity gate pull-off. To fully take advantage of the unique benefits offered by photonics to implement EA techniques, the development of photonic RF memory (PRFM) is required. PRFM can potentially cover frequencies from near DC to 110 GHz, which are of interest in Electronic Warfare (EW). Photonic technology offers the opportunity for high fidelity signal storage without the use of down-conversion or analogue-to-digital converters. In this report, design issues and possible solutions of PRFM are discussed to assist with the ongoing experimental investigation.

Author

Photonics; Radio Frequencies; Memory; Signal Processing; Dynamic Range

20040035866 Lawrence Livermore National Lab., Livermore, CA

Phase Velocity Spectrum Analysis for A Time Delay Comb Transducer for Guided Wave Mode Excitation

Quarry, M. J.; Rose, J. L.; Sep. 26, 2000; 14 pp.; In English

Report No.(s): DE2003-15005454; UCRL-JC-138500; No Copyright; Avail: Department of Energy Information Bridge

A theoretical model for the analysis of ultrasonic guided wave mode excitation of a comb transducer with time delay features was developed. Time delay characteristics are included via a Fourier transform into the frequency domain. The phase velocity spectrum can be used to determine the mode excitation on the phase velocity dispersion curves for a given structure. Experimental and theoretical results demonstrate the tuning of guided wave modes using a time delay comb transducer.

NTIS

Wave Excitation; Transducers; Phase Velocity

20040035906 Helsinki Univ. of Technology, Espoo

Enterprise Resource Planning: Integration with Automation Systems

Fortu, T.; 2002; 106 pp.; In English

Report No.(s): PB2004-102898; REPT-7; Copyright; Avail: National Technical Information Service (NTIS)

Real time production data, short product life cycles, value-added products and services, customized products at mass product price, market globalization, enterprise networking, e-business and outsourcing forces enterprises to adopt new technologies in order to stay competitive in an aggressive, dynamic and turbulent market. Organizational and operational changes in the business process must be made and the enterprise activities must be automated. This Master's Thesis contains

a detailed analysis of the information technology systems needed in the new generation manufacturing environment, from the perspective of small and medium size companies in the electronics industry. Manufacturing Execution Systems, MES, closes the gap between Enterprise Resource Planning, ERP, and the plant floor manufacturing systems or the Distributed Control System, DCS, enabling real time decision-making at the management level of the company. Both of these advanced information-processing systems and the implementation of an ERP system with the DCS are analyzed from a new angle. The importance of the MES system, including support software tools, becomes critical when discussing functionality improvement issues at the enterprise level.
NTIS
Manufacturing; Information Systems; Commerce; Electronic Equipment; Real Time Operation; Life (Durability)

20040035912 Helsinki Univ. of Technology, Espoo
Rotordynamics for Electrical Machines. Postgraduate Seminar on Electromechanics
Genta, G.; Brusa, E.; Amati, N.; Aug. 2003; 190 pp.
Report No.(s): PB2004-102764; LECTURE SER-11; Copyright; Avail: National Technical Information Service (NTIS)
This course is based on two parts with the main theoretical and practical aspects of rotor dynamics. A first section contains a selection of theoretical topics, including the description of the main phenomena and the approaches used to predict the dynamic behavior of rotating systems. Basic concepts concerning critical speeds, dynamic instability, damping and gyroscopic effects, non isotropy of supports and rotor are developed by means of simplified analytical models. Numerical methods are then introduced: the finite element method is preferred to show the computation of the main dynamic parameters in case of industrial examples. The code used is Dynrot, nowadays toolbox of the Mathworks Matlab, written by Prof. G. Genta.
NTIS
Electromechanics; Numerical Analysis; Rotor Dynamics; Mathematical Models

20040035939 Helsinki Univ. of Technology, Kylmaelae
Theoretical Susceptibility of Planck 70 GHz Radiometer to Systematic Effects
Ovaska, S.; Sjoeman, P.; Eskelinen, P.; 2003; 22 pp.; In English
Report No.(s): PB2004-102758; HUT-MET-48; Copyright; Avail: National Technical Information Service (NTIS)
In this work, an analytical approach is taken to examine the theoretical susceptibility of the Planck 70 GHz correlation radiometer to various systematic effects. In any Cosmic Microwave Background (CMB) experiment, extracting the maximum information from the data requires effort in understanding and minimizing systematic effects. The effects of fluctuations in amplifier gain, amplifier noise temperature, reference load temperature and DC gain ratio r are examined. In addition, the effect of imperfect matching of amplifier gains and noise temperatures and of imperfect isolation between the sky and reference signals is analyzed. Some simplifying assumptions will be made in the analysis of the radiometer.
NTIS
Numerical Analysis; Systematic Errors; Systems Analysis; Microwave Radiometers

20040035942 Valtion Teknillinen Tutkimuskeskus, Espoo (Finland), Espoo, Finland
Cellular Polypropylene electret Material Electromechanical Properties
Paajanen, M.; 2003; 124 pp.; In English
Report No.(s): PB2004-102854; VTT/PUB-436; Copyright; Avail: National Technical Information Service (NTIS)
The cellular polypropylene (PP) film is soft and elastic and it encloses multiple polymer-gas interfaces between thin non-cellular surface layers. With a high enough corona voltage it is possible to achieve a high space charge density on the internal interfaces. The cellular charged structure forms an effective electret material that has an electromechanical transducer coefficient d33, typically around 200 Pcn(sup -1) for the 70 micrometers thick film. The sensor and actuator operations in thickness mode are reciprocal according to electromechanical models for simplified multiple and single layer structures. The direct d(sub 33) coefficient related to sensor operation in units of CN(sup -1) equals the indirect d(sub 33) coefficient related to the actuator operation in units of MV(sup -1). Dynamical measurements seem to give a lower transducer coefficient compared to quasi static measurements.
NTIS
Electrets; Electromechanics; Polypropylene; Silicon Films

20040036395 Texas Technological Univ., Lubbock, TX
Support for the 14th IEEE International Pulsed Power Conference
Giesselmann, Michael; Nov. 14, 2003; 69 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-03-1-0305; Proj-2301/EX
Report No.(s): AD-A420391; AFRL-SR-AR-TR-04-0109; No Copyright; Avail: CASI; A04, Hardcopy

The Conference was held at the Hyatt Regency Hotel in Dallas, TX, 15-18 June 2003. There were 584 participants from a total of 22 countries. The conference featured several firsts such as all-electronic abstract and paper submission, all electronic paper presentations, an expanded and professionally managed industrial exposition, and an internet cafe with wireless 'hot-spots' in the conference area.
DTIC
Electronic Equipment

20040036453 Naval Postgraduate School, Monterey, CA
Digital Antenna Architectures Using Commercial Off the Shelf Hardware
Eng, Cher Shin; Dec. 2003; 96 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420436; No Copyright; Avail: CASI; A05, Hardcopy

The changes in war fighting tactics and advancement of technology shape the ways to implement and design multifunction phased array radars. This thesis investigated whether the commercial modulation boards used in the 3-D 2,4-GHz phased array transmit antenna is capable of wideband performance. The phase of the transmitted signal out of the modulator board was adjusted to provide a phase shift from 0 to 2pi, and the insertion phases at these phase settings were measured using a Vector Network Analyzer, sweeping the frequency from 0.8 to 2,5 GHz. The measured insertion phases are used to simulate the radiation pattern of a linear phased array, and the results show that the modulator does not have instantaneous wideband characteristics. This thesis also looked at the design of the complementary phased array receiver architecture using commercially available demodulator boards. The demodulator board was successfully configured to operate as a phase shifter. Phase shifted transmit signals were injected into the demodulator, and corresponding phase shifts were measured via the hi-Phase and Qitadratitre voltages.
DTIC
Commercial Off-the-Shelf Products; Digital Systems

20040036465 Virginia Center for Signals and Waves, Glen Allen, VA
Realizations of Electromagnetic Pulsed-Beam Wavelets and Applications of Physics-Based Radar Analysis and Sensing
Kaiser, Gerald; Dec. 31, 2003; 5 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0271
Report No.(s): AD-A420447; AFRL-SR-AR-TR-04-0106; No Copyright; Avail: CASI; A01, Hardcopy

A solid and rigorous understanding of electromagnetic pulsed beam wavelet (PBW) sources has been established, though more work is needed to compute realizable current sources (eliminating magnetic charges). New results on using branch cuts to form spheroidal antennas are promising, as they determine the necessary boundary conditions to make the sources nonsingular. The recent computation of the 4D Fourier transform of PBW opens the way toward efficient numerical computations with PBW based on the FFT, including their implementations toward EM wavelet-based radar analysis.
DTIC
Electromagnetic Wave Transmission; Radar Antennas; Wave Equations; Wavelet Analysis

20040036479 Naval Postgraduate School, Monterey, CA
Modeling of the Ring-Hybrid Dipole Antenna and Mutual Coupling in a Small Antenna Array
Ong, Chee H.; Dec. 2003; 119 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420457; No Copyright; Avail: CASI; A06, Hardcopy

This thesis project modeled a microstrip ring- hybrid dipole that is capable of simultaneously producing a sum pattern and difference pattern using the method of moments (MoM) based on the Rao-Wilton-Glisson (RWG) edge elements. The ring-hybrid dipole is simply a ring-hybrid coupler driving a dipole antenna. A two-feed point dipole model was developed and its antenna parameters were found to be a good representation of the ring-hybrid dipole actual values. In the feed network modeling, the matrix solution combined the MoM equations on the antenna surfaces and a magic-tee scattering matrix by applying Kirchhoff's voltage and current laws at the terminals of the antenna, Once the excitation is specified, the complete system of equations was solved to yield the MoM current expansion coefficients and the signals in the feed network. The effect

of mutual coupling in an array of three ring-hybrid dipoles was examined by extending the model, In the receive mode, the direction and polarization of the incidence plane wave were varied, The phases for both the sum port and difference port outputs were observed to change smoothly, except during situations of cross polarization and zero phase difference, The array model will ton% the foundation for the design and analysis of a mutual coupling compensation network,
DTIC
Antenna Arrays; Antenna Couplers; Dipole Antennas; Phased Arrays

20040036603 Naval Postgraduate School, Monterey, CA
Triple Modular Redundancy (TMR) in a Configurable Fault-Tolerant Processor (CFTP) for Space Applications
Yuan, Rong; Dec. 2003; 285 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420585; No Copyright; Avail: CASI; A13, Hardcopy

Without the protection of atmosphere, space systems have to mitigate radiation effects, Several different technologies are used to deal with different radiation effects in order to keep the space device work properly, One of the radiation effects called Single Event Upset (SEU) can change the state of a component or data on the bus, A single error is possible to cause a system failure if it is not corrected, Besides error correction, a space system also needs the flexibility to be modified or upgraded easily, Consequently, the idea of having a TMR design instantiated in an FPGA to construct a Configurable Fault-Tolerant Processor (CFTP) developed, The TMR, which runs one program in three identical soft-core processors with voters, is a scheme used to mitigate an SEU, The full design of TMR running in an FPGA functions as a System-On-a-Chip (SOC), Both soft-core processor and FPGA offer the CFTP a great flexibility to be reconfigured, A complete TMR design includes some fundamental components besides processors and voters such as the Reconiler, Interrupt, and Error Syndrome Storage Device (ESSD), These components have their unique function in the TMR design, They are created and simulated, Factors that affect test bench-settings like processor pipelining are important to always keep in mind, A component is designed to implement proper functions first, Then it is revised to work with the processor and memory, The full design for the TMR in this thesis proves its ability to detect and correct an SEU, The follow-on research suggested is to improve the efficiency and performance of this design.
DTIC
Computer Programming; Computer Systems Design; Fault Tolerance; Technology Utilization

20040036605 Oregon Univ., Eugene, OR
Road to Intelligent Optical Devices: Instrumentation for Characterization of Optical Materials
Wang, Hailin; Deutsch, Miriam; Jan. 2004; 5 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0403
Report No.(s): AD-A420586; AFRL-SR-AR-TR-04-0210; No Copyright; Avail: CASI; A01, Hardcopy

Equipment acquired and preliminary research results utilizing the equipment are reported. A synchronously- pumped optical parametric oscillator and a regenerative Ti: Sapphire amplifier system, both from Coherent, Inc., have been acquired and installed. The equipment has been used for optical characterization of metallo-dielectric photonic crystals (MDPCs) and for realization of electromagnetically- induced transparency (EIT) in semiconductor heterostructures. Ordered MDPCs have been successfully fabricated via colloidal assembly. EIT in semiconductors have been demonstrated for the first time in interband optical transitions in GaAs quantum well structures.
DTIC
Optical Equipment; Optical Materials

20040037708 Lawrence Livermore National Lab., Livermore, CA
Microfluidic Applications of Soft Lithography
Rose, K. A.; Krulevitch, P.; Hamilton, J.; Apr. 10, 2001; 12 pp.; In English
Report No.(s): DE2003-15004776; UCRL-JC-143343; No Copyright; Avail: Department of Energy Information Bridge

The soft lithography fabrication technique was applied to three microfluidic devices. The method was used to create an original micropump design and retrofit to existing designs for a DNA manipulation device and a counter biological warfare sample preparation device. Each device presented unique and original challenges to the soft lithography application. All design constraints of the retrofit devices were satisfied using PDMS devices created through variation of soft lithography methods. The micropump utilized the versatility of PDMS, creating design options not available with other materials. In all cases, the

rapid processing of soft lithography reduced the fabrication time, creating faster turnaround for design modifications.
NTIS
Microelectronics; Materials Tests; Lithography; Fabrication

20040037718 Science Applications International Corp., McLean, VA
Cost Performance Estimating Relationships for Hybrid Electric Vehicle Components
Jul. 31, 2003; 51 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DASW01-97-D-0061
Report No.(s): AD-A420454; No Copyright; Avail: CASI; A04, Hardcopy

This report documents hybrid electric vehicle (HEV) component cost performance estimating relationships (CPER) developed by Science Applications International Corporation (SAIC) for the Office of the Deputy Assistant Secretary of the Army for Cost and Economics under contract DASW0l-97-D-0061 (Delivery Order 6). These CPER are tools that support cost estimation of HEV components. While this technology is still developing, recent advances make it likely that future military vehicles will contain HE systems. This technology is a significant departure from the power package and drive train technology seen on current generation vehicles. Estimation methods based upon these older technologies would miss important insight into the current state of technology. These estimating tools develop methodologies for energy storage components, drive system components, and a supplemental armor solution. Using these, cost estimates for different combinations of components can be generated. This provides the basis for cost comparisons among those alternative configurations. It does not include the traditional vehicle components such as the frame, weaponry, C41, wheels or tracks, crew stations, NBC, or special equipment. Separate estimates of these other vehicle systems would be combined with the hybrid electric system estimate to arrive at a vehicle cost estimate. The report is divided into three sections. Section 1, which encompasses chapter 1, provides the organization of the report and outlines the general methodology used to collect the data and develop the estimates contained in this report. Section II, encompassing chapters 2 through 5, describes the primary designs for hybrid electric power designs and provides estimates for the individual components of a hybrid electric vehicle system. Section III, which includes chapters 6 and 7, provides additional considerations for the cost estimation and modeling of hybrid electric vehicles.
DTIC
Cost Estimates; Electric Automobiles; Electric Motor Vehicles; Electric Propulsion

20040040114 Lockheed Martin Missiles and Space, Sunnyvale, CA, USA
Hubble Space Telescope: Battery Capacity Trend Studies
Rao, M. Gopalakrishna; Hollandsworth, Roger; Armantrout, Jon; [2004]; 60 pp.; In English; 2003 NASA Aerospace Battery Workshop, 18-20 Nov. 2003, Huntsville, AL, USA
Contract(s)/Grant(s): NAS8-32697; NAS5-5000; No Copyright; Avail: CASI; A04, Hardcopy

Battery cell wear out mechanisms and signatures are examined and compared to orbital data from the six on-orbit Hubble Space Telescope (HST) batteries, and the Flight Spare Battery (FSB) Test Bed at Marshall Space Flight Center (MSFC), which is instrumented with individual cell voltage monitoring. Capacity trend data is presented which suggests HST battery replacement is required in 2005-2007 or sooner.
Author
Electric Batteries; Hubble Space Telescope; Capacitance; Manufacturing

20040040117 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Qualifying the Sunpower M87N Cryocooler for Operation in the AMS-02 Magnetic Field
Mustafi, Shuvo; Banks, Stuart; Shirey, Kim; Breon, Susan; October 16, 2003; 20 pp.; In English; Space Cryogenics Workshop, 18-19 Sep. 2003, Girdwood, AK, USA; No Copyright; Avail: CASI; A03, Hardcopy

The Alpha Magnetic Spectrometer-02 (AMs-02) experiment uses a superfluid helium dewar to cool a large superconducting magnet. The outer vapor-cooled shields of the dewar are to be held at 80 K by four Sunpower M87N cryocoolers. These cryocoolers have magnetic components that might interact with the external applied field generated by the superconducting magnet, thereby degrading the cryocoolers' performance. Engineering models of the Sunpower M87 have been qualified for operation in a magnetic environment similar to the AMs-02 magnetic environment. Although there was no noticeable performance degradation at field levels that were comparable to AMs-02 field levels, there appears to be a small performance degradation at higher field levels. It was theorized that there were three possible issues related to these performance losses at high magnetic fields: i) induced piston rubbing on the cylinder wall due to forces and torques on the

linear motor due to the applied magnetic fields; ii) Magnetic hysteretic and/or eddy current damping of the balancer due to its motion in the applied magnetic fields; iii) Inductance losses in motor due to the applied magnetic field. The experiments conducted at the Massachusetts Institute of Technology (MIT) cyclotron facility in June 2002 were designed to test these. Tests were performed over a range of field levels that were lower, comparable, and higher than the field levels that the cryocoolers will experience in the AMs-02 operating environment. This paper describes the experiments and the inferences derived from them.
Author
Magnetic Fields; Superconducting Magnets; Alpha Magnetic Spectrometer; Cryogenic Cooling; Motors; Superfluidity; Space Missions

20040040148 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Whiskers of Tin-Lead (Sn-Pb) on Reflowed Die Attach Solder Used in the Manufacture of Die Attach Solder Used in the Manufacture of a Laser Diode Array
Leidecker, Henning; Greenwell, Chris; Brusse, Jay, Compiler; [2003]; 8 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

intent of this presentation is to depict a mechanism for creating damaging electrical shunts on laser diodes: Failure Mechanism. Metal whisker formation from die attach solder.
Derived from text
Fabrication; Damage; Eutectics; Whisker Composites; Semiconductor Lasers

20040040155 STAR Cryoelectronics, LLC, Santa Fe, NM, USA
Two-Stage SQUID Amplifiers for Cryogenic Detector Readouts
Cantor, Robin; March 05, 2004; 115 pp.; In English
Contract(s)/Grant(s): NAS5-00236; SBIR-15.01-6481; No Copyright; Avail: Contact the Goddard SBIR Field Center Manager for further information

STAR Cryogenics (STARCryo) has successfully completed the development of a low-noise two-stage dc SQUID amplifier and advanced PC-based high-speed readout electronics for cryogenic detector readout applications. Several SQUID and integrated amplifier designs have been developed and fabricated based on the Phase I designs. The integrated amplifiers include two input SQUID and two output array designs. STARCryo has developed a new fabrication process that enhances the robustness of these devices against possible static damage with handling (patent pending). Two niobium shield assemblies for the amplifiers based on a modular chip package design have been completed. One is connectorized while the other is a more compact, connectorless version. Both are improved to enhance mechanical robustness and reduce sensitivity to microphonics. STARCryo has built a new Programmable Feedback Loop electronics that is compatible with STARCryo's PC-based SQUID control electronics architecture. The new feedback loop offers the user a considerable degree of flexibility and greatly simplifies operation of the amplifier-all amplifier drive signals and feedback loop parameters for either stage may be set remotely via software running on a PC. A standalone control software application for the SQUID amplifier electronics has been completed, along with detailed system-level documentation.
Author
Cryogenics; Readout; Electronics; Squid (Detectors); Fabrication; Amplifier Design

20040040171 Toledo Univ., OH, USA
Magnetic Circuit Model of PM Motor-Generator to Predict Radial Forces
McLallin, Kerry, Technical Monitor; Kascak, Peter E.; Dever, Timothy P.; Jansen, Ralph H.; February 2004; 14 pp.; In English; First International Energy Conversion Engineering Conference, 17-21 Aug. 2003, Portsmouth, VA, USA
Contract(s)/Grant(s): NCC3-924; WBS 22-755-60-15
Report No.(s): NASA/CR-2004-212620; AIAA Paper 2003-6068; E-14178; No Copyright; Avail: CASI; A03, Hardcopy

A magnetic circuit model is developed for a PM motor for flywheel applications. A sample motor is designed and modeled. Motor configuration and selection of materials is discussed, and the choice of winding configuration is described. A magnetic circuit model is described, which includes the stator back iron, rotor yoke, permanent magnets, air gaps and the stator teeth. Iterative solution of this model yields flux linkages, back EMF, torque, power, and radial force at the rotor caused by eccentricity. Calculated radial forces are then used to determine motor negative stiffness.
Author
Magnetic Circuits; Flywheels; Winding; Stators; Permanent Magnets

20040040196 Defence Science and Technology Organisation, Edinburgh, Australia

Construction Techniques for LC Highpass and Lowpass Filters used in the 1 MHz to 1 GHz Frequency Range

Martinsen, W.; October 2003; 142 pp.; In English

Report No.(s): DSTO-TN-0531; DODA-AR-012-994; Copyright; Avail: Other Sources

This technical note describes construction techniques for building passive LC highpass and lowpass filters whose intended use spans several octaves of bandwidth. It examines limitations in the frequency domain of the two basic components, inductors and capacitors, used to build these filters, the unwanted effects of the distributed reactance of opposite sign to the wanted within these components and the electro-magnetic coupling between these components when used to build a filter. The impact these unwanted characteristics have on the filter s overall performance is then examined. Recommendations are given on the various steps that may be taken to reduce these unwanted effects minimising the deviation from a filter's ideal performance.

Author

Capacitors; Electromagnetic Coupling; Microwave Frequencies; Octaves

20040040303 Ljubljana Univ., Ljubljana, Slovenia

Electrotechnical Review, Volume 70, No. 5

Zajc, Baldomir, Editor; Babic, Hrvoje, Editor; Solina, Franc, Editor; Bajd, Tadej, Editor; Brglez, Franc, Editor; Divjak, Sasa, Editor; Drnovsek, Janko, Editor; Furlan, Joze, Editor; Groselj, Bojan, Editor; Gubina, Ferdo, Editor, et al.; 2003; ISSN 0013-5852; 78 pp.; In English; In Slovene; Copyright; Avail: Other Sources

In this paper, a modular, configurable and versatile prototype platform for real-time video and image processing is presented. Based on the FPGA technology and a RISC softcore processor for data processing, the platform supports simultaneous HW/SW co-design and partitioning. This reduces application design cycle and shortens design iterations, especially considering the later design steps. As examples, applications of two different algorithms for motion detection are presented.

Author

Algorithms; Prototypes; Risc Processors; Real Time Operation; Field-Programmable Gate Arrays

20040040386 New Univ. of Ulster, Jordanstown, UK

The Development of a Dielectric System for the On-Line Cure Monitoring of the Resin Transfer Molding Process

McIlhagger, A.; Brown, D.; Hill, B.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 161-169; In English; See also 20040040360; Copyright; Avail: Other Sources

The aerospace industry has identified the need for an on-line cure monitoring system for the RTM process which can determine the through-thickness cure state of a composite, without affecting the integrity of the finished component. Several techniques have been extensively investigated but Dielectric Analysis (DEA) appears to offer the greatest potential. The parallel plate sensor configuration is appropriate for through-thickness measurements. Using a laboratory dielectric instrument, dielectric properties in fibre (conductive and nonconductive) reinforced composite samples have been measured during a simulated RTM cure cycle. Particular parameters derived from dielectric measurements have been shown to be indicative of key stages at which the resin must exhibit specific properties if optimum mechanical properties of the fully cured composite are to be achieved. Correlation of key dielectric events with other thermal data has been shown. Sensors are currently being developed with a view to eventual incorporation into the RTM mould. The ultimate aim of this work is the development of an on-line cure monitoring system for the RTM process in collaboration with Bombardier Shorts.

Author

Dielectrics; On-Line Systems; Fiber Composites; Resin Transfer Molding

20040041317 Lawrence Livermore National Lab., Livermore, CA

Microfabricated Multi-Frequency Particle Impedance Characterization System

Fuller, C. K.; Hamilton, J.; Ackler, H.; Krulevitch, P.; Boser, B.; Mar. 01, 2000; 10 pp.; In English

Report No.(s): DE2003-15005423; UCRL-JC-136585; No Copyright; Avail: Department of Energy Information Bridge

We have developed a microfabricated flow-through impedance characterization system capable of performing AC, multi-frequency measurements on cells and other particles. The sensor measures both the resistive and reactive impedance of passing particles, at rates of up to 100 particles per second. Its operational bandwidth approaches 10 MHz with a signal-to-noise ratio of approximately 40 dB. Particle impedance is measured at three or more frequencies simultaneously, enabling the derivation of multiple particle parameters. This constitutes an improvement to the well-established technique of

DC particle sizing via the Coulter Principle. Human peripheral blood granulocyte radius, membrane capacitance, and cytoplasmic conductivity were measured and were found to be consistent with published values.
NTIS
Capacitors; Capacitance; Impedance; Alternating Current; Impedance Measurement

20040041318 Geological Survey, Denver, CO, USA
Electrofishing and Its Harmful Effects on Fish
Snyder, D. E.; Sep. 2003; 166 pp.
Report No.(s): PB2004-103957; USGS/BRD/ITR-2003-0002; No Copyright; Avail: CASI; A08, Hardcopy

Electrofishing, a valuable sampling technique in North America for over half a century, involves a very dynamic and complex mix of physics, physiology, and behavior that remains poorly understood. New hypotheses have been advanced regarding 'power transfer' to fish and the epileptic nature of their responses to electric fields, but these too need to be more fully explored and validated. Fishery researchers and managers in the Colorado River Basin, and elsewhere, are particularly concerned about the harmful effects of electrofishing on fish, especially endangered species. Although often not externally obvious or fatal, spinal injuries and associated hemorrhages sometimes have been documented in over 50% of fish examined internally. Such injuries can occur anywhere in the electrofishing field at or above the intensity threshold for twitch. These injuries are believed to result from powerful convulsions of body musculature (possibly epileptic seizures) caused mostly by sudden changes in voltage as when electricity is pulsed or switched on or off. Significantly fewer spinal injuries are reported when direct current, low-frequency pulsed direct current, or specially designed pulse trains are used. Salmoniae are especially susceptible.
NTIS
Fishes; Electric Fields; Endangered Species

20040041367 University of Electro-Communications, Tokyo, Japan
Bulletin of The University of Electro-Communications, Volume 16, No. 2
January 2004; ISSN 0915-0935; 92 pp.; In Japanese; Copyright; Avail: Other Sources

Contents include the following: 21st Century COE Program at the University of Electro-Communications 'Innovation in Coherent Optical Science'. Multi-Period Hedging Model of FX Risk Based on Empirical Transition Matrix. Naive Parameter Estimation Technique of Equity Return Models Based on Short and Long Memory Processes. A Remote Lecture System with Laser Pointer for the Internet and Broadband Networks. How the word GOD was Expressed in Japanese in the Early Years of the Meiji Era? The Third Asian-European Workshop on Information Theory 'Fundamental Concepts on Information Theory'. Advanced Seminar using Microwave CAD - A New Trend for Seminars in Universities for Professional Engineers.
CASI
Computer Aided Design; Information Theory; Matrices (Mathematics); Microwaves

20040043721 Nippon Telegraph and Telephone Public Corp., Japan
NTT Technical Review, Volume 2, No. 1
Kawachi, Masao, Editor; Wada, Masato, Editor; Fukuda, Kenichi, Editor; Shihbata, Tsugumichi, Editor; Sawaki, Minako, Editor; Sadakata, Toru, Editor; Ida, Minoru, Editor; Iwata, Hideyuki, Editor; Sasaki, Yutaka, Editor; Tajima, Kimihiro, Editor, et al.; January 2004; ISSN 1348-3447; 111 pp.; In English; See also 20040043722 - 20040043731; Original contains black and white illustrations; Copyright; Avail: Other Sources

Contents include the following: Toward the Dissemination of Environmental Information Designed to Improve Quality of Life. Next-Generation Broadband Wireless Access Technologies. Research and Development of Broadband Wireless Access Technologies. Research and Development of Broadband Wireless Access technologies. SDM-COFDM technologies for broadband wireless access over 100 Mbit/s. Broadband Wireless Access Technologies Using the Quasi-Millimeter Wave Band. Active Integrated Antenna Technique. Mesh-type Broadband Fixed Wireless Access System. A Cost-effective Ubiquitous Wireless Access Network. New Measures for Data Center Services. Performance Bottleneck Analysis of Web Applications with eASSIST. An Application Sharing Platform with Low Management Costs. Advanced Virtualization and Sharing of IT Resources for Shared Data Centers. Recommendation System for a Bookstore Electronic Commerce Site. Seamless Access to Multiple Networks Using Domain Name Resolution. Development of an STM Transport System Accommodating Ethernet Signals. Global Standardization Activities. Standardization Activity of OSGi (Open Services Gateway Initiative). R&D Information. First Multi-application Smart Card Recognized as Globa lPlatform Compliant. Joint Experiment on Broadband Network for Intelligent Social Infrastructure in the 21st century. First Interworking of GMPLS and

MPLS. Secure and Reliable Sharing of User Attributes among Websites. External Awards/Papers Published in Technical Journals and conferences.
CASI
Broadband; Cost Effectiveness; Electronic Commerce; Information Dissemination; Information Systems; Reliability Analysis; Standardization

20040043762 Naval Research Lab., Chesapeake Beach, MD
Design Considerations of a Differentially Pumped Cathode System for LAPPS
Blackwell, David; Walton, Scott G.; Leonhardt, Darrin; Fernsler, Richard; Meger, Robert A.; Feb. 27, 2004; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420619; NRL/MR/6750--04-8747; No Copyright; Avail: CASI; A03, Hardcopy

The results of tests of a differential pumping system separating a plasma production cathode chamber and a processing chamber are presented. The tests are a series of measurements taken to evaluate two aspects of system performance. These are the effectiveness of the system to maintain large differential pressures, and, the degree to which different gases in the two chambers can be isolated from one another. It is found that the observed operating range of differential pressure is predicted by the measured conductance and pumping speeds fairly accurately, and the measured conductance themselves are scalable with channel width and pressure in a manner generally consistent with laminar flow. Through the RGA measurements, all three channels tested were found to isolate the cathode from the process chamber gas very well under all except the most egregiously lopsided input flow rates. As the channel is widened, more cathode source gas tends to mix with the process gas and the range of operating pressure becomes more limited. Both of these are alleviated as the pumping speed on the process chamber is increased.
DTIC
Cathodes; Plasmas (Physics)

20040043771 Naval Postgraduate School, Monterey, CA
Vulnerability of Wireless Point-to-Point Systems to Interception
Pin, Melvin L.; Dec. 2003; 93 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420632; No Copyright; Avail: CASI; A05, Hardcopy

Wireless systems have always been susceptible to interception in both urban outdoor and indoor environments. In point-to-point communication links, the placement of base station antennas is usually determined by an experimental or analytical assessment of the propagation path. Since point-to- point links are typically used to network widely separated areas, antennas used in such situations are likely to be directional, but may still be susceptible to interception by covert entities. In this thesis research, issues pertaining to vulnerability will be identified and preventive measures will be suggested. The generation of received signal contours as a function of location and frequency for different propagation models will also be investigated. This thesis thus examines the vulnerabilities of wireless point-to-point communication to interception by propagation simulations using computational electromagnetic codes available in the Naval Postgraduate ECE Department's Microwave and Antenna Laboratory. The software was used to examine the vulnerability of these wireless systems and identify simple measures that can be taken to increase the system's security.
DTIC
Interception; Vulnerability

20040043885 Systran Federal Corp., Dayton, OH
Aerospace Sensor Component and Subsystem Investigation and Innovation-2 Component Exploration and Development (ASCSII-2 CED) Delivery Order 0003: Hermetically Sealed Cavities in 3-D GaAs-Silicon and Silicon-Silicon Packages for Microelectromechanical System (MEMS) Devices Using Selective and Large-Scale Bonding
Malshe, Ajay P.; Mar. 2003; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-00-D-1726; Proj-2002
Report No.(s): AD-A420804; AFRL-SN-WP-TR-2003-1045; No Copyright; Avail: CASI; A03, Hardcopy

Chip-scale bonding of GaAs-to-silicon and silicon- to-silicon to produce cavities for 3-D assembly of MEMS devices has been demonstrated using SnAgCu and eutectic SnPb solders. Laser and furnace reflow were used for region- selective and fast bonding of the chips, respectively, for 3-D assembly. For example, for GaAs-to-silicon bonding, lines of solder paste, 150 mm in width, were screen-printed onto silicon wafers to form square-shaped sealing rings as small as 2 by 2 mm. The solder line width was optimized to provide the smallest width, yet sufficient to ensure a hermetic seal. The solder was reflowed, and the

wafer was diced into individual chips of various die sizes. The chips were then flipped onto gold-coated GaAs chips and again placed in the reflow oven at a temperature of up to 250 deg C for a total reflow time of 7 minutes. The bonded chips were then tested for hermeticity using MIL-STD-883E and by examining the sealed area after the separation of the chips using a pull test. For the case of selectively laser-bonded silicon-to-silicon chips, the structures exhibited excellent hermetic it and adhesion stren th with a uniform microcavity and uniform reflow of the solder.
DTIC
Bonding; Cavities; Electronic Equipment; Gallium Arsenides; Microelectromechanical Systems; Silicon

20040044165 Naval Undersea Warfare Center, Newport, RI
Plunging Towed Array Antenna
Gieseke, Thomas J., Inventor; Oct. 6, 2003; 17 pp.; In English
Patent Info.: Filed 6 Oct. 2003; US-Patent-Appl-SN-10679675
Report No.(s): AD-D020123; No Copyright; Avail: Defense Technical Information Center (DTIC)
A towed antenna system and method of use includes a communication device disposed on a buoyant body attached to a housing by a tether. The housing includes a spool, a reel- wire guide, and a motor. The buoyant body and the reel housing are deployed from and towed at from a submerged platform. Hydrodynamic forces from towing prevent the buoyant body from rising to the surface while maintaining the housing at an equilibrium depth. To establish communication, the tether is released from the spool and the buoyant body rises to the surface. The tether is released until the communication session is over or until the tether is fully deployed. The reel-wire guide prevents the tether from becoming snagged during release. Once the communication session has been completed, the tether is retracted and the buoyant body re- establishes its equilibrium depth.
DTIC
Antenna Arrays; Patent Applications

20040044166 Department of the Navy, Washington, DC
Buoyant Device for Bi-Directional Acousto-Optic Signal Transfer Across the Air-Water Interface
Antonelli, Lynn T., Inventor; Oct. 6, 2003; 31 pp.; In English
Patent Info.: Filed 6 Oct. 2003; US-Patent-Appl-SN-10679680
Report No.(s): AD-D020124; No Copyright; Avail: Defense Technical Information Center (DTIC)
A buoy system bi-directionally communicates in-air and underwater. A buoy having a shell to float on water has an upper portion in air and a lower portion in water. An array of acoustic transducers which is disposed in the lower portion receives acoustic signals and transmits acoustic signals. A dome-shaped retro-reflective coating on the upper portion is vibrated for retro-reflecting impinging laser illumination as data signals in air. An array of photo-detectors on the upper portion are responsive to impinging laser control signals and/or signals which may be transmitted as acoustic signals in water.
DTIC
Acousto-Optics; Air Water Interactions; Buoyancy; Patent Applications; Signal Transmission; Sound Waves

20040044167 Department of the Navy, Washington, DC
System and Method for Connecting with a Network of Sensors
Hagerty, James D., Inventor; Aug. 25, 2003; 21 pp.; In English
Patent Info.: Filed 25 Aug. 2003; US-Patent-Appl-SN-10652084
Report No.(s): AD-D020126; No Copyright; Avail: Defense Technical Information Center (DTIC)
This patent application discloses a system and method to supply power to, and to communicate with, an array of remote devices. The remote devices can be acoustic sensors or types of remote devices. In a preferred embodiment, the system includes a microwave source/signal demodulator that supplies wireless power and provides data interrogation signals to the sensors. The microwave transmission line is of a stripline construction. The source/demodulator radiates power to the sensor transceivers and receives data from the sensors. The source/demodulator can transmit sequential interrogation signals to activate address-selectable sensors. The source/demodulator also may decode received signals returning from the sensors. The stripline may be attached to a vessel's hull beneath a hull treatment layer and the sensors mounted on the surface of the hull treatment. (2 figures)
DTIC
Connectors; Data Transmission; Microelectromechanical Systems; Microwave Transmission; Patent Applications; Strip Transmission Lines

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20040035725 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the International Symposium on Integrated Ferroelectrics (15th) (ISIF-15). Part 5 of 8. Volume 56, (2003)
Taylor, G. W.; 2003; 178 pp.; In English, March 9 - 12, 2003, Colorado Springs, Colorado
Report No.(s): PB2004-101703; Copyright; Avail: National Technical Information Service (NTIS)
;Partial Contents: Ferroelectric Non-Volatile Logic Devices; Design of a Ferroelectric Programmable Logic Gate Array; The Ferroelectric Slab Waveguide: A Geometry for Microwave Components That Incorporates Ferroelectric Materials; Compact Distributed Phase Shifters at X-Band using BST; Design of a Triaxial Piezoelectric Accelerometer; A Proposed Architecture for Polarization-Switching D/A Converter (PDAC).
NTIS
Ferroelectric Materials; Piezoelectricity

20040035726 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the International Symposium on Integrated Ferroelectrics (15th) (ISIF-15). Part 7 of 8. Volume 58, (2003)
Taylor, G. W.; Joshi, V.; Aggarwal, S.; Ramesh, R.; 2003; 156 pp.; In English, March 9 - 12, 2003, Colorado Springs, Colorado
Report No.(s): PB2004-101705; Copyright; Avail: National Technical Information Service (NTIS)
Partial Contents: Hysteresis Offset and Dielectric Response of Compositionally Graded Ferroelectric Materials; Doping Effects on the Piezoelectric Properties of Low-Temperature Sintered PbTiO3-Based Ceramics for SAW Applications; Conservation of Permittivity and Tunability of Ferroelectrics Over Temperature; A Model of Phase Transition Kinetics in Lead Scandium Tantalite Thin Films; The Order Parameter in Relaxors; An Equivalent Circuit Model for Ba0.5Sr0. 5Tio3-Based Capacitors.
NTIS
Ferroelectric Materials; Piezoelectricity

20040035903 Lawrence Livermore National Lab., Livermore, CA
Note on Differencing the Viscous Dissipation Terms for a Newtonian Fluid
Cloutman, L. D.; Jun. 01, 2001; 36 pp.; In English
Report No.(s): DE2003-15005563; UCRL-ID-144159; No Copyright; Avail: Department of Energy Information Bridge
Most of the research effort on finite differencing the transient equations of fluid dynamics has been put into the convection terms and time marching schemes. As important as that effort has been, we cannot neglect the rest of the terms in the equations. In this report, we focus attention on the finite difference approximation used for the viscous dissipation term in the energy equation. As a concrete example, we use the COYOTE computational fluid dynamics (CFD) code (1) to show how the choice of difference methods can influence accuracy in subtle but significant ways. Terms with the same mathematical form as the viscous dissipation appear in various turbulence models, and this discussion applies to them as well. In Section 2, we present the basic governing equations. Section 3 summarizes some relevant equations from standard turbulence models. Section 4 expands these equations into components in Cartesian and cylindrical coordinates, a necessary step in creating the finite difference equations. Section 5 discusses some considerations on how to difference the viscous terms, and Section 6 gives numerical examples. We conclude with the summary in Section 7.
NTIS
Finite Difference Theory; Energy Dissipation; Computational Fluid Dynamics; Cartesian Coordinates

20040035969 United Technologies Corp., East Hartford, CT
Intensification of Transport Processes in Fluid- Filled Porous Media by Sound Waves. Application to Fuel Cell Technology
Staroseisky, Alexander; Fedchenia, Igor; Li, Wenlong; Jan. 31, 2004; 85 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-C-0061; Proj-5.600.0012
Report No.(s): AD-A420039; No Copyright; Avail: CASI; A05, Hardcopy

In this work we aim developing a novel theoretical framework to evaluate the feasibility of attaining significant improvement of fuel cells performance and stability by increasing the transport processes in porous partially fluid filled cathode compartment through the application of acoustic and structural waves. We have developed a unified model of structural/acoustic wave propagation in the PEM cathode compartment and coupled it with mass transfer in the porous media. A novel generalized filtration law that accounts for dynamic loadings, varying saturation, and solid structure distortion describing mass transfer in this complex but generic system has been found. It has been demonstrated that vibration gives rise to net change of saturation inside porous medium. Based on the numerical and experimental results number of practical recommendations optimizing material selections and performance regime has been made. Developed methodology is useful for wide range of Fuel Cell problems as well as for wide range of other porous structures and could serve as an important design tool.
DTIC
Fuel Cells; Porous Materials; Sound Waves

20040036155 Stanford Univ., Stanford, CA
Structure-Based Turbulence Modeling
Jan. 2001; 139 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0173
Report No.(s): AD-A420173; TF-85; AFRL-SR-AR-TR-04-0095; No Copyright; Avail: CASI; A07, Hardcopy

The Reynolds stresses alone are not sufficient to characterize complex turbulent flows adequately. Complementary information, contained in the structure dimensionality tensor, must also be included in one-point turbulence models. This work uses hypothetical turbulent eddies to bring awareness of turbulence structure into the turbulence model. Averaging over a large ensemble of eddies produces a set of one-point statistics, representative of the eddy field, and a set of equations of state relating the Reynolds stresses and the structure dimensionality to the eddy statistics. An algebraic model for the eddy statistics is constructed in terms of the local mean deformation and two turbulent scales; the turbulent kinetic energy and the large-scale enstrophy. The algebraic model is further sensitized to the presence of walls by a blocking scheme, which ensures proper asymptotic behavior for the Reynolds stresses in the vicinity of walls. Contrary to existing ad-hoc definitions of a second scale equation, the large-scale enstrophy equation has a fundamental background; it is derived from the large-scale vorticity equation. Its terms represent large-scale processes, and their exact form provides valuable guidance when making choices for their closure, and when matching their asymptotic behavior in the vicinity of walls. The algebraic model produces physically realistic Reynolds stresses and structure tensors for different combinations of mean strain and mean rotation, with and without frame rotation. The complete model, with evolution equations for the turbulent scales and algebraic equations for the turbulence structure, was successfully implemented. The full model was found to produce excellent results for a set of channel flows in fixed frames and in spanwise-rotating frames of reference.
DTIC
Turbulence Models; Turbulent Flow

20040036345 Naval Postgraduate School, Monterey, CA
Computational Fluid Dynamics Analysis of Shock Propagation and Reflection in a Pulse Detonation Engine Combustor
Chan, Jimmy K.; Dec. 2003; 123 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420349; No Copyright; Avail: CASI; A06, Hardcopy

The ability to enhance detonation wave transmission at a diffraction plane through various shock reflection/focusing conditions was evaluated numerically. The geometry dimensions were generally representative of the condition existing in a valve-less pulse detonation engine developed by the Naval Postgraduate School and consisted of a small cylindrical 'initiator' combustor which transmitted a shock wave to a larger diameter combustor. The wall cross section of the larger combustor was varied to evaluate the increase in reflected shock temperature and pressure conditions ultimately revealing the dramatic increase in local temperature for a 'scalloped' outer wall condition over the cylindrical cross section cases. The initiator diameter was held constant and the larger combustor diameters varied in order to evaluate the effects of diameter ratio on the shock reflection conditions for both cylindrical and scalloped geometries. A computational fluid dynamics (CFD) solver known as OVERFLOW was used to model the fluid dynamic processes but was limited in capability to shock wave Mach numbers less than about 4.2.
DTIC
Combustion Chambers; Computational Fluid Dynamics; Detonation Waves; Pulse Detonation Engines

20040036425 Naval Postgraduate School, Monterey, CA
Experimental and Numerical Analysis of a Crossflow Fan
Cheng, Wee T.; Dec. 2003; 101 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420413; No Copyright; Avail: CASI; A06, Hardcopy

An auto vehicle that can take off and land vertically is envisioned to solve current and future problems of road congestion by utilizing the enormous air space above this. Crossflow Fan has been looked into in the past to serve this purpose but not sufficient to justify its capability to provide enough vertical thrust with limited power and space. Hence more in depth study is required to further improve the thrust efficiency and thrust to power ratio to a point where this thrust producing method is viable. A 12-inch diameter, 1, 5-inch span, 30-blade Cross Flow fan test apparatus was constructed and tested using an existing Turbine Test Rig (TTR) as a power source. Instrumentation was installed and a data acquisition program was developed to measure the performance of the Crossflow Fan. Performance measurement was taken over a speed range of 1,000 to 6,000 RPM. An experiment was conducted with the Crossflow Fan to determine among other things the stalling characteristics of the compressor. Performance and flow visualization results were then compared to predictions obtained from 2-D numerical simulation conducted using Flott, a commercial PC-based computational fluid dynamics software package by Softflo.
DTIC
Cross Flow; Numerical Analysis

20040036595 Naval Postgraduate School, Monterey, CA
An Empirical Study of a Pin Fin Heat Exchanger in Laminar and Turbulent Flow
Summers, Jeffrey W.; Dec. 2003; 121 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420571; No Copyright; Avail: CASI; A06, Hardcopy

This study concentrates on the empirical characterization of a staggered array pin fin compact heat exchanger placed in a modular, rectangular wind tunnel. A full analysis of the heat transfer and pressure drop behavior was conducted on various pin-fin shapes, sizes, and configurations. The study was based on airflow over a range of low Reynolds numbers in the laminar and low turbulent flow, as well as higher turbulent flow regimes. The empirical data gathered can be used to corroborate and develop better numerical models to characterize the performance of such compact heat exchangers.
DTIC
Heat Exchangers; Laminar Flow; Turbulent Flow

20040040083 National Advisory Committee for Aeronautics, Washington, DC, USA
The Principles of Turbulent Heat Transfer
Reichardt, H.; Archiv f. die Gesamte Waermetechnik; September 1957; No. 6/7; 47 pp.; In English
Report No.(s): NACA-TM-1408; No Copyright; Avail: CASI; A03, Hardcopy

The literature on turbulent heat transfer has in the course of years attained a considerable volume. Since this very complicated problem has not as yet found a complete solution, further studies in this field may be expected. The heat engineer must therefore accomodate himself to a constantly increasing number of theories and formulas. Since the theories generally start from hypothetical assumptions, and since they contain true and false assertions, verified knowledge and pure suppositions often being intermingled in a manner difficult to tell them apart, the specialist had difficulty in forming a correct evaluation of the individual studies. The need therefore arises for a presentation of the problem of turbulent heat transfer which is not initially bound by hypothetical assumptions and in which uninvestigated can be clearly distinguished form each other. Such a presentation will be given in the present treatment. Brief remarks with regard to the development of the theory of local heat transfer are included.
Derived from text
Turbulent Heat Transfer; Turbulent Flow; Wall Flow; Fluid Flow; Approximation

20040040088 National Advisory Committee for Aeronautics. Langley Aeronautical Lab., Langley Field, VA, USA
Aerodynamic Forces on a Vibrating Unstaggered Cascade
Soehngen, H.; Zeitschrift fuer Angewandte Mathematik und Mechanik (Magazine for Applied Mathematics and Mechanics); August 1957; Volume 35, Issue 3, pp. 81-88; In English
Report No.(s): NACA/TM-1412; No Copyright; Avail: CASI; A03, Hardcopy

The unsteady aerodynamic forces, [based on two-dimensional incompressible flow considerations], are determined for an

unstaggered cascade, the blades of which are vibrating in phase in an approach flow parallel to the blades.
Author
Aerodynamic Forces; Cascade Flow; Unsteady Aerodynamics; Turbomachine Blades; Vibration

20040040089 National Advisory Committee for Aeronautics. Langley Aeronautical Lab., Langley Field, VA, USA
On the Spectrum of Natural Oscillations of Two-Dimensional Laminar Flows
Grohne, D.; Zeitschrift fuer Angewandte mathematik und Mechanik (Magazine for Applied Mathematics and Mechanics); December 1957; Volume 34, Nos. 8-9, pp. 344-357; In English
Report No.(s): NACA/TM-1417; No Copyright; Avail: CASI; A03, Hardcopy

In the investigation of stability of a two-dimensional laminar flow with respect to small disturbances, a disturbance of the stream function moving downstream (in the direction of the x-axis) by the 'partial wave formula' is described.
Derived from text
Laminar Flow; Oscillations; Two Dimensional Flow; Numerical Analysis; Spectral Methods

20040040091 Research and Technology Organization, Neuilly-sur-Seine, France
Optical Air Flow Measurements in Flight
December 2003; 106 pp.; In English
Report No.(s): RTO-AG-160-Vol-20; AC/323(SCI-033)TP/48-Vol-20; Copyright; Avail: CASI; A06, Hardcopy

Providing an introductory practical overview of in-flight optical flow measurement techniques is the goal of this AGARDograph. This document is written for instrumentation engineer or research scientist having a need for making non-intrusive flow measurements on an aircraft. It is hoped that this document will be particularly useful for the technologist with a limited background in optical theory and limited experience in applying optical technology. The experience of the authors and well as numerous other workers has been infused to provide guidance to avoid expensive non-productive diversions that may occur when applying optical technology for the first time in the flight environment. This AGARDograph provides basic knowledge and techniques necessary to assess the applicability of optical measurements and to address effective optical measurement techniques in flight. Key aspects of optical measurements are discussed and the tradeoffs are identified as they are currently understood. Basic components of optical measurement systems are discussed and key requirements are identified. Specific systems designed for a variety of applications are discussed to provide insight for the reader.
Author
Air Flow; Flow Measurement; In-Flight Monitoring; Nonintrusive Measurement; Optical Measurement

20040040198 NASA Marshall Space Flight Center, Huntsville, AL, USA
Numerical Modeling of Pulse Detonation Rocket Engine Gasdynamics and Performance
December 12, 2003; 20 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paper 2004-0463; Copyright; Avail: CASI; A03, Hardcopy

This paper presents viewgraphs on the numerical modeling of pulse detonation rocket engines (PDRE), with an emphasis on the Gasdynamics and performance analysis of these engines. The topics include: 1) Performance Analysis of PDREs; 2) Simplified PDRE Cycle; 3) Comparison of PDRE and Steady-State Rocket Engines (SSRE) Performance; 4) Numerical Modeling of Quasi 1-D Rocket Flows; 5) Specific PDRE Geometries Studied; 6) Time-Accurate Thrust Calculations; 7) PDRE Performance (Geometries A B C and D); 8) PDRE Blowdown Gasdynamics (Geom. A B C and D); 9) PDRE Geometry Performance Comparison; 10) PDRE Blowdown Time (Geom. A B C and D); 11) Specific SSRE Geometry Studied; 12) Effect of F-R Chemistry on SSRE Performance; 13) PDRE/SSRE Performance Comparison; 14) PDRE Performance Study; 15) Grid Resolution Study; and 16) Effect of F-R Chemistry on SSRE Exit Species Mole Fractions.
CASI
Gas Dynamics; Mathematical Models; Pulse Detonation Engines; Propulsion System Performance; Engine Tests

20040040215 Research and Technology Organization, Neuilly-sur-Seine, France
Symposium on Advanced Flow Management, Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems
March 2003; 1200 pp.; In English; In French; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems, 7-11 May 2001, Loen, Norway; See also 20040040216 - 20040040293
Report No.(s): RTO-MP-069(I)-Pt-A-B; AC/323(AVT-072/073)TP/47-Pt-A-B; Copyright; Avail: CASI; A99, Hardcopy

The principal emphasis of Vortex Flows and High Angle of Attack for Military Vehicles in this symposium is on the understanding and prediction of separation-induced vortex flows and their effects on vehicle performance, stability, control, and structural design loads. In nine sessions the subject was highlighted based on recent and current research and developments for flows with vortical type separation to enhance the overall vehicle performance. Heat Transfer and Cooling in Propulsion and Power Systems was focussed in a complementary way on the internal flow stream control. Propulsion and power systems, for land, sea, and air are normally based on thermal energy cycles as gas turbines, piston engines and rockets. Growing cycle temperatures place severe demands on gas path components and require new and improved cooling technologies for engine components (a.o. compressors, combustors, turbines). Particular emphasis is also put on advanced cooling concepts to meet the demands of lean low emission combustion in transport vehicle engines. The Symposium brought together specialists from Industry, Universities and Research Institutes. It highlighted progress achieved since the last AGARD activities on the subject of the meeting by covering numerical and experimental work as well as flow visualization and in-flight testing. New developments in military applications at industry have been addressed by excellent review papers given from leading industries and research institutes involved. Technological gaps have been identified and trends for future developments were assessed in two technical evaluations at the end of the symposium as a mature basis for future research work and technical applications.
Author
Vortices; Flow Visualization; Heat Transfer

20040040217 Technische Univ., Brunswick, Germany
A New Vortex Flow Experiment for Computer Code Validation
Hummel, D.; Redeker, G.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 31 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

In this paper the present knowledge on the vortex formation on slender delta wings is summarized. The interference mechanisms between primary and secondary vortices as well as the vortex breakdown phenomenon are especially emphasized. The effects of Mach number and Reynolds number are treated separately and the differences in the flow around wings with sharp and rounded leading edges are discussed. The experimental details necessary for the validation of numerical methods are derived and a brief review of relevant modern experimental techniques is given. Finally a configuration suited for a new International Vortex Flow Experiment (VFE-2) as well as a corresponding test program are presented.
Author
Vortices; Delta Wings; Computer Programs; Slender Wings

20040040218 Defence Research Establishment Atlantic, Dartmouth, Nova Scotia, Canada
A Quasi-Steady Evaluation of Submarine Rising Stability: The Stability Limit
Watt, George D.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 18 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

When submarines blow ballast to surface from depth in an emergency, they can experience a roll instability if they ascend with large ow incidence angles. It is shown that an instability is caused by the destabilizing hydrodynamic rolling moment on the sail (which points upwards into the onset crossflow) overcoming the static righting moment (the center of gravity is below the center of buoyancy) as the boat is accelerated upwards by buoyancy. The former increases with velocity squared while the latter is constant. Conventional first order rolling moment models are shown to underpredict the nonlinear hydrodynamic rolling moment, especially at high incidence angles. However, properly modelling the quasi-steady hydrodynamics still does not fully explain the early onset of the roll instability.
Author
Stability; Quasi-Steady States; Submarines; Hydrodynamics; Mathematical Models

20040040221 Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese, Belgium
The Unsteady Temperature Field in a Turbine Blade Cooling Channel
Arts, T.; Abad-Lozano, M. T.; Kinoue, Y.; Pierret, S.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 14 pp.; In English; See also 20040040215; Copyright; Avail: CASI; A03, Hardcopy

The unsteady velocity and temperature fields are measured in a straight smooth and rib roughened square duct,

representative of a stator cooling channel. The mainstream Reynolds number is 3(exp 10)4. Single cold and hot wire probes as well as a dual hot/cold wire probe are used for this purpose. The experimental results are compared to the predictions from FINE, a commercial software package developed by Numeca International.
Author
Turbine Blades; Temperature Distribution; Velocity Distribution

20040040223 Defence Evaluation Research Agency, Bedford, UK
Pitfalls in the Interpretation of Delta Wing Flow Visualisation
Greenwell, D. I.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 15 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper illustrates some pitfalls in the interpretation of flow visualization images of delta wing leading-edge vortices. Numerical simulations of tracer particle trajectories in around straight and helical vortices are presented, representing unburst and burst delta wing vortices respectively. For straight vortices, the appearance of the smoke-ring effect in wind tunnel testing is analyzed, and shown to be unrelated to the size or presence of a viscous inner core in the vortex. The role of the swirl-induced radial pressure gradient in the vortex centerline trace seen in water tunnels is demonstrated. For helical (burst) vortices, the crossflow topology visualized with upstream tracer injection is shown to depend on the vortex core size and the helix pitch. Typical vortex helices are close to a flow regime which can produce visualized flow structures resembling axisymmetric bubble breakdowns. It is postulated that the intermittent open-ended bubble burst seen in delta wing vortices is in fact an artifact of the tracer flow visualization technique, as transient disturbances temporarily reduce the pitch of the fundamental helical burst structure.
Author
Delta Wings; Flow Visualization; Leading Edges; Vortices

20040040224 European Aeronautic Defence and Space Co., Munich, Germany
Time Accurate Euler Calculations of Vortical Flow over a Delta Wing in Rolling Motion
Fritz, W.; Arthur, M. T.; Brandsma, F. J.; Buetefisch, K.-A.; Ceresola, N.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper presents the results of the research work conducted by the participants Alenia (Italy), Dasa (Germany), DERA (UK), NLR (The Netherlands) and DLR (Goettingen, Germany) in the former European programme WEAG-TA15 within Common Exercise V [1]. The objective of this common exercise was the numerical and experimental investigation of vortex dominated flow about a rolling delta wing and also to provide a data base for further code validation. Numerical calculations with different unsteady Euler methods (central schemes with dissipation, upwind schemes) using a common grid have been performed at a constant rolling rate of .r=0.0762 for different angles of incidence: a0=0 , a0=10 and a0=17 . From the numerical results it turns out that the different spatial discretisations lead to characteristic differences mainly in the magnitudes of the vortex induced suction peaks in the unsteady pressure distributions and in the prediction of vortex breakdown.
Author
Vortex Breakdown; Delta Wings; Temperature; Pressure Distribution; Euler Equations of Motion

20040040225 Office National d'Etudes et de Recherches Aerospatiales, Paris, France
Numerical Simulation of Vortex Flows Around Missile Configurations
Champigny, P.; dEspiney, P.; Bredif, M.; Broussard, H.; Gillyboeuf, J.-P.; Kergaravat, Y.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations Contract(s)/Grant(s): DGA-98.70.505; Copyright; Avail: CASI; A03, Hardcopy

This paper describes the work achieved during the recent years to improve the quality of Navier-Stokes computations for industrial purpose. The main axes for improvement are the grid adaptation strategy, the turbulence modeling and the application to industrial missiles. A few years ago, Navier- Stokes computations were rarely run for external aerodynamics simulations. This is no longer true. Both industrial companies (EADS Aerospatiale Matra Missiles and MATRA BAe

Dynamics France) now use it on a regular basis. Nevertheless some progresses are still necessary, especially for the prediction of the axial force.
Author
Missile Configurations; Vortices; Matra Missile; Navier-Stokes Equation; Aerodynamic Configurations

20040040226 Institute for Aerospace Research, Ottawa, Ontario, Canada
Numerical Modelling of Vortex Flow Instabilities and Interactions
Mokry, M.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 12 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Evolution of vortices and their interactions are investigated in the Lagrangian context using the continuous vortex sheet method. Among the topics investigated are the numerical Helmholtz instability on a circular vortex sheet, the fractal-pattern instability on an expanding vortex spiral, interactions of vortices with shear layers, and some other phenomena related to experimental observations in the laboratory and nature.
Author
Flow Characteristics; Mathematical Models; Vortices; Euler-Lagrange Equation; Fractals

20040040227 Naval Surface Warfare Center, Bethesda, MD, USA
Airwake Simulation of Modified TTCP/SFS Ship
Tai, Tsze C.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 12 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The TTCP/SFS ship configuration is modified by adding a rounded bow section at the front end to avoid complete separation along the side walls. Airwake of the modified configuration, subject to atmospheric wind of 70 ft/sec at wind angles of zero and 40 degrees, is simulated by using a multi-zone thin-layer Navier-Stokes method. The resulting flow contains regions of massive separation along with free vortices, but there is no separation along the hull surface observed. Major flow features including viscous vortex interactions are captured. Large leading-edge separation coupled with leading-edge vortices at the front end of the round bow is detected. The flow then re-attaches over the forward deck. Calculated velocity data in the flight deck region will be made available to TTCP member activities upon request by e-mailing to the author.
Author
Computational Fluid Dynamics; Ships; Marine Transportation; Air Flow; Computerized Simulation; Wakes

20040040228 Mississippi State Univ., Mississippi State, MS, USA
Physics Based Simulations of Reynolds Number Effects in Vortex Intensive Incompressible Flows
Sreenivas, K.; Hyams, D.; Mitchell, B.; Taylor, L.; Briley, W. R.; Whitfield, D. L.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0751; Copyright; Avail: CASI; A03, Hardcopy

The primary objective of this study is to study the differences in the computed flow fields between model-, quarter- and full-scale Reynolds numbers. Towards this end, an efficient RANS incompressible flow solver, U(sup 2)NCLE, capable of performing viscous, high Reynolds number flow simulations for complex geometries using unstructured grids has been developed. This flow solver is to be demonstrated for large-scale meshes with good sub-layer resolution (y(sup +) less than 1) and approximately 106 points or more with an emphasis toward hydrodynamic applications. Results are shown for model-, quarter- and full-scale computations on the SUBOFF model with sail at various angles of drift. Effects of grid density on computed flow fields at model- and full-scale Reynolds numbers are also considered.
Author
Viscous Flow; Computational Fluid Dynamics; Simulation; High Reynolds Number

20040040229 Rockwell International Science Center, Thousand Oaks, CA, USA
PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes
Malmuth, Norman; Cole, J.; Fedorov, A.; Shalaev, V.; Hites, M.; Williams, D.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 20 pp.; In English; See also 20040040215; Original contains color and black and white illustrations
Contract(s)/Grant(s): F49620-96-C-0004; F49620-92-C-0006; F49620-99-C-0005; Copyright; Avail: CASI; A03, Hardcopy

Combined asymptotics and numerics (CAN) give an insightful picture of shear layer cavities and provide a means of quickly visualizing the flow pattern within them. It appears that the recirculating flow can be modeled with inviscid approximations of the viscous flow for many practical cases. For bodies transiting the shear layer of such cavities such as in store separation, much of the details such as the modification of the apparent mass effect due to the shear layer can be obtained from cross flow approximation-inner solutions from slender body theory. These tools are now being extended to transonic flows.
Author
Weapon Systems; Asymptotic Methods; Approximation; Mathematical Models; Personal Computers; Aerodynamics

20040040234 Oxford Univ., Oxford, UK
Reduced Instrumentation Heat Transfer Testing of Model Turbine Blade Cooling Systems
Tsang, C. L.; Ireland, P. T.; Dailey, Geoff; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Turbine cooling system engineers often evaluate designs using experiments that measure heat transfer rates and pressure drop. Engine Reynolds numbers are reproduced in large-scale test sections and the dimensionless heat transfer coefficients then relate directly to engine values. The experimental test strategy allows the designer to quantify the performance of new, for example more intricate, flow schemes. One common method entails the use of a model manufactured from a thermally insulating material which is subjected to a rapid change in inlet gas temperature. This paper is concerned with a method of processing these tests by only analysing the gas temperature changes. The approach offers data at lower resolution compared to conventional methods but can provide information in situations where full surface temperature changes can not be measured. The advantages and disadvantages of the method are discussed and results are compared to the data from a conventional analysis of liquid crystal coated models.
Author
Heat Transfer; Performance Tests; Turbine Blades; Cooling Systems

20040040237 Oxford Univ., Oxford, UK
The Development and Validation of Simple Empirical Models of Impingement Cooling from Full Surface Heat Transfer Coefficient Distributions
Gillespie, David R. H.; Son, Chang-Min M.; Ireland, Peter T.; Dailey, Geoffrey M.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

A simple heat transfer model of a cast passage impingement cooling system with film-cooling extraction is presented. This was derived from detailed local Nusselt number distributions on all surfaces of the system, measured in a large scale model using transient liquid crystal techniques. These data were averaged over physically sensible regions correlated to local flow conditions. An energy balance technique was use to calculate the convective efficiency. A second conventional 'plate insert' impingement passage has also been investigated. Local Nusselt number distributions on the target and impingement plates were used along with correlated data to predict the overall convective efficiency, and determine the sensitivity of the prediction to the data resolution. A reduced instrumentation heat transfer test using fast response gas thermocouples mounted at the inlet and exit planes of the test section, was used to assess the validity of the empirical models.
Author
Impingement; Film Cooling; Heat Transfer Coefficients

20040040238 Ecole Centrale de Lyon, Ecully, France
Two-Equation Thermal Model for Heat Transfer Predictions
Kulisa, Pascale; Marciniak, Nathalie; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 5 pp.; In English; See also 20040040215; Copyright; Avail: CASI; A01, Hardcopy

The very high temperature level reached in actual turbine components requires accurate simulation tools to predict the heat transfers. The turbine flow is very complex. It is dominated by high pressure gradients, three-dimensional viscous effects, and high heat fluxes. Moreover, the turbulence plays a major role in the heat transfer level. Very efficient turbulence models have been developed for the prediction of dynamic flows. Modelization of thermal field is relatively inferior to the modelling

of dynamic field. The current practice is to use assumption of constant turbulent Prandtl number. The objective of this work is to develop and assess thermal flux models for turbine aerothermal field prediction.
Author
Heat Transfer; Predictions; Turbulence Models

20040040239 MTU Aero Engines, Munich, Germany
Approach for Coupled Heat Transfer/Heat Flux Calculations
Bock, Stephan; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 10 pp.; In English; See also 20040040215; Original contains black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

Coupled CFD/FE heat transfer / heat flux calculations for material temperature prediction with independent grids expose the need to exchange boundary condition information between the fluid and the solid domain. The author introduces a method of storing the boundary condition information together with the geometry information, where boundary conditions are represented by a set of geometric entities. This method of 'virtual boundary conditions' simplifies some aspects of the coupled calculations by introducing a clear grid interface and enables a master model approach from the geometry generation (CAD) down to the analytical disciplines (CAE). The detachment of the boundary condition information from the computational grid also exposes advantages when considering different degrees of geometric complexity (2D/3D).
Author
Computational Fluid Dynamics; Boundary Conditions; Heat Transfer

20040040240 Defence Evaluation Research Agency, Farnborough, UK
Measurements and Predictions of Endwall Heat Transfer in Two High Pressure Turbines
Hilditch, M. A.; Smith, G. C.; Chana, K. S.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Accurate predictions of turbine heat transfer rates are needed to reduce the overall costs and risks of developing an efficient cooling system and to improve predictions of turbine life. 3D Navier Stokes codes are commonly used to predict the aerodynamic flowfield, but their use for heat transfer calculations is not so well established. This paper describes heat transfer predictions for the endwalls of two high pressure nozzle guide vanes using a typical Navier Stokes code and Baldwin Lomax turbulence model. The results are compared with experimental data and other published calculations and can be explained in terms of the endwall secondary flows.
Author
Heat Transfer; Guide Vanes

20040040241 Hellenic Air Force, Athens, Greece
An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack
Pantelatos, D. K.; Mathioulakis, D. S.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 11 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The investigation of the flow field around an axisymmetric body inclined at an angle with respect to the oncoming free stream constitutes a challenging task due to the complex nature of the flow. However, understanding the unanswered yet question concerning the basic reason that causes flow asymmetries over an apparently symmetric body at high angles of attack would improve maneuverability of bodies of such shapes. In the present work the flow field about a blunted nose cylinder was studied at various pitch and yaw angles by carrying out pressure measurements, employing an oil film and smoke flow visualization techniques.
Author
Axisymmetric Bodies; Angle of Attack; Flow Distribution; Cylindrical Bodies

20040040242 NASA Langley Research Center, Hampton, VA, USA
Cranked Arrow Wing (F-16XL-1) Flight Flow Physics with CFD Predictions at Subsonic and Transonic Speeds
Lamar, John E.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 20 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

The CFD modeling used has produced reasonably good global upper-surface pressure coefficient comparisons with measured flight data at both transonic and subsonic speeds at the angles of attack presented. Boundary layer comparisons showed the profiles to be reasonably well predicted inboard and under the primary vortex system. However, the secondary vortex profile was not well predicted either at the anticipated separation point or under the secondary vortex. Moreover, the flight data showed there to be a vortex/boundary-layer interaction that occurred in the vicinity of the secondary vortex. The spanwise distribution of local skin friction measured data was reasonably well predicted, especially away from the wing leading-edge. Lastly, predicted and measured flight-pressures, as well as flight-image data, for the F-16XL-1 airplane are now available via the World Wide Web.

Author

Arrow Wings; Computational Fluid Dynamics; Subsonic Speed; Transonic Speed; Mathematical Models; F-16 Aircraft; Swept Wings

20040040243 Rolls-Royce Deutschland G.m.b.H., Dahlewitz, Germany

Development and Modeling of Angled Effusion Cooling for the BR715 Low Emission Staged Combustor Core Demonstrator

Gerendas, M.; Hoeschler, K.; Schilling, T.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 12 pp.; In English; See also 20040040215; Original contains color illustrations

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A technology program was started in 1994 within the framework of the German Aeronautics Research Program to develop axial staged combustor technology up to a core engine demonstrator. The objective was to demonstrate a 50% NOx reduction against the ICAO CAEP II limit without any compromise on the CO, UHC and smoke emission level compared to the latest single annular combustor technology. All other requirements, like ignition and relight capability, stability, durability and turbine inlet temperature traverse, were set equal to today s state-of-the-art combustors. The combustor cooling concept chosen was of the angled effusion type. Development of adequate modeling techniques and steady-state and transient rig tests to calibrate the thermal models was the key factor for the success of the project. Despite the 15% increase in cooled surface, the overall combustor flow fraction required for cooling was reduced by 15% without any change in the combustor liner material from that of the in-service single annular combustor of the BR715. The axially staged combustor technology developed in the described program enables RR Deutschland to offer a staged combustor for the BR715 within the usual timescale of an engine certification process. It also forms the basis for future combustor technology to limit NOx-emissions for advanced engine cycles.

Author

Fabrication; Models; Effusives; Cooling; Emission; Combustion Chambers

20040040244 Institut National des Sciences Appliquees, Lyon, France

Blowing Effects on Heat and Mass Transfer for Different Geometrical Configurations

Bataille, F.; Mathelin, L.; Bellettre, J.; Lallemand, A.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 10 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A02, Hardcopy

In this paper, the blowing impact on the dynamical and thermal boundary layers is investigated through experiments and numerical simulations. Two different geometries (flat plate and circular cylinder) are separately studied. It is shown that blowing tends to thicken the boundary layers and to dramatically decrease the gradients in the immediate vicinity of the surface, leading to a strong decrease of the viscous stress and heat exchanges. Hence, the surface temperature can be lowered in case of cold blowing. This process finds applicability in the surface thermal protection area or in the flow control due to the modifications that blowing induces to the wake instabilities.

Author

Blowing; Heat Transfer; Mass Transfer; Thermal Boundary Layer; Circular Cylinders

20040040247 NASA Langley Research Center, Hampton, VA, USA

Vortical Flow Prediction Using an Adaptive Unstructured Grid Method

Pirzadeh, Shahyar Z.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 36 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

A computational fluid dynamics (CFD) method has been employed to compute vortical flows around slender wing/body configurations. The emphasis of the paper is on the effectiveness of an adaptive grid procedure in 'capturing' concentrated vortices generated at sharp edges or flow separation lines of lifting surfaces flying at high angles of attack. The method is based on a tetrahedral unstructured grid technology developed at the NASA Langley Research Center. Two steady-state, subsonic, inviscid and Navier-Stokes flow test cases are presented to demonstrate the applicability of the method for solving practical vortical flow problems. The first test case concerns vortex flow over a simple 65 delta wing with different values of leading-edge radius. Although the geometry is quite simple, it poses a challenging problem for computing vortices originating from blunt leading edges. The second case is that of a more complex fighter configuration. The superiority of the adapted solutions in capturing the vortex flow structure over the conventional unadapted results is demonstrated by comparisons with the wind-tunnel experimental data. The study shows that numerical prediction of vortical flows is highly sensitive to the local grid resolution and that the implementation of grid adaptation is essential when applying CFD methods to such complicated flow problems.
Author
Computational Fluid Dynamics; Unstructured Grids (Mathematics); Computational Grids; Vortices; Navier-Stokes Equation; Separated Flow

20040040250 National Aerospace Lab., Amsterdam, Netherlands
Leading Edge Vortex Flow Computations and Comparison with DNW-HST Wind Tunnel Data
Brandsma, F. J.; Dol, H. S.; Elsenaar, A.; Kok, J. C.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations
Contract(s)/Grant(s): NIVR-07601N; Copyright; Avail: CASI; A03, Hardcopy

Computations are presented for the vortical flow around a sharp-edged cropped delta wing with 65 degrees leading edge sweep using a computational method based on the Reynolds-averaged Navier-Stokes equations. It is demonstrated that turbulence modelling plays a crucial role in the ability to capture the vortical structures. Standard one- and twoequation turbulence models need corrections for vortical flows in order to avoid over-prediction of the levels of turbulent viscosity inside vortex cores. In this paper two types of modifications to the two-equation k-omega turbulence model are investigated to overcome this problem. One modification consists of limiting the production turbulent kinetic energy in the k-equation, whereas the other modification is aimed at increasing the production of dissipation in the dissipation equation (omega equation); omega represents the dissipation of turbulent kinetic energy. The computational results at the conditions 85 . 0 = 8 M , o 10 = a , and 6 10 9 = R c Re , are compared with detailed experimental surface and field data obtained from a series of wind tunnel tests in the DNW-HST at NLR. The comparisons show that the modification which increases the production term for the dissipation rate of turbulent kinetic energy in the omega-equation produces the best results when it comes to capturing the vortex core in a realistic way. The proposed modification is in line with other approaches found in the literature for one-equation turbulence models.
Author
Wind Tunnel Tests; Computational Fluid Dynamics; Navier-Stokes Equation; Reynolds Equation; Reynolds Averaging; K-Omega Turbulence Model; Vortices

20040040251 National Research Council of Canada, Ottawa, Ontario, Canada
Unsteady Flows and Airfoil-Vortex Interaction
Mamou, M.; Khalid, M.; Xu, H.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Unsteady flows past two airfoils in tandem placed in a shock tube flowfield have been studied using Navier-Stokes equations. An implicit Global Newton iterative procedure is applied for time accurate solution of the transient flowfield. This study is primarily motivated by a need to understand the aerodynamic implications of the blade-vortex interaction in the rotor flowfield of a helicopter. To simulate the vortex effects in 2D, a streamwise moving shock wave is imposed immediately upstream of the leading edge of the lead airfoil, which is pitched at an angle of attack of 20 degrees. The lead airfoil is used to generate a vortex that can be lifted off and convected downstream until it reaches the trailing test airfoil. After the passage of the shock wave over the lead airfoil, a nearly symmetric vortex is generated. This vortex, then, separates at the trailing edge and convects downstream at the freestream velocity towards the aft airfoil. To avoid numerical dissipation, a refined grid is used along the vortex path. For the aft airfoil, it is observed that the passage of the vortex has notable affects upon its aerodynamic characteristics. It is further noted that the vortex is followed by the lead airfoil wake, which splits later on into

series of smaller vortices. Owing to the high angle of attack of the lead airfoil, the viscous flow underneath seems to progressively grow behind the shock wave resulting in a separation. The flowfield is seen to comprise of a complex pattern of incident and reflected compressibility waves from the walls, which interact with the separated flow presents on the lower airfoil surface.
Author
Airfoils; Navier-Stokes Equation; Reflected Waves; Unsteady Flow; Vortices; Flow Distribution

20040040252 Boeing Co., Saint Louis, MO, USA
Axisymmetric and Non-Axisymmetric Initiation of Vortex Breakdown
Cary, Andrew W.; Darmofal, David L.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 21 pp.; In English; See also 20040040215; Copyright; Avail: CASI; A03, Hardcopy

The onset of axisymmetric (bubble) and non-axisymmetric (spiral) modes of breakdown is stud- ied numerically for swirling pipe ows. We nd that the onset of axisymmetric vortex breakdown occurs when the vortex attains local criticality. A transient simulation of the evolution of vortex breakdown revealed that downstream-running waves are trapped approximately at the location of ow criticality. These trapped waves are slowly ampli ed and eventually result in the bubble breakdown region with reversed ow and enlarged core size. Non-axisymmetric disturbance were found to decay on columnar base ows; however, for base ows with bubble breakdown, non- axisymmetric disturbances were ampli ed. These ampli ed disturbances resulted in the formation of spiral breakdown. If the base ow inlet swirl was only slightly larger than that leading to ax- isymmetric breakdown, a nearly columnar solution was obtained, suggesting that weak asymmetry may help to stabilize the columnar solution branch. The numerical simulations also revealed that most of the energy in spiral breakdown is contained in the rst few non-axisymmetric modes of variation.
Author
Vortex Breakdown; Asymmetry; Mathematical Models; Symmetry

20040040253 Technische Hochschule, Aachen, Germany
Normal Shock Vortex Interaction
Thomer, O.; Schroeder, W.; Krause, E.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 11 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Breakdown of a slender longitudinal vortex caused by a normal shock is studied with a numerical solution of the Euler and the Navier-Stokes equations for time-dependent, three- dimensional, supersonic ow at a free stream Mach number of 1.6 and different vortex strengths. When breakdown occurs, a free stagnation point is formed downstream from the shock, followed by a region of reversed ow with a bubble-like ow structure. The burst part of the vortex grows in the axial and radial directions until the bubble reaches a stable position. The shock remains normal near the axis of the vortex but is curved further away from it. The ow downstream from the shock is slightly oscillating. The numerical results clearly reveal the time-dependent ow structure in the axial and the radial direction. The results compare well with recent experimental findings.
Author
Shock Wave Interaction; Navier-Stokes Equation; Vortices; Aerodynamics

20040040254 Institute for Aerospace Research, Canada
A Critical Assessment and Requirement for Ground Testing on Vortex Breakdown Locations over Delta Wings
Huang, X. Z.; Hanff, E. S.; Jobe, Charles; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

A critical assessment has been conducted on more than sixty experimental data sets about vortex breakdown locations over 65 and 70 degrees delta wings at different angles of attack. Test conditions, such as tunnel wall and blockage, model support interference, model geometry and its deformation under load, as well as the methodology used to define breakdown location are examined. A screening process has been conducted to help identify the relative merits of the various data sets and to extract useful, quantitative information from the contradicting database. Aerodynamic and experimental requirements to ensure high quality data are discussed. The requirements for flow quality and data accuracy is further raised.
Author
Ground Tests; Vortex Breakdown; Grids; Delta Wings

20040040255 Office National d'Etudes et de Recherches Aerospatiales, Meudon, France

Experimental Investigation of Vortex Breakdown over a Delta Wing with Consideration of Control by Fluid Injection

Molton, P.; Mitchell, A.; Barberis, D.; Afchain, D.; Rodriguez, O.; Pruvost, J.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper gives the results of two experiments on control of vortex breakdown on a delta wing by fluid injection. The first was conducted in a wind tunnel on a wing with a 70-degree sweep. It focused on characterizing vortex breakdown through analysis of the unsteady pressures on the wing s suction surface, with the aim of defining a detection mode as a control input for feedback control. Control by along-the-core fluid injection, near the apex, caused downstream movement of vortex breakdown that was detected by field measurements and surface pressure sensors. The second experiment, in a water tunnel, concerned a wing with a 60-degree sweep. Fluid was injected at different locations along the wing s upper surface. The results demonstrated the effectiveness of injecting momentum to control vortex breakdown.

Author

Fluid Injection; Delta Wings; Vortex Breakdown; Wind Tunnels; Pressure Sensors

20040040257 Royal Inst. of Tech., Stockholm, Sweden

Time Accurate Simulations of High-Alpha Aerodynamics for Pitching Delta Wings

LeMoigne, Y.; Rizzi, A.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

The primary objective of the study is to reproduce the dynamic formation, development and burst of the vortex that forms on the leeward side of a 70 degree-swept delta wing pitching in sinusoidal oscillations around its 40% chord point. Emphasis is put on the prediction of the hysteresis loops that form in the aerodynamic loads history but the visualization of the unsteady flow around the wing is also introduced. The freestream Mach number for all the computations (both Euler and Navier-Stokes) is set to 0.2 while the mean angle of attack is changed between 12 , 22 and 38 for oscillations with a semi-amplitude varying between 3 degrees and 18 degrees. The moving grid approach implemented in the flow solver NSMB is used to reproduce the motion of the wing and the timedependent flow equations are integrated with the dual timestepping method. In addition, a method for co-processing the simulation and the visualization of the flowfield is presented using flow feature extraction to reduce the amount of data saved in this large data storage requiring test case.

Author

Aerodynamics; Delta Wings; Navier-Stokes Equation; Computational Grids; Flow Equations; Data Reduction; Oscillations

20040040258 Naval Air Warfare Center, Patuxent River, MD, USA

A Computational Study of Unsteady Ship Airwake

Polsky, Susan A.; Bruner, Christopher W. S.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 11 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

The superstructure, deck, and other features of large ships produce large separated regions in the airflow over the ship and a variety of vortex flows generated mainly by edges in the geometry. These features are of importance for aircraft operations on and around these ships. The ability to predict the airwake over a ship can aid in the development of aircraft operating envelopes and can be used to diagnose airwake structures that result in problematic or unusable landing spots. In addition, the ability to predict airwake could be used as a design tool to address air operations early in a ship design. To date, wind tunnels have been used almost exclusively to predict ship airwake. The drawback of this approach is twofold. The first issue involves the size of real ships in comparison with the available size of wind tunnels. Because the ships in question are so large, the scale factors required to build reasonably-sized wind tunnel models are generally in the 1/100th range. Because of this, the conditions required in a wind tunnel to match full scale Reynolds numbers (Re) are unattainable. Also, unsteady flow phenomena, which are of moderate frequency at full scale, are much higher frequency at wind tunnel scales. These unsteady features are often those of most concern to the pilot. The large scale factors involved introduce Reynolds number and frequency scaling issues when attempting to scale to full-scale values. It can be argued that these flows are largely Reynolds number independent; however, this has not been shown conclusively, and the question of scale is never far from the forefront. Computational fluid dynamics (CFD) has been used in this work as an alternative approach to predicting ship airwake. CFD

can be used to compute full-scale solutions and to obtain detailed off-body and time-accurate data.
Derived from text
Air Flow; Computational Fluid Dynamics; Ships; Unsteady Flow; Wind Tunnel Tests; Wakes

20040040259 Dassault Aviation, Saint-Cloud, France
CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft
Rosenblum, Jean-Pierre; Hasholder, Jean-Max; Courty, Jean-Claude; Rocca, Xavier; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 10 pp.; In French; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A02, Hardcopy

If we want to control vortex breakdown on a delta wing of a military aircraft in order to create rolling moments or improve stability at high angle of attack, the use of CFD simulations may help us to improve our understanding of the flow mechanisms that occur with the use of specific control devices. The first step of such studies is to make sure that we can simulate properly and with accuracy vortex breakdown on a delta wing without any control device. At Dassault Aviation we have done some computations (both Euler and Navier-Stokes) on Mirage 2000 delta wing in a high angle of attack configuration (with deflection of the 2 slats). On such a complex industrial configuration the flow over the wing is a mixing of the vortices coming from the apex, the inner slat and the outer slat. Euler computations lead to unsteady convergence, but the average forces allowed a correct prediction of the occurrence of the maximum of lift coefficient versus incidence. Navier-Stokes computations for the maximum lift coefficient showed that the wing vortices were fully burst, though it was not the case on the experimental pressure distributions. Several ways of improvement are considered. The first one is to greatly improve the mesh discretization in the region of the vortex. A second one is to improve the turbulence model: one knows very well that classical k-epsilon models are unable to simulate properly turbulence in rotation, which is the case in the shear layers that build the vortex core. In order to simplify the flow configuration, we will show CFD results and comparison with the experimental data on a generic delta wing of 70 sweep angle. The corresponding experiments were conducted by ONERA at Fauga F2 wind tunnel. We will compare the vortex breakdown location, surface pressure distributions and velocity profiles in the vortex at locations upstream and downstream the vortex breakdown. The influence of mesh refinement in the vortex core and of turbulence model (using an EARSM model that takes into account the influence of rotation and anisotropy) will be presented. Finally we will give some recommendations for the simulation of such complex flows.
Author
Computational Fluid Dynamics; Vortex Breakdown; Delta Wings; Mirage Aircraft

20040040260 BAE Systems, Waterlooville, UK
Vortex Effects in the Dynamics of Underwater Weapons
Lyes, P. A.; Steer, A. P.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 12 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

As the control and mobility of submarines are improved to meet the challenges of the 21st-century security environment, so the capabilities of underwater weapons must keep pace with these developments. An underwater weapon is typically propelled by a pump-jet, controlled by an arrangement of movable lifting surfaces and stabilized by fixed fins. The propulsor, fins and control surfaces are situated close together at the tail, and close to the axis of the weapon due to the requirements for weapons to be launched through tubes. The control and propulsion components form a closely coupled hydrodynamic system, in which the rate of fluid flow through the propulsor strongly affects both the propulsion and the control characteristics of the weapon. Vortices are generated by the cylindrical body and fins of the weapon during manoeuvres. These are intimately linked with the rest of the flow field generated by the vehicle. It is required to assess the degree to which the manoeuvering forces, experienced by the vehicle, are affected by the vortices, and how these are modified by the effect of the propulsor and control systems. A detailed model of the propulsor has been developed, using stage interfaces to construct a fluid dynamic model of the duct, working rotor and stator, with resolved flows around the blades. This is a significant advance on models which used a momentum source for the effect of the rotor and stator, but did not include the blade flows. These important developments were carefully analysed. It was shown that the CFD method can predict propulsion characteristics. The modelling of the complete, three-dimensional vehicle with working propulsor, at angles of yaw, enables the matching of CFD models for the vehicle and propulsor, the computation of forces at yaw angles and validation of the vehicle flow through comparison with measured data. This work was carried out as part of Technology Group 01 of the MoD Corporate Research Programme.
Author
Vortices; Underwater Vehicles; Weapons; Computational Fluid Dynamics; Dynamic Control

20040040261 Naval Air Systems Command, Patuxent River, MD, USA

Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control

Ghee, Terence A.; Hall, Doug R.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 17 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

A 4% Uninhabited Combat Air Vehicle (UCAV) has been extensively tested at low speeds in a wind tunnel to investigate using vortex flow control to control vehicle attitude. The program is the initial step to utilize experimental and computational techniques to understand the flowfield environment on a representative low-observable air vehicle and use that understanding to apply an efficient vortex flow control apparatus. Gross flow field characteristics were identified using flow visualization and the approximate vortex location was determined for a number of angles-of-attack for a tunnel dynamic pressure of 26.74 psf. From this study, the model was instrumented with pressure transducers at appropriate locations on the wing and unsteady data was acquired for a number of angles-of-attack and tunnel dynamic pressures. A six-component internal balance was then installed to measure aerodynamic forces and moments. Limited steady electronically scanned pressure data were acquired. Computational fluid dynamic (CFD) analysis was conducted on the model geometry to compare with the results from the wind tunnel study. The results show two vortex structures: a weak apex vortex and a stronger wing vortex. Wing vortex frequency exhibits a broad-banded dominant frequency of approximately 10 Strouhal number. Maximum suction pressure was seen to move forward on the wing leading edge as the wing vortex moved inboard with increasing angle-of-attack. The CFD results adequately predicted the force and moment data. However, the CFD comparison to the unsteady pressure data was not stellar: CFD frequently failed to predict the mean pressure coefficient and the frequency content of the signal.

Author

Numerical Analysis; Experimentation; Vortex Shedding; Flow Distribution; Computational Fluid Dynamics; Dynamic Pressure

20040040262 Norwegian Univ. of Science and Technology, Trondheim, Norway

Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure

Norstrud, Helge; Oestman, Anders; Oye, Ivar; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; January 2003; 11 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Wind flow over topography is often converted to vortex flow due to the interaction of specific features of the terrain such as two mountain peaks. An example of this is found in the area of Straumsfjorden in Northern Norway at certain wind directions, see Figure 1. During an emergency flight along that coastline a rescue helicopter of type Eurocopter SA 365N Dolphin 2 experienced a sudden pitch-down change of attitude, which was subsequently corrected by the pilot and the automatic flight control system. After a safe landing the crew observed that both sides of the horizontal stabilizer was missing. Since the weather condition at the time of accident involved strong winds, the Norwegian Aircraft Accident Investigation Board ordered a numerical wind analysis of the mountainous area around the pitch-down location. The present paper reports on this study and also put forward a hypothesis of dynamic stall together with torsional loading as the cause for the mishap.

Author

Simulation; Structural Failure; Wind (Meteorology); Vortices; Helicopters; Numerical Analysis

20040040263 Technische Univ. Munich, Garching, Germany

Aerodynamic Active Vibration Alleviation for Buffet Excited Vertical Tails

Breitsamter, Christian; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 14 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

The efficiency of an active auxiliary rudder system in alleviating fin buffeting is investigated based on extensive low-speed wind tunnel tests. A modern fighter air-craft model of 1/15-scale is used representing a single-fin configuration of canard-delta wing type. A specific vertical tail is fabricated featuring a digitally controlled auxiliary rudder providing harmonic oscillations. The vertical tail is instrumented to measure unsteady surface pressures, fin tip accelerations and auxiliarity rudder moments. Open-loop tests show that the fin unsteady pressure field is feeded with energy at the frequencies of the auxiliary rudder motions. With increasing frequency and deflection angle the rims surface pressures are shifted to higher levels even at high incidences. Therefore, closed-loop operations may reduce buffet loads by approximately 18%. A nearly constant rudder moment over the angle-of-attack range investigated substantiates the effectivenes of the auxiliary rudder concept also at high-alpha. The active control system employs single-input single-output control laws to alleviate buffeting in the first fin

bending and torsion mode, respectively. Controller efficiency and stability parameters are evaluated using dynamic system simulations. The studies demonstrate that with active control fin tip acceleration spectral density peaks at the frequencies of the first fin eigenmodes can be reduced by as much as 60% at angles of attack up to 31 deg.
Author
Aerodynamic Characteristics; Vibration; Buffeting; Active Control

20040040264 Naval Postgraduate School, Monterey, CA, USA
On the Use of Vortex Flows for the Propulsion of Micro-Air and Sea Vehicles
Jones, K. D.; Platzer, M. F.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Recent interest in flapping-wing propulsion, in particular for hovering or low-speed flight of micro air vehicles, has led to a renewed interest in the measurement and prediction of unsteady, vortex-dominated flows. The proposed vehicles typically operate at Reynolds numbers below 20,000, and operate with mildly to fully separated flow throughout the flapping cycle. This paper provides a brief history on the topic, and summarizes research efforts at the Naval Post-graduate School over the last decade, demonstrating the current numerical and experimental capabilities, and indicating areas where further work is required. Specifically, several wind and water tunnel experiments are described where the vortex structures generated by single flapping foils and by two foils arranged in a biplane configuration were visualized and thrust was measured as a function of flapping amplitude and frequency. Additional experiments are reported which show the potential of flapping foils to energize flat-plate boundary layers and to suppress or reduce regions of flow separation. Two and three-dimensional panel code and two-dimensional Navier-Stokes computations are also described to analyze these flapping-foil experiments.
Author
Vortices; Water Tunnel Tests; Wing Flaps; Wind Tunnel Tests; Biplanes; Water Vehicles; Aerodynamic Configurations; Propulsion System Performance

20040040265 NASA Langley Research Center, Hampton, VA, USA
Prediction of Flows about Forebodies at High-Angle-of-Attack Dynamic Conditions
vanDam, C. P.; Saephan, S.; Fremaux, C. M.; DalBello, T.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 15 pp.; In English; See also 20040040215; Original contains color illustrations
Contract(s)/Grant(s): NAG1-2006; NCC1-01007; Copyright; Avail: CASI; A03, Hardcopy

A Reynolds-average Navier Stokes method developed for rotorcraft type of flow problems is applied for predicting the forces and moments of forebody models at high-angle-of-attack dynamic conditions and for providing insight into the flow characteristics at these conditions. Wind-tunnel results from rotary testing on generic forebody models conducted by NASA Langley and DERA are used for comparison. This paper focuses on the steady-state flow problem.
Author
Angle of Attack; Reynolds Averaging; Wind Tunnel Tests; Forebodies; Computational Fluid Dynamics; Steady State; Rotary Wing Aircraft; Dynamic Stability

20040040266 NASA Langley Research Center, Hampton, VA, USA
In-Flight Flow Visualization Results of the F-106B with a Vortex Flap
Brandon, Jay M.; Hallissy, James B.; Brown, Philip W.; Lamar, John E.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 34 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Surface and off-surface flow visualization techniques were used to visualize the three-dimensional vortex flows on the F-106 aircraft with vortex flaps installed. Results at angles of attack between 9 degrees to 18 degrees and Mach numbers from 0.3 to 0.9 are presented. A smoke flow vapor screen technique was used to document leading-edge vortex paths and sizes, while an oil flow technique was employed to provide detailed information on reattachment and separation line locations and other flow details. Results were obtained for two vortex flap deflection angles, 30 degrees and 40 degrees. Flow visualization revealed the existence of a multiple vortex system that had not previously been seen in subscale tests or predicted for this configuration. The vortex flap generated a leading-edge vortex system that reattached near the flap hinge over a wide angle

of attack range. In addition to the primary vortex, flow visualization revealed the presence of several distinct vortices which traced a path from the vortex flap and then over the wing.
Author
F-106 Aircraft; Flow Visualization; Vortex Flaps; Flight Tests; Turbojet Engines; Wind Tunnel Tests; Computational Fluid Dynamics; Aircraft Design

20040040267 Air Force Research Lab., Wright-Patterson AFB, OH, USA
Design Issues Associated with Full-Scale Application of Active Control of Vortex Flows
Moorhouse, David J.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 9 pp.; In English; See also 20040040215; Copyright; Avail: CASI; A02, Hardcopy

Control technology is becoming one of the most pervasive aspects of vehicle design and operation. The engine, subsystems, weapons, etc., etc. all have their individual control systems in addition to the flight control system (FCS) of the aircraft overall. In addition, the basic FCS itself is expanding continually with aspects such as thrust vectoring. Research has indicated promising results from the control of the flow fields over an aircraft, and the vortical flow fields in particular. First, the manipulation of forebody vortices to create a lateral force has indicated the potential for significant yaw control at elevated angles of attack (AoA). Benefits can also come from preventing uncommanded asymmetric vortex behavior, which is known to create forces and moments sufficient to cause aircraft to depart from controlled flight. The consideration of vortex flow control includes aspects of both the aerodynamic aircraft model and also use as a control effector. Both of these effects, plus high-angle-of-attack aerodynamics in general, are known to be very non-linear. In addition, experience has shown that the full-scale characteristics are frequently not as predicted. There is a need to address the integration of effects such as those described above into the design of a full-scale aircraft, and especially the flight control system (FCS). Another relevant factor is the current emphasis on modelling and simulation based acquisition. There has to be an assumption that the models are sufficiently accurate. A basic question that must be addressed is the validation of analytical methods used to model the predicted characteristics. If the methods have been validated against wind tunnel data, then they are subject to the same uncertainties as the basic small-scale measurements. Only if they have been validated against full-scale flight data should analytical methods be considered accurate, at least within the range of measurements. The object of this paper is to review some recent published research data from the viewpoint of how the results would be interpreted in the application to a full-scale design. Second, flight test experience with both passive and active vortex control devices is presented. We then discuss issues with designing a flight control system to include that capability. There needs to be consideration of the required control design technology. The overall intent is to help communication between researchers and aircraft designers, and to question whether the traditional techniques in those communities should be revised for future developments.
Derived from text
Active Control; Flow Distribution; Vortices; Full Scale Tests; Wind Tunnel Models; Control Systems Design; Aircraft Design

20040040268 NASA Dryden Flight Research Center, Edwards, CA, USA
Forebody Aerodynamics of the F-18 High Alpha Research Vehicle with Actuated Forebody Strakes
Fisher, David F.; Murri, Daniel G.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 17 pp.; In English; See also 20040040215; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Extensive pressure measurements and off-surface flow visualization were obtained on the forebody and strakes of the NASA F-18 High Alpha Research Vehicle (HARV) equipped with actuated forebody strakes. Forebody yawing moments were obtained by integrating the circumferential pressures on the forebody and strakes. Results show that large yawing moments can be generated with forebody strakes. At a 50 -angle-of-attack, deflecting one strake at a time resulted in a forebody yawing moment control reversal for small strake deflection angles. However, deflecting the strakes differentially about a 20 symmetric strake deployment eliminated the control reversal and produced a near linear variation of forebody yawing moment with differential strake deflection. At an angle of attack of 50 and for 0 and 20 symmetric strake deployments, a larger forebody yawing moment was generated by the forward fuselage (between the radome and the apex of the leading-edge extensions) than on the radome where the actuated forebody strakes were located. Cutouts on the flight vehicle strakes that were not on the wind tunnel models are believed to be responsible for deficits in the suction peaks on the flight radome pressure distributions and differences in the forebody yawing moments.
Author
Aerodynamic Configurations; F-18 Aircraft; Forebodies; Research Vehicles; Strakes; Computational Fluid Dynamics; Wind Tunnel Tests; Aircraft Control

20040040270 Pratt and Whitney Aircraft, East Hartford, CT, USA

The Importance of Cooling Technology in Propulsion and Power Systems

Auxier, Thomas A.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 6 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A02, Hardcopy

Turbine cooling is the breakthrough technology for gas turbine engines and although the turbine engine and cooling are considered mature technologies, to date they have only achieved about 60 to 70% of the cycle advantage available. Moreover, great improvements have been made in hot section materials and protective coatings, yet without hot section cooling, the high thrust to weight war fighter engine and the high bypass ratio turbofan engine would be greatly compromised. Specifically, the level of combustor exit temperature of today s engines which is key for improved cycles would be limited to less than 2300 F using today s best materials and alloys. Air cooled turbine cooling technology utilizes convection in conjunction with film cooling to achieve combustor exit temperatures at least 1000 F higher than the highest combustor exit temperature that could be achieved with just materials alone. Moreover, a stoichiometric turbine would be yet another 1000 F higher. Thus, to continue the trend towards stoichiometric capability, hot section cooling technology will be a key ingredient. The open system air cooling technology is comprised of convection and film cooling. Although convection is near its maximum potential, film cooling still has about 50 to 60% of its potential remaining to be utilized. Thus, improved air-cooled technology will most likely concentrate on improved film cooling capability. In addition, closed loop cooling systems will also probably be revisited.

Author

Cooling Systems; Propulsion System Configurations; Propulsion System Performance; Air Cooling; Convection; Gas Turbine Engines

20040040271 Oxford Univ., Oxford, UK

A Heat Transfer Study of a Film Cooled Nozzle Guide Vane

Sargison, J. E.; Guo, S. M.; Oldfield, M. L. G.; Jones, T. V.; Rawlinson, A. J.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 16 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

A heat transfer study of a heavily film cooled nozzle guide vane (NGV) has been conducted in a transonic annular cascade. Engine representative Mach and Reynolds numbers were simulated and the aerodynamic and thermodynamic characteristics of the coolant flow (momentum flux and density ratio between the coolant and mainstream) have been modelled by using a heavy 'foreign' gas (30.2% SF6 and 69.8% Ar by weight). NGVs with fan-shaped and cylindrical hole film cooling geometries have been studied. A variety of measurement techniques, namely transient liquid crystal methods, thin film gauges and direct heat flux gauges, have been used to measure the heat transfer coefficient and film cooling adiabatic effectiveness over the surfaces of the NGVs. Aerodynamic efficiency of the different NGV cooling systems were measured using a four-hole probe which traversed downstream of the NGVs. As the data is collected in an environment that models the engine, the data is of benefit for both CFD code validation and to check engine design methods. Predictions of the results are also given.

Author

Heat Transfer; Cooling Systems; Nozzle Efficiency; Transonic Flow; Aerodynamic Characteristics; Film Cooling

20040040272 Poznan Technical Univ., Poland

Influence of Combustion Condition and Air-Fuel Charge Rotation on Intensity of Heat Transfer in an IC Engine Operating on Gas Fuel

Rabiega, Janusz; Boguslawski, Leon; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 5 pp.; In English; See also 20040040215; Copyright; Avail: CASI; A01, Hardcopy

In the Heat Engineering Chair of Poznan University of Technology, there have been investigations carried out for the last 10 years, of heat transfer processes on the wall of a single action internal combustion engine. Investigations of local heat transfer coefficients were carried out in different combustion conditions and the engine was propelled with a methane-carbon dioxide mixture (65% of CH4 and 35% of CO2). There were changes of the timing, the excess air number (lambda = 1,05 +/- 1,3), and charge rotation. The authors investigated its influence on intensity of heat transfer in the single action internal combustion engine. The motion of the piston, the surface temperature of the chamber wall and pressure in the combustion chamber were recorded using a digital acquisition system. Then the transient heat flux from combustion gases to the wall was calculated, by solving numerically the unsteady inverse one-dimension heat conduction problem. The authors observed a

significant influence of the excess air number, ignition timing and the way of combustion mixture preparation on the process of heat transfer in the combustion chamber. Time dependent plots of heat flux to the wall are presented.
Author
Combustion Products; Conductive Heat Transfer; Wall Pressure; Process Heat; Pressure Chambers; Internal Combustion Engines

20040040273 Warwick Univ., Coventry, UK
High Bandwidth Heat Transfer Measurements in an Internal Combustion Engine under Low Load and Motored Conditions
Chana, K. S.; Wilson, T. S.; Bryanston-Cross, P.; Burnett, M.; Jones, T. V.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 8 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A02, Hardcopy

Heat transfer between the working fluid and the combustion chamber in an internal combustion engine is one of the most important parameters for cycle simulation and analysis. The heat transfer influences the in-cylinder pressure and temperature levels, engine efficiency and exhaust emissions. Most of the current research carried out on combustion chambers focuses on gas temperature measurement by Coherent Anti-Stokes Raman Scattering (CARS) and heat transfer measurements by thermocouples. Heat transfer measurement by thermocouples leads to poor bandwidths and large uncertainties. A more advanced experimental technique for heat transfer measurement used in gas-turbine engine research, platinum thin film resistance thermometers, has been recently employed in a single cylinder engine. Heat transfer rate measurements have been successfully obtained on the piston surface and cylinder head exposed to the combustion gases. The thin film gauge system has a frequency response of around 100kHz and hence can track the heat transfer rate changes on the piston surface and cylinder head adequately. Measurements taken with the engine motored and at low load are presented and discussed.
Author
Heat Transfer; Temperature Measurement; Internal Combustion Engines; Loads (Forces); Gas Temperature; Gas Turbine Engines

20040040274 ALSTOM Power Ltd., Baden-Daettwil, Switzerland
Film Cooling on a Concave Surface: Influence of External Pressure Gradient on Film Cooling Performance
Lutum, E.; vonWolfersdorf, J.; Semmler, K.; Naik, S.; Weigand, B.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 16 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

The film cooling performance on a concave surface with zero and favourable pressure gradient free-stream flow was investigated experimentally. Adiabatic film cooling effectiveness values have been obtained for five different injection geometries, three with cylindrical holes and two with shaped holes. Heat transfer coefficients were derived for selected injection configurations Air and CO2 injection was used to achieve a variation of the density ratio between coolant and free-stream acceleration caused generally an increase in adiabatic film cooling effectiveness for the investigated injection configurations and boundary conditions. This increase is stronger for the results obtained with cylindrical holes. No significant effects of the free-stream acceleration on the Stantion number ratios were obtained during corresponding heat transfer experiments. The determined heat flux ratios or film cooling performance indicated that coolant injection with shaped film cooling holes is much more efficient than with cylindrical holes especially at higher blowing rates.
Author
Film Cooling; Cylindrical Bodies; Surface Cooling; Heat Transfer; Pressure Effects

20040040275 Technische Univ., Darmstadt, Germany
Curvature Effects on Film Cooling with Injection Through Two Rows of Holes
Jung, K.; Hennecke, D. K.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 14 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The adiabatic film cooling effectiveness on convex and concave curved surfaces (as a model for suction and pressure side film cooling of gas turbine blades) with two staggered rows of injection holes are investigated by using a mass transfer technique. Additionally measurements on a flat plate are made for comparison. Two different radii of curvature (R/D = /- 60,

/- 120) and two streamwise distances of the rows (12D and 24D) with film cooling holes inclined at 40 are considered. The blowing rates are varied in a wide range from 0.25 to 2.0 and the main stream Reynolds numbers (Re(sub D)) between 10000 and 50000. At low and moderate blowing rates the effectiveness is enhanced on convex and reduced on concave curved surfaces compared to results obtained on the flat surface. At high blowing rates the effectiveness is not greatly influenced by surface curvature. The effect of curvature was found to be negligible between the two rows and reduced downstream of the second row compared to results described in the literature for single row injection.
Author
Adiabatic Conditions; Film Cooling; Injection; Hole Distribution (Mechanics); Turbine Blades; Gas Turbines

20040040276 Turbomeca S.A. - Brevets Szydlowski, Bordes, France
Experimental Study of Geometric Effect for Design of Multihole Cooling for Combustion Chamber Walls
Leger, B.; Schott, G.; Grienche, G.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 9 pp.; In English; See also 20040040215; Copyright; Avail: CASI; A02, Hardcopy

The increase of temperature and pressure in the gas turbines is a general trend that allows the engine performances to be increased. These higher thermodynamic cycles impose cooling systems of increasingly high performance. As a matter of fact, lean combustion, that is necessary to reduce the amount of nitrogen oxides (Nox) produced, consumes more and more air, and this air is taken mainly from the air usually reserved for cooling. The decrease of the quantity of air available for the cooling systems and the increase of the gas temperature in the combustion chamber are contradictory elements of the problem which oblige us to better control wall temperatures with a minimum air consumption. Multiholed walls in combustion chambers remain a satisfactory, efficient and low-cost solution to the problem. We have designed a test cell which allows us to improve our knowledge of this type of cooling system by varying the aerothermodynamic and geometric parameters. Many studies have been conducted on a single hole or on one, two or three rows of holes. These fairly complete studies well show the aerodynamic (jet penetration, turbulence analysis) and thermal (localized increase of heat transfer in and around the hole) aspects, but are in most cases applicable to the cooling of turbine
Author
Aerodynamic Characteristics; Air Cooling; Combustion Chambers; Cooling Systems; Design Analysis; Heat Transfer; Holes (Mechanics)

20040040278 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne, Germany
The Influence of Cooling Air Ejection on Flow Development and Heat Transfer in a Rotating Leading Edge Coolant Duct of a Film-Cooled Turbine Blade
Elfert, Martin; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 14 pp.; In English; See also 20040040215; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

With increasing turbine inlet temperature, the cooling of gas turbine components exposed to the hot gas flow will be of great importance. The improvement of the efficiency demands higher performance from the blade cooling systems with minimized coolant flow rates to cope with the increase in heat load as well as to meet the obligatory safety requirements. This calls for very accurate knowledge of the gas and coolant side flow and heat transfer, which both affect the blade temperature field, in order to obtain an efficient cooling design. This paper provides information about rotational effects on fluid motion and heat transfer within a rotating coolant duct of circular cross section with bleeding of cooling air through a row of film cooling holes for the purpose of film cooling of the hot gas side of the blade. Experimental data were obtained from a model mounted to the rotating duct facility at DLR. Flow development were measured by a non-intrusive optical Laser velocimeter. Wall temperature distributions around the duct wall and the generated heat were measured to provide data for local heat transfer analysis. The direction of bleeding is varied against the direction of rotation to study its effect on the development of secondary vortex structures which are generally caused within the flow by the rotational forces. Depending on the direction of bleeding, secondary vortex motion as well as heat transfer variation around the duct circumference are enhanced with pressure side ejection or weakened with suction side ejection.
Author
Air Flow; Cooling; Ejection; Heat Transfer; Rotation; Leading Edges; Ducts; Turbine Blades

20040040280 Rolls-Royce Ltd., Bristol, UK

Research into the Influence of Rotation on the Internal Cooling of Turbine Blades

Rowbury, D. A.; Parneix, S.; Chanteloup, D.; Lees, A.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 10 pp.; In English; See also 20040040215; Original contains black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

This paper provides an overview of the on-going work in the Brite-EuRam Internal Cooling of Turbine Blades (ICTB) project. The project is a collaborative, pan-European research program that brings together partners from industry and academia. The project aims to build an extensive experimental database concerning the effects of rotation on the internal flow distribution and heat transfer levels of rotor blades. The database will be used to develop correlations for integration into company design codes, thereby improving design methodologies, and for CFD code validation and improvement. Experiments are being conducted on a number of test facilities. Test rigs at Ecole Polytechnique Federale de Lausanne (EPFL) and Alstom UK allow static tests on realistic geometries, while testing on idealised geometries with rotation are carried out on facilities at the University of Wales Swansea (UWS) and Technische Universitat Darmstadt (TUD). Finally, an engine representative geometry is to be tested with rotation, matching all major non-dimensional parameters, in the new Rotating Heat Transfer Rig (RHTR) at R-R Bristol. The program concentrates on mass and heat transfer measurements in the bend regions of a multipass system, with heat transfer data collected for all passages in the engine representative model. A number of CFD codes are then used to analyse a wide variety of the test cases. The RHTR and the static test facilities provide full surface heat transfer coefficient data through the use of thermochromic liquid crystals. The EPFL rig also uses PIV to produce detailed velocity vector and turbulence measurements. The rotating rig at TUD employs the naphthalene sublimation technique to calculate mass transfer data. The UWS rig investigates the influence of rib angle, blockage ratio, pitch-to-height ratio, Reynolds number, and hub-to-tip ratio on heat transfer levels in square and rectangular passages through the application of a uniform wall heat flux. This paper gives a brief description of each of the test facilities involved in the program. Results derived from the test rigs at EPFL and UWS are presented, along with predictions of the EPFL data using FLUENT. These CFD predictions have been carried out at Alstom Switzerland (Alstom CH).

Author

Computational Fluid Dynamics; Cooling; Rotation; Turbine Blades; Test Facilities; General Overviews

20040040281 Politecnico di Milano, Milan, Italy

Experimental Measurements and Numerical Modelling of Conductive and Radiative Heat Transfer in Polytetrafluoroethylene

Galfetti, L.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 11 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Polytetrafluoroethylene (PTFE, or Teflon) components are used in propulsion and power systems due to their resistance in high temperature environments. Heat transfer in PTFE samples is investigated, both experimentally and numerically, to characterize the thermal protection behavior of PTFE samples under conductive and radiative heat sources. PTFE is known to undergo a sharp, reversible transition at 600 K, changing from the white, virgin substance to a transparent, amorphous material. As the temperature of PTFE is raised above 620-670 K, pyrolysis occurs and the polymer decomposes into gaseous products. Experiments performed using a CO2 laser show that the internal absorption of radiation causes a continuous increase of both the internal temperature and the thickness of the gel layer. These experimental data are then used to validate a model of the thermal response and degradation process of PTFE samples. To model the ablation processes, under the same operating conditions of the experimental approach, a transient one-dimensional model, including variable thermal properties and radiation absorption is written. Energy, mass conservation equation and the decomposition rate kinetic equations are discretized by means of a finite difference technique. The comparison between experimental and numerical results is then discussed. Conclusions stress the importance of a coordinated approach to investigate the design and the sizing of PTFE thermal protection systems under ablating and non-ablating conditions.

Author

Mathematical Models; Polytetrafluoroethylene; Radiative Heat Transfer; Conductive Heat Transfer; Kinetic Energy

20040040282 Air Force Research Lab., Wright-Patterson AFB, OH, USA

Installation Effects on Heat Transfer Measurements for a Turbine Vane

Polanka, Marc D.; Meininger, Matthew; Joe, Chris R.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Experiments have been conducted for a modern high pressure turbine vane in the USAF Turbine Research Facility (TRF). This turbine vane was instrumented with two types of heat flux gauges. The first was a thin film Upilex gauge design wrapped over the full airfoil surface, while the second consisted of Pyrex insert type gauges. Initial measurements showed significant discrepancies in the resultant Nusselt number from these two types of gauges. As the inlet Reynolds number was decreased, these discrepancies collapsed to single laminar level Nusselt number. This suggested a potential change in the flowfield for one of the gauge types. Interrogation of the vane surface metrology showed depressions in the epoxy filler between the Pyrex insert and the metal airfoil. After filling these depressions, the vane was reinstalled and identical tests repeated. This second test revealed a better comparison for two of the Pyrex insert gauges while minimal change resulted in two other gauges. Similar results were achieved for the range of Reynolds numbers tested in laminar, transitional, and turbulent regions for the airfoil. These results suggest that further installation effects may still be present in the Pyrex gauges. Such alterations in the flow field can lead to misleading results and costly errors when applying experimental rig data to turbine design.
Author
Installing; Heat Transfer; Measuring Instruments; Turbines; High Pressure; Vanes

20040040283 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Moissy-Cramayel, France
Aerothermal Technologies and Design Tools for Advanced HP Turbines
Brisset, C.; Duboue, J. M.; Picot, P.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 18 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The design of advanced turbines has to meet ever more ambitious requirements. Higher performances and component life must be reached within shorter design cycles at lower cost. Snecma Moteurs is building up an extensive experience in the design and manufacturing of the next generation of high pressure turbines for military and commercial aircraft engines. The purpose of the present contribution is to report on the recent advances in the design of cooling technologies for High Pressure (HP) turbine blades. First of all, the new concepts of advanced cooling circuits are described and their interests in terms of life duration put into relief. Several examples demonstrate the way these new advanced cooling technologies can be optimized by carrying out high-tech Computational Fluid Dynamics (CFD) methods. Finally, validation cases of the aerothermal methodology analysis built up at Snecma Moteurs are detailed. They present the interest of being focused on engine tests results and show the degree of performance and quality that Snecma Moteurs HP turbines aerothermal technology and design tools have now reached.
Author
Aerothermodynamics; Computational Fluid Dynamics; High Pressure; Turbine Engines; Cooling; Engine Design; Technology Utilization

20040040284 Technische Hochschule, Aachen, Germany
Numerical Investigation on Flow Field and Heat Transfer Phenomena in Multi-Hole Cooling Configurations
Bohn, Dieter E.; Moritz, Norbert; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 10 pp.; In English; See also 20040040215; Original contains black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

A transpiration cooled flat plate configuration is investigated numerically by application of a 3-D conjugate fluid flow and heat transfer solver, CHT-Flow. The geometrical setup and the fluid flow conditions are derived from modern gas turbine combustion chambers. The plate is composed of three layers, a substrate layer (CMSX-4) with a thickness of 2 mm, a bondcoat (MCrAlY) with a thickness 0,15 mm, and a thermal barrier coating (EB-PVD, Yttrium stabilized ZrO2) with a thickness 0,25 mm, respectively. The results of aerothermal calculations with adiabatic wall boundary conditions and the results of aerothermal calculation with fixed surface temperatures are compared to conjugate calculations that comprise both the fluid flow and the solid body. For conjugate calculations, there are no boundary conditions prescribed on the wall surfaces that are in contact with the fluid flow. The surface temperatures from the conjugate calculations are used as a boundary condition in the case of the aerothermal calculations with fixed surface temperatures. For the conjugate calculations the numerical grid contains the cooling holes, the solid body, and the main flow area upon the plate. For the aerothermal investigations the grid contains the cooling holes and the main flow area. The transpiration cooling is realized by finest drilled holes with a diameter of 0,2 mm that are shaped in the region of the thermal barrier coating. The holes are inclined with an angle of 30 deg. Two different configurations are investigated that differ in the shaping of the holes in their outlet region. The numerical investigations focus on the deviation for the prediction of the thermal load of the solid body in the case of realistic cooling configuration that are induced by neglect of the heat transfer in the solid body. Due to a different prediction of the heat fluxes

the structure of the cooling film deviates significantly between conjugate and aerothermal analysis. This investigations show that aerothermal investigation can only be a first step in a design process of cooling configurations.
Author
Numerical Analysis; Flow Distribution; Heat Transfer; Cooling; Zirconium Oxides; Surface Temperature; Thermal Analysis

20040040285 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Moissy-Cramayel, France
Use of NS3D Code in the Design of HPT Blade Cooling Air Supply Systems
Balland, M.; Coulon, S.; Monchois, F.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 11 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Competition in aeronautical propulsion imposes new challenges in terms of maintenance costs and product availability. Within the HP turbine design process, aero-thermal engineers are given only a short time in which to propose adequate solutions for HPT blade cooling air supply systems. The industrialization of the SAVIRAT chain at SNECMA MOTEURS offers opportunities for applying Navier-Stokes calculations which are now compatible with the quality and time constraints of a project design phase. One clear way to improve the life time of HPT disks is to remove hooks between the forward sealing plate and the HPT disk itself. In addition to its main mechanical function, this device also optimizes the relative speed of the HPT blade cooling air before it enters the slot bottoms. This document details the contribution made by Navier-Stokes 3D analyses during the HPT disk design phase, in the event of a simple contact, without hooks, between the forward flange and the disk rim. A fluid and solid wall 3D mesh represents the HPT cooling air supply system, from the forward sealing plate exit holes to the entry of the cooling air in the blade root. Calculations were carried out under adiabatic conditions. Models have been created for several configurations. These have led us to draw the following conclusions: - where a no hook device is used, analysis reveals a vortex phenomenon due to bailing, - in the case of a conventional solution with hooks, the vortex phenomenon disappears and the pressure distribution in the slot bottoms is homogenous, - fitting blade roots with axial air deflectors restores air supply quality in slot bottoms. To conclude, the state of industrialization of the SAVIRAT chain at SNECMA MOTEURS allows aero-thermal engineers to use 2D or 3D Navier-Stokes calculation supports for design work. Some applications may have a significant impact on the optimization of components, in terms of efficiency or maximizing life time. Secondary flows of turbine rotors are one of the most interesting fields of application.
Author
Adiabatic Conditions; Aerodynamic Heating; Air Quality; Cooling Systems; Navier-Stokes Equation

20040040286 Bergamo Univ., Bergamo, Italy
Experimental Investigation of Cooling Jets Mixing in a Gas Turbine Cascade
Barigozzi, G.; Bassi, F.; Perdichizzi, A.; Savini, M.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 14 pp.; In English; See also 20040040215; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper presents an overview of the experimental results concerning a full coverage film cooled vane cascade investigation. Main objectives of this study were a detailed description of the cooling jets to mainstream aerodynamic mixing process and related loss generation mechanisms, together with the generation of a data set for CFD codes validation. Experimental results have been obtained in a low speed wind tunnel for linear cascade testing. The tested blade profile is typical of a real gas turbine nozzle vane. Full coverage film cooling is achieved by means of 11 injection rows fed by a single internal cavity: 3 are located on the pressure side, 5 on the suction side and 3 in the leading edge region. All tests have been performed using air as coolant fluid, matching the design momentum flux ratio; this condition corresponds to an overall mass flow ratio equal to 2.5 %. A detailed experimental investigation has been performed in order to characterize the vane performances. Tests include mean and turbulent blade to blade velocity distributions, boundary layer profiles and a detailed description of cooling jet mixing process in the near hole region of the last pressure and suction side injection rows. Similar tests have been also performed on a solid blade cascade (without injection holes).
Author
Film Cooling; Gas Turbines; Jet Mixing Flow; Low Speed Wind Tunnels; Computational Fluid Dynamics; Cascade Flow; Two Dimensional Flow; Vanes

20040040287 Florence Univ., Italy

Heat Transfer Modelling in Gas Turbine Stage

Martelli, F.; Adami, P.; Belardini, E.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 17 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Two 3D CFD solvers for internal flow applications are briefly presented and applied for the investigation of heat transfer problems in gas turbine components. The numerical approaches considered are respectively based on a structured (XFLOS) and on an unstructured (HybFlow) methods. The two solvers are briefly described in terms of discretization scheme and turbulence modelling features for gas-turbine applications. Information are also provided concerning the unsteady approach, the multi-blok extension and the parallel porting of the two codes. These implementations are considered for improving the computational efficiency in the application to complex 3D stage investigations. Particular care is demanded to the turbulent flow modelling which assumes great concern for heat transfer predictions on high loaded transonic turbine blades. According this observation, the two CFD approaches are initially applied to the heat transfer investigation of a 2D transonic turbine inlet NGV. Following this first assessment the thermal investigation of blade rows in considered for a 2D unsteady stage environment while further developments are finally reported for the 3D case.

Author

Computational Fluid Dynamics; Gas Turbine Engines; Three Dimensional Flow; Mathematical Models; Heat Transfer

20040040288 Loughborough Univ. of Technology, UK

Conjugate Heat Transfer Predictions of a Combustor Heatshield Containing Pedestals

Luff, J. K.; McGuirk, J. J.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper reports an investigation into the use of CFD methods for modelling the combined fluid flow and heat transfer in a generic combustor heatshield geometry typical of current aeroengine designs. The study describes the development and testing of a conjugate heat transfer methodology, to allow the CFD code to predict the heat exchange in both fluid and solid regions of the solution domain simultaneously; special attention is given to continuity of heat flux at the fluid/solid interface. The heatshield cooling air is supplied via rows of jets that flow through holes in the backplate and impinge on the heatshield backside. An interesting phenomenon associated with these jets is investigated. It is noticed that under some conditions of heatshield flow, jet impingement leads to the model predicting a minimum in heat transfer coefficient, rather than a maximum, at the impingement point. It is shown, by predicting the measured Nusselt number distribution in a single impinging jet experiment, that this is a correct simulation, associated with the combined effects of low impingement height and low turbulence levels in the jet cores. The presence of pedestals on the impingement surface removes this effect by creating extra turbulence and enhancing conductive paths for heat transfer. A model for including the pedestals in both flow and heat exchange processes as a sub-grid-scale model in the CFD simulation is described. An illustrative calculation of the performance of the overall model for a realistic heatshield geometry is provided, indicating the predicted spatial variation of temperature on heatshield surfaces.

Author

Heat Transfer; Fluid Flow; Combustion Chambers; Heat Shielding

20040040289 Research and Technology Organization, Neuilly-sur-Seine, France

Unsteady Simulations of Film Cooling in Turbine Blades

Sekar, B.; Mawid, M. A.; Park, T. W.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; In English; See also 20040040215; Copyright; Avail: Other Sources; Paper was not available at the time of publication

Contents include the following: Military Vortices. Motion Effects on Leading-Edge Vortex Behavior over Delta Wings and Generalised Modeling. An Experimental Investigation of Leading Edge Vortices and Passage to Stall of Nonslender Delta Wings. An Experimental and Computational Study of the Aerodynamics of a Square Cross-Section Body at Supersonic Speeds. An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack. Pitfalls in the Interpretation of Delta Wing Flow Visualisation. Study on Unsteady Vortex Behaviour of a Rolling 65 Delta Wing at M=0.8 using Pressure Sensitive Paint (PSP). Transonic Pressure, Force, and Flow-Visualization Measurements on a Pitching Straked Delta Wing at High Alpha. A New Vortex Flow Experiment for Computer Code Validation. Vortex Flow Dilemmas and Control on Wing Planforms for High Speeds. Unsteady Aerodynamic Model for Thin Wings with Evolutive Vortex Sheets.

Time Accurate Euler Calculations of Vortical Flow over a Delta Wing in Rolling Motion. Unsteady Flows and Airfoil-Vortex Interaction. Vortical Flow Prediction Using an Adaptive Unstructured Grid Method. Leading Edge Vortex Flow Computations and Comparison with DNW-HST Wind Tunnel Data. Numerical Simulation of Vortex Flows Around Missile Configurations. Axisymmetric and Non- Axisymmetric Initiation of Vortex Breakdown. A Critical Assessment and Requirement for Ground Testing on Vortex. Breakdown Locations over Delta Wings. Normal Shock Vortex Interaction. Experimental Investigation of Vortex Breakdown over a Delta Wing with Consideration of Control by Fluid Injection. Numerical Modelling of Vortex Flow Instabilities and Interactions. Time Accurate Simulations of High-Alpha Aerodynamics for Pitching Delta Wings.
CASI
Aerodynamic Characteristics; Aerodynamic Configurations; Computational Fluid Dynamics; Computer Programs; Flow Visualization; Mathematical Models

20040040290 NASA Langley Research Center, Hampton, VA, USA
Control of Interacting Vortex Flows at Subsonic and Transonic Speeds Using Passive Porosity
Erickson, Gary E.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 8 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

A wind tunnel experiment was conducted in the NASA Langley Research Center (LaRC) 8-Foot Transonic Pressure Tunnel (TPT) to determine the effects of passive surface porosity on vortex flow interactions about a general research fighter configuration at subsonic and transonic speeds. Flow-through porosity was applied to a wing leading-edge extension (LEX) mounted to a 65 deg cropped delta wing model to promote large nose-down pitching moment increments at high angles of attack. Porosity decreased the vorticity shed from the LEX, which weakened the LEX vortex and altered the global interactions of the LEX and wing vortices at high angles of attack. Six-component forces and moments and wing upper surface static pressure distributions were obtained at free-stream Mach numbers of 0.50, 0.85, and 1.20, Reynolds number of 2.5(10(exp 6)) per foot, angles of attack up to 30 deg, and angles of sideslip to +/- 8 deg. The off-surface flow field was visualized in selected cross-planes using a laser vapor screen flow visualization technique. Test data were obtained with a centerline vertical tail and with alternate twin, wing-mounted vertical fins having 0 deg and 30 deg cant angles. In addition, the porosity of the LEX was compartmentalized to determine the sensitivity of the vortex-dominated aerodynamics to the location and level of porosity applied to the LEX.
Author
Vortices; Wind Tunnel Tests; Porosity; Delta Wings; Leading Edges; Subsonic Speed; Transonic Speed

20040040292 National Aerospace Lab., Emmeloord, Netherlands
Analysis of Combined Convective and Film Cooling on an Existing Turbine Blade
deWolf, Wim B.; Woldendorp, Sandor; Tinga, Tiedo; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 17 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

To support gas turbine operators, NLR is developing capabilities for life assessment of hot engine components. As a typical example the first rotor blades of the high pressure (HP) turbine of the F-100-PW-220 military turbofan will be discussed. For these blades tools have been developed to derive the blade temperature history from flight data obtained from F-16 missions. The resulting relative life consumption estimate should support the Royal Netherlands Air Force in their engine maintenance activities. The present paper describes the prediction method for the blade temperature, based on reverse engineering. Input data are the flight data of the engine performance parameters and the geometry of the HP turbine blades and vanes including film cooling orifices. The engine performance parameters are converted in HP turbine entry and exit conditions by the NLR Gas Turbine Simulation Program (GSP) engine model. Next a Computational Fluid dynamics (CFD) tool is used to calculate the resulting flow field and heat transfer coefficients without film cooling. An engineering method is used to predict the internal cooling and the resulting film injection temperature. The film cooling efficiency is estimated and a finite element method (FEM) for heat conduction completes the analysis tool. The method is illustrated by results obtained for the engine design point.
Author
Computational Fluid Dynamics; Film Cooling; Turbine Blades; High Pressure; Turbofans; Convective Heat Transfer; Military Aircraft

20040040336 Rensselaer Polytechnic Inst., Troy, NY, USA

Investigation of the Flow-Induced Vibration in the E2 Test Facility

Castillo, Luciano; August 17, 2001; 16 pp.; In English

Report No.(s): NASA/NP-2002-02-00006-SSC; No Copyright; Avail: CASI; A03, Hardcopy

An investigation of flow induced vibration due to coupling between the fluid flow and the propellants lines (LOX and RP-1) was performed. Various flow rate conditions were studied to check whether flow induced vibration was possible due to vortex shedding in both valves and pipe lines. Resonance test was conducted for all segments of the LOX-feedline for the preburner under test. In addition, critical values of frequency and velocity are calculated using a mass damping model. A simple chart characterizing the relation between frequency and velocity is developed for each component; i.e. propellant lines, valves and flow meters. It was found that flow induced vibration occurs for various segments with flow rates of 113 lb/s, 275 lb/s and 40 lb/s. Even more interesting using critical conditions for buckling, it was found that the valve or pipe may collapse for a flow rate of 275 lb/s and valve height of 10% of pipe diameter. Furthermore, two models for the acoustic pressure acting on the segments particularly for the valve are proposed.

Author

Test Facilities; Fluid Flow; Vibration; Mathematical Models; Feed Systems; Propellants

20040040374 Kyoto Inst. of Tech., Japan

Study on the Flow Behaviour of SMC Products

Hamada, H.; Hasegawa, T.; Tanigaki, E.; Naito, H.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 339-344; In English; See also 20040040360; Copyright; Avail: Other Sources

SMC possesses the superior features such as high processing ability or good surface smoothness without any particular technique. Therefore it is used for relatively large composite structures such as bath unit. On the other hand, since SMC is composed of short fiber and large amount fillers, that leads complex material flow during compression molding process and the large scatter of mechanical properties. As a consequence, the material flow behavior should be understood to design the SMC products. SMC materials are usually set in a die as the laminated materials so that several SMC laminates are stacked together. Material flow of SMC is not uniform such as metal forming. The slippage flows between laminates, which were typical flow behavior of SMC at initial stage in compression molding, have been already found. It is considered that the initial flow behavior greatly affects on following flow and filling process. In this study, the initial flow behavior characterized by slippage was analyzed with using large deformation finite element analysis. Particularly it is noted here that double nodes were set between layers in order to display slippage flow.

Author

Composite Structures; Finite Element Method; Mechanical Properties; Forming Techniques

20040040375 Swedish Inst. of Composites, Pitea, Sweden

Squeeze Flow Rheology in Large Tools

Vahlund, C. Fredrik; Gebart, B. Rikard; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 365-372; In English; See also 20040040360; Copyright; Avail: Other Sources

A 310t hydraulic press has been modified for squeeze flow rheology studies so that large tools and high closing velocities can be achieved. Isothermal squeeze flow experiments of GMT have been performed for closing velocities up to 30 mm/s and maximum closing forces of 1000 kN. Successful power law fits of closing velocity versus closing force data have been performed for the velocity interval 3-30 mm/s.

Author

Mathematical Models; Isothermal Flow; Rheology; Flow Velocity

20040040382 Delaware Univ., Newark, DE, USA

Modelling and Control of Liquid Composite Mold Filling Process

Sozer, E. M.; Bickerton, S.; Advani, S. G.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 109-124; In English; See also 20040040360

Contract(s)/Grant(s): N00014-97-C-0415; Copyright; Avail: Other Sources

Liquid Composite Molding (LCM) processes are gaining popularity in various composites industries, including aerospace, automotive, infrastructure and marine. LCM encompasses an increasing group of mold filling processes, which involve the injection of a resin into a mold cavity filled with a fibrous reinforcement preform. The goal is to understand the fiber fluid interactions at the microscopic level and to develop a macroscopic description to predict the movement of the free

surface flow front of a thermosetting resin through a complex three-dimensional mold geometry. Practice has converged on use of Darcy's law to describe the impregnation process by treating the stationary fibers as an anisotropic porous media. A key to successful modeling is the permeability of the porous media which characterizes the resistance of the fibers to the flow of the infiltrating resin. The seminar will address modeling permeability for plain weave fabric, fabric deformation and its effect on flow, race tracking near the mold walls and edges, presence of fiber bundles with low permeabilities as compared to the overall preform resistance and how to incorporate this knowledge in a numerical simulation of the LCM process. A promising approach to implement on-line control of LCM based on numerical simulations and in-situ sensors will also be discussed.
Author
Thermosetting Resins; Porosity; Free Flow; Anisotropic Media; Approach Control; Deformation

20040040396 Surrey Univ., Guildford, UK
Predictions and Measurement of the Permeability and Capillary Pressure in Capillary Flows Through Woven Fabrics
Amico, S. C.; Lakakou, C.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 311-318; In English; See also 20040040360; Copyright; Avail: Other Sources

The present work refers to the capillary flow of Newtonian fluids along E-glass fibre yams and through a plain-woven fabric. In the first case, one-dimensional Darcy's flow is considered through the micropores of the fibre yarns. In the second case, two-dimensional inplane network infiltration is considered through the micropores of the network of fibre bundles in the fabric. In both eases predictions include the infiltration length as a function of time, the apparent permeability and the capillary pressure. The latter case also includes the number of unsaturated transverse yams and the degree of saturation. All predictions are compared to experimental measurements and the agreement is very good.
Author
Capillary Flow; Fabrics; Microporosity; Time Dependence; Bundles

20040041383 Defence Science and Technology Organisation, Edinburgh, Australia
A Thermodynamically Complete Model for Simulation of One-Dimensional Multi-Phase Flows
Resnyansky, A. D.; October 2003; 36 pp.; In English
Report No.(s): DSTO-TR-1510; DODA-AR-012-922; Copyright; Avail: Other Sources

The publication describes a convenient form of one-dimensional equations describing the multi- phase flows associated with the initiation of novel warheads. The model, which has been proposed earlier for the case of two phases, is extended to the case of multi-phase flows. The generalized pressure and energy, which are used in the theory of mixtures, are linked through a thermodynamic potential within the present formulation.
Author
Thermodynamics; Multiphase Flow; Simulation

20040041409 Syracuse Univ., NY, USA
Workshop on Transition and Unsteady Aspects of Turbomachinery Flows
LaGraff, John E.; [2004]; 10 pp.; In English
Contract(s)/Grant(s): NAG3-2837; No Copyright; Avail: CASI; A02, Hardcopy

A workshop was organized on the topic of the title and held on August 17-20, 2003 at the Syracuse University Minnowbrook Conference Center in Blue Mountain Lake, New York. Attendance was by invitation only, 47 guests attended and 30 presentations were made. Support was received from NASA Glenn Research Center, the US Air Force Office of Scientific Research, the European Office of Aeronautical Research and Development, the Asian Office of Aeronautical Research and Development and Syracuse University. This workshop was the fourth in a trienniel series beginning in 1993. A publication under a NASA CP 2004-212913 will be issued and include all abstracts. No full written papers were required. This report includes a list of attendees and the program of presentations. The next workshop is scheduled for August 20-23, 2006.
Author
Conferences; Turbomachinery

20040042430 NASA Ames Research Center, Moffett Field, CA, USA
Divergence Free High Order Filter Methods for Multiscale Non-ideal MHD Flows
Yee, H. C.; Sjoegreen, Bjoern; December 1, 2003; 1 pp.; In English; ICOSAHOM 2004, 21-25 Jun. 2004, Providence, RI, USA; No Copyright; Avail: Other Sources; Abstract Only

Low-dissipative high order filter finite difference methods for long time wave propagation of shock/turbulence/combustion compressible viscous MHD flows has been constructed. Several variants of the filter approach that cater to different flow types are proposed. These filters provide a natural and efficient way for the minimization of the divergence of the magnetic field (Delta . B) numerical error in the sense that no standard divergence cleaning is required. For certain 2-D MHD test problems, divergence free preservation of the magnetic fields of these filter schemes has been achieved.
Author
Finite Difference Theory; Magnetohydrodynamic Flow; Wave Propagation; Dissipation; Divergence

20040043773 Naval Postgraduate School, Monterey, CA
Cold Flow Drag Measurement and Numerical Performance Prediction of a Miniature Ramjet at Mach 4
Khoo, Wee Teik; Dec. 2003; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420634; No Copyright; Avail: CASI; A05, Hardcopy

Experimentation was carried out in a supersonic wind tunnel to investigate the drag force on a miniature ramjet when subjected to Mach 4 flow. CFDRC-FASTRAN, a numerical flow solver developed for the analysis of high-speed flows was used to model the performance of the miniature ramjet. To reduce computational time, a 2D axisymmetric model of the ramjet was developed to investigate the shock angles over the intake and the results were compared with the experiment. A 3D axisymmetric flow model was developed to investigate the fuel mixing which was injected into the ramjet from the nose cone and from the struts, which held the centerbody in place. Finally a 2D model was developed to investigate the combustion of the propane fuel, which was injected from the struts. For all of the simulations a two- equation, k-omega, turbulence model was used. Further investigation is needed at supersonic freestream conditions in the simulation of the combustion process.
DTIC
Drag; Drag Measurement; Flow Measurement; Mathematical Models; Miniaturization; Performance Prediction; Ramjet Engines; Supersonic Speed

20040043789 California Univ., Davis, CA
Instabilities and Transition in Three-Dimensional Boundary Layers with Emphasis on Gas-Turbine-Blade Flows
Ryzhov, Oleg S.; Jan. 2000; 18 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0066
Report No.(s): AD-A420665; AFRL-SR-AR-TR-04-0136; No Copyright; Avail: CASI; A03, Hardcopy

Absolute instability of (Gortler vortices on the severely curved concave pressure side of a gas-turbine blade is the main thrust of the third-year work under this grant. For the most part, the Gortler vortices have been investigated in an incompressible boundary layer over thin-wing sections or artificial inserts on an otherwise flat plate. The cascade of modem aircraft engines operate in the high subsonic Mach number regime with velocity fields strongly affected by centrifugal forces maintained by the large curvature of profiles. Unsteady spiral-type vortices developing in these environments provoke the absolute instability in the streamwise direction of the boundary layer leading to earlier transition. An effort undertaken after the meeting in Shalimar (May 29-31, 2002) show that the heat transfer coefficient is even more susceptible to enhancing oscillations in the upstream moving wave packets than the pressure.
DTIC
Boundary Layers; Gas Turbines; Stability; Three Dimensional Boundary Layer; Turbine Blades

20040043809 Naval Postgraduate School, Monterey, CA
Fin Stabilizers As Maneuver Control Surfaces
Sarch, Martin G.; Dec. 2003; 131 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420698; No Copyright; Avail: CASI; A07, Hardcopy

Roll angle is often a limiting factor during high- speed turns and repetitive turning maneuvers. Navy and Coast Guard surface ships are designed for high-speed operation. Sharper turns at higher speeds and repetitive high-speed turns can increase ship survivability by helping these vessels avoid incoming threats. This is particularly true if the amount and direction of roll during the turn is controlled since the ship's susceptibility to radar and other sensors may be diminished at certain angles. Sharper turns at higher speeds can also reduce the time it takes to reach a person in the water, improving the chances for successful rescue. Controlled roll during repetitive sharp turns can make high-speed pursuit safer and more likely to succeed. The objective of this thesis is to study the effects of fin stabilizers on a ship's turning performance. Fin stabilizers, commonly added to a ship design for the sole purpose of minimizing unwanted roll during ordinary operations, are shown to also favorably influence both the magnitude and direction of heel experienced during high speed and repetitive maneuvers. The

effects of fin stabilizers on other turn performance characteristics are also examined. A strategy for actively employing fins during maneuvers is proposed.
DTIC
Control Surfaces; Fins; Stabilizers (Fluid Dynamics)

20040043825 Texas A&M Univ., College Station, TX
Unified Framework for Development of Pressure- Strain Correlation Turbulent Transport and Sub-Grid Stress Closure Models for Turbulence Simulation
Girimaji, Sharath S.; Sep. 2003; 89 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0476; Proj-2307
Report No.(s): AD-A420725; AFRL-SR-AR-TR-04-0135; No Copyright; Avail: CASI; A05, Hardcopy

Study of turbulence is of vital scientific, military and economic interest. Advances in several areas of external aerodynamics and internal combustor flows of interest to Air Force hinge on our ability to clearly understand and adequately predict the effects of turbulence. At the current time, however, there exists a substantial gap between our knowledge of the physics of turbulence phenomenon and the physics that is incorporated into turbulence models, especially subgrid closures. The disciplines of turbulence theory/ analysis (e.g., rapid distortion theory, spectral closure models), high-order turbulence modeling (e.g., second- moment closures, structure-based models and realizability constraints) and turbulence simulation (DNS- direct numerical simulations, and LES- large eddy simulations) are evolving independently with very little cross fertilization of ideas. For example, the currently popular LES subgrid closures (e.g., Smagorinsky, dynamic Smagorinsky) are algebraic in nature; completely insensitive to extra rates of strain such as rotation, curvature, and buoyancy and, further, may not even be realizable. These major deficiencies in the LES-SGS modeling are tolerated despite the fact that, in higher order closures, these physical effects and mathematical constraints have long been represented adequately. Further, we would like to point out that the very premise of detached-eddy simulation (DES) approach - that is seen as the practical computational tool for turbulence - is erroneous. This is due to the fact that inhomogeneous spatial filtering is inevitable in this method, and yet the governing equations ignore the effects that necessarily arise with inhomogeneous filtering of the velocity field.
DTIC
Simulation; Stress Analysis; Turbulence; Turbulent Flow

20040043930 Lawrence Livermore National Lab., Livermore, CA
Lattice Boltzmann Simulation of Particle Laden Flows in Microfluidic Systems
Clague, David S.; Weisgraber, Todd; Wheeler, Elizabeth; Dec. 2003; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA875000096; DARPA ORDER-E117; Proj-E117
Report No.(s): AD-A420860; AFRL-IF-RS-TR-2003-289; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this effort was to develop dynamic simulation tools to study and characterize particulate transport in Microfluidic devices. This includes the effects of external fields and near-field particle-particle, particle- surface interactions. The unique aspects of this effort are that we focused on the particles in suspension and rigorously accounted for all of the interactions that they experienced in solution. In contrast, other numerical methods within the program, finite element and finite volume approaches incorporated approximations to begin to account for particle- particle interactions. Through the programs (BioFlips and SIMBIOSYS), we developed collaborative relationships with device-oriented efforts. More specifically and at the request of the SIMBIOSYS program manager, we allowed our efforts/milestones to be more guided by the needs of our BioFlips colleagues; therefore, our efforts were focused on the needs of the MD Anderson Cancer Center (Peter Gascoyne), UC Davis (Rosemary Smith), and UC Berkeley (Dorian Liepmann). The first two collaborations involved the development of Dielectrophoresis analysis tools and the later involved the development of suspension and fluid modeling tools for microneedles.
DTIC
Fluidics; Simulation

20040045158 NASA Ames Research Center, Moffett Field, CA, USA
Efficient Low Dissipative High Order Schemes for Multiscale MHD Flows, I: Basic Theory
Sjoegreen, Bjoern; Yee, H. C.; April 10, 2003; 25 pp.; In English; AIAA CFD Conference, 23-26 Jun. 2003, Orlando, FL, USA; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this paper is to extend our recently developed highly parallelizable nonlinear stable high order schemes for complex multiscale hydrodynamic applications to the viscous MHD equations. These schemes employed multiresolution

wavelets as adaptive numerical dissipation controls t o limit the amount of and to aid the selection and/or blending of the appropriate types of dissipation to be used. The new scheme is formulated for both the conservative and non-conservative form of the MHD equations in curvilinear grids. The four advantages of the present approach over existing MHD schemes reported in the open literature are as follows. First, the scheme is constructed for long-time integrations of shock/turbulence/combustion MHD flows. Available schemes are too diffusive for long-time integrations and/or turbulence/combustion problems. Second, unlike exist- ing schemes for the conservative MHD equations which suffer from ill-conditioned eigen- decompositions, the present scheme makes use of a well-conditioned eigen-decomposition obtained from a minor modification of the eigenvectors of the non-conservative MHD equations t o solve the conservative form of the MHD equations. Third, this approach of using the non-conservative eigensystem when solving the conservative equations also works well in the context of standard shock-capturing schemes for the MHD equations. Fourth, a new approach to minimize the numerical error of the divergence-free magnetic condition for high order schemes is introduced. Numerical experiments with typical MHD model problems revealed the applicability of the newly developed schemes for the MHD equations.
Author
Dissipation; Magnetohydrodynamic Flow; Numerical Analysis; Adaptive Control; Multiscale Models

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20040035807 NASA Goddard Space Flight Center, Greenbelt, MD, USA
AIRS Geolocated Radiometric Data Products/AMSU-A Geolocated Radiometric Data Products
Vicente, Gilberto; [2003]; 2 pp.; In English; Fall 2003 AGU Meeting, Dec. 2003, USA; Original contains color illustrations
Report No.(s): NASA/NP-2003-11-594-GSFC; No Copyright; Avail: CASI; A01, Hardcopy

This report presents AIRS data product information on: AIRIBRAD, IR level 1B radiances; Vis/NIR level 1B radiances;L1B Daily Summary Browse Product (Cloud Radiance); and the Advanced Microwave Sounding Unit-A (AMSU-A).
Derived from text
Advanced Microwave Sounding Unit; Radiometers; Precipitation (Meteorology)

20040035971 Texas Univ., Austin, TX
Exploitation of Microdoppler and Multiple Scattering Phenomena for Radar Target Recognition
Ling, Hao; Jan. 15, 2004; 69 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0021
Report No.(s): AD-A420040; 4; No Copyright; Avail: CASI; A04, Hardcopy

This report summarizes the scientific progress on the research grant 'Exploitation of MicroDoppler and Multiple Scattering Phenomena for Radar Target Recognition' during the period 1 October 2002 - 30 September 2003. Research on the construction of a microDoppler radar and the resulting data collection and signal processing is presented. Additional research into ray tracing simulation, inverse scattering and time reversal imaging is also reported.
DTIC
Doppler Radar; Inverse Scattering; Radar Targets; Target Recognition

20040036037 Utah State Univ., Logan, UT
Lidar Upgrade for Temperatures Winds and Structures at the Edge of Space
Wickwar, Vincent B.; Jan. 2001; 16 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0275
Report No.(s): AD-A420093; AFRL-SR-AR-TR-04-0100; No Copyright; Avail: CASI; A03, Hardcopy

With funds from DURIP grant F49620-01-1-0275, Utah State University (USU) purchased equipment and components to upgrade the Atmospheric Lidar Observatory (ALO) operated by the Center for Atmospheric and Space Sciences (CASS) on the University campus. (Other funds are being used for labor to integrate these into the lidar system.) The upgrade is to the large lidar telescope and to related laser and detector systems. This will make it possible to measure Doppler winds and spatial structures in neutral density and temperature at the edge of space (i.e., in the upper mesosphere, mesopause, and lower

thermosphere) between 80 and 105 km altitude. This is a region that has been very difficult to study from the ground or from space. Yet it is a region with very strong winds, waves, and variability in temperatures and densities. This upgraded research capability at ALO will provide a long- term ability at mid latitude to specify this region and to determine the dominant physics so as to develop a predictive capability. This includes distinguishing the effects of space weather from those that propagate upwards into this region. The information garnered by this research will be applicable to numerous Air Force (AF) programs and systems including those that need to evaluate infrared backgrounds and distinguish man-made objects from structured backgrounds, that are affected by large time-varying density changes, and that depend on thermospheric densities to determine ionospheric densities and their variations. These upgraded observational capabilities will complement and extend similar ones that the AF has supported at much higher latitudes (ALOMAR in Norway) and is supporting at much lower latitudes (AEGIS in Hawaii). This upgraded facility will significantly improve research opportunities at USU at all levels. ALO attracts many very good students. A half dozen undergraduate students carry out the observations and many of them participate in the research.
DTIC
Optical Radar

20040036493 Cornell Univ., Ithaca, NY
Numerical Errors in Weight Vector Computation
Bojanczyk, Adam; Mar. 2003; 10 pp.; In English
Report No.(s): AD-A420469; No Copyright; Avail: CASI; A02, Hardcopy
Presentation of numerical errors in weight vector computations used in signal processing.
DTIC
Signal Processing

20040036495 Florida Univ., Gainesville, FL
Robust Capon Beamforming
Jiang, Yi; Stoica, Petre; Wang, Zhisong; Li, Jian; Mar. 2003; 29 pp.; In English
Report No.(s): AD-A420470; No Copyright; Avail: CASI; A03, Hardcopy
Presentation of robust capon beamforming techniques.
DTIC
Signal Processing

20040036499
Registration-Based Solutions to the Range- Dependence Problem in Stap Radars
Lapierre, Fabian D.; Verly, Jacques G.; Mar. 2003; 46 pp.; In English
Report No.(s): AD-A420472; No Copyright; Avail: CASI; A03, Hardcopy
Presentation of registration-based solutions to the range-dependence in STAP radars.
DTIC
Signal Processing

20040036501 Information Systems Labs., Inc., Vienna, VA
Space-time Beamforming with Knowledge-Aided Constraints
Bergin, Jameson; Teixeira, Christopher M.; Techau, Paul M.; Guerci, Joseph R.; Mar. 2003; 24 pp.; In English
Report No.(s): AD-A420473; No Copyright; Avail: CASI; A03, Hardcopy
Presentation of space-time beamforming with knowledge-aided constraints.
DTIC
Signal Processing

20040036503 Massachusetts Inst. of Tech., Lexington, MA
Space-Time Adaptive Processing Using Sparse Arrays
Zatman, Michael; Mar. 2003; 34 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A420474; No Copyright; Avail: CASI; A03, Hardcopy

Presentation of space-time adaptive processing techniques using sparse arrays.
DTIC
Signal Processing; Space-Time Adaptive Processing

20040036567 Naval Postgraduate School, Monterey, CA
Tunable Bandwidth Quantum Well Infrared Photo Detector (TB-QWIP)
Giannopoulos, Mihail; Dec. 2003; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420545; No Copyright; Avail: CASI; A05, Hardcopy

In this thesis a tunable bandwidth quantum well photo- detector (TB-QWIP) is fabricated and experimentally characterized. The designed detector is based on the Stark effect with two quantum step wells arranged opposite to each other to simultaneously achieve both blue- and red-shift of the absorption peak for either direction of the bias. The characterization of the TB-QWIP is based on absorption measurement with Fourier Transform Infra Red (FTIR) spectroscopy, current versus applied voltage (I-V) measurement with a semiconductor parameter analyzer, and photo current spectroscopy. The measured IR absorption peaks found at room temperature 8.8 microns and 10.0 microns, are in good agreement with designed values.
DTIC
Infrared Detectors; Quantum Wells

20040036589 Naval Postgraduate School, Monterey, CA
Broadband Counter-Wound Spiral Antenna for Subsurface Radar Applications
Yong, Lim T.; Dec. 2003; 95 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420566; No Copyright; Avail: CASI; A05, Hardcopy

Subsurface radar also known as ground-penetrating radar is increasingly being used for the detection and location of buried objects such as mines and structure that are found within the upper regions of the earth's surface. The thesis gives a review of the work done to date in this area, laying emphasis on the possible antenna designs to match the range of intended applications. An overall design strategy is outlined, together with a more detailed treatment of the ground-penetrating radar supersystems and topics which are relevant to effective subsurface radar operation. These include the dielectric properties of earth materials, the choice of frequency of operation, as well as the design and construction of suitable antennas. Finally, a new antenna structure called the counter-wound spiral antenna, which is suitable for subsurfaces radar applications, is examined. The counter-wound spiral antenna has a broad bandwidth and a linear polarization with a controllable plane of polarization from a planar geometry. It has an electronically steerable plane of polarization. This trinities property offers a restriction in antenna polarization loss and allows the extraction of maximum information from the target scattered echo.
DTIC
Ground Penetrating Radar; Spiral Antennas

20040037727 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The James Webb Space Telescope
Gardner, Jonathan P.; [2003]; 1 pp.; In English; IAU XXV meeting, July 2003, Sydney,, Australia; No Copyright; Avail: Other Sources; Abstract Only

The James Webb Space Telescope (JWST) will be a large (6m) cold (50K) telescope launched to the second Earth-Sun Lagrange point. It is the successor to the Hubble Space Telescope, and is a partnership of NASA, ESA and CSA. It's science goals are to detect and identify the first galaxies to form in the universe, to trace their assembly into the Hubble Sequence, and to study stellar and planetary system formation. JWST will have three instruments: The Near InfiaRed Camera (NIRCam) and the Near InfraRed multiobject Spectrometer (NIRSpec) will cover the wavelength range 0.6 to 5 microns, and the Mid InfraRed Instrument (MIRI) will do both imaging and spectroscopy from 5 to 28 microns.
Author
James Webb Space Telescope; Imaging Techniques; Galaxies; Lagrangian Equilibrium Points

20040037782 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Status and Performance of HST Wide Field Camera 3
Kimble, Randy; MacKenty, John; O'Connell, Robert; [2003]; 2 pp.; In English; SPIE Conference, 3-8 Aug. 2003, San Diego, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The HST Wide Field Camera 3 is a panchromatic UV-visible-near infrared camera whose development is currently nearing completion, for a planned installation into the Hubble Space Telescope during Servicing Mission 4. WFC3 provides

two imaging channels. The UVIS channel features a 4096 x 4096 pixel CCD focal plane with sensitivity from 200 to 1000 nm and a 160 x 160 arcsec field of view. The UVIS channel provides unprecedented sensitivity and field of view in the near ultraviolet for HST. The IR channel features a 1014 x 1014 pixel HgCdTe focal plane covering 850 to 1700 nm with a 135 x 135 arcsec field of view, providing a substantial advance in IR survey efficiency for HST. The construction of WFC3 is nearly complete, and the instrument is well into its integration and test program. We present the current status of the instrument and its projected scientific performance when installed into HST.
Author
Cameras; Hubble Space Telescope; Near Infrared Radiation; Spaceborne Photography; Spacecraft Instruments

20040037785 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Array of Frequency Selective Bolometers (FSB) for the Spectral Energy Distribution (SPEED) Camera
Silverberg, R. F.; Ali, S.; O'Dell, C.; Timbie, P. T.; Bier, A.; Campano, B.; Chen, T. C.; Cottingham, D. A.; Sharp, E.; Cheng, E. S., et al.; [2003]; 1 pp.; In English; 10th International workshop on Low Temperature Detectors, 7-11 Jul. 2003, Genoa,, Italy; No Copyright; Avail: Other Sources; Abstract Only

The SPEED camera is being developed to study the spectral energy distributions of high redshift galaxies using the Heinrich Hertz Telescope (HHT) in Arizona. SPEED requires a small cryogenic detector array of 2x2 pixels with each pixel having four frequency bands in the 150-350 GHz range. Here we describe the development of the detector array of these high efficiency FSBs. The FSB design provides the multi-pixel multi-spectral band capability required for SPEED in a compact stackable array. The SPEED bolometers will use proximity effect superconducting transition edge sensors as their temperature-sensing element allowing for higher levels of multiplexing in future applications.
Author
Bolometers; Cameras; Frequencies; Spectral Energy Distribution; Telescopes

20040040060 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Quality Improvement for Intermediate Views Using Example-Based Super-Resolution
Sato, Hidenori; Freeman, William T.; Onozawa, Akira; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 44-47; In English; See also 20040040049; Copyright; Avail: Other Sources

We propose an algorithm that improves the quality of intermediate-view images obtained by mapping the average color of multiple-view images onto a visual hull. The algorithm estimates a real image from an intermediate-view image using example-based super-resolution. Estimation is performed using relationships between two kinds of training images: an ideal image whose quality is as good as a real image and an intermediate view image viewed from the same viewpoint. High frequencies of the real image of an intermediate-view are estimated using the relationship between high frequencies of an ideal image and those of a corresponding intermediate-view image. Experimental results show that the quality of the resulting images is almost as good as that of ideal images.
Author
Image Processing; High Resolution; Algorithms; Color

20040040078 NASA Glenn Research Center, Cleveland, OH, USA
Optics-Only Calibration of a Neural-Net Based Optical NDE Method for Structural Health Monitoring
Decker, Arthur J.; February 2004; 20 pp.; In English
Contract(s)/Grant(s): 22-323-78
Report No.(s): NASA/TM-2004-212951; E-14390; No Copyright; Avail: CASI; A03, Hardcopy

A calibration process is presented that uses optical measurements alone to calibrate a neural-net based NDE method. The method itself detects small changes in the vibration mode shapes of structures. The optics-only calibration process confirms previous work that the sensitivity to vibration-amplitude changes can be as small as 10 nanometers. A more practical value in an NDE service laboratory is shown to be 50 nanometers. Both model-generated and experimental calibrations are demonstrated using two implementations of the calibration technique. The implementations are based on previously published demonstrations of the NDE method and an alternative calibration procedure that depends on comparing neural-net and point sensor measurements. The optics-only calibration method, unlike the alternative method, does not require modifications of the structure being tested or the creation of calibration objects. The calibration process can be used to test improvements in the NDE process and to develop a vibration-mode-independence of damagedetection sensitivity. The calibration effort was intended to support NASA s objective to promote safety in the operations of ground test facilities or aviation safety, in general,

by allowing the detection of the gradual onset of structural changes and damage.
Author
Nondestructive Tests; Neural Nets; Calibrating; Holography

20040040139 Laser Technology (UK) Ltd., Stamford, UK
Rapid, Sensitive Inspection of Marine Composites using Laser Shearography
Gregory, R.; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 117-124; In English; See also 20040040136; Original contains black and white illustrations; Copyright; Avail: Other Sources

Laser Shearography has been at the forefront of advanced composite inspections in aircraft spacecraft and marine NDE testing. This NDE technology is able to detect weaknesses in the composite caused by disbonds and un-bonds or by Rapid yet sensitive inspections at over 5 to 10 sq yards per hour with 100% coverage are not uncommon with laser shearography equipment. Laser Shearography is able detect weaknesses in bonds as variations to the surface strain field in response to a variety of stressing mediums ranging from thermal to vacuum stressing. Advances in the optical arrangements and data processing enables sub-fringe resolution leading to advanced determination of how the material behaves under load. Laser Shearography has been at the forefront of advanced composite inferior adhesive bonds.
Author
Shearography; Composite Materials; Image Analysis

20040040145 FORCE Technology, Aalborg, Denmark
Performance of Automated Ultrasonic Inspection of Large-Scale Sandwich Structures in Naval Ships
Wulf, Thomas; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 125-135; In English; See also 20040040136; Original contains black and white illustrations; Copyright; Avail: Other Sources

On basis of the successful ultrasonic developing work performed within the EUCLID RTP3.21 project [l] and the JP 3.23 THALES project [2], it has now been possible to make clear detection of defects in GRP, CFRP, PVC foam and Balsa wood sandwich structures by means of automated ultrasonic scanner equipment, especially defects located in the core material such as crushed core, core cracks and skin-core debondings. The reasons for these improvements in detection capability on sandwich structures are mainly due to pulser and scanning optimisations such as probe frequency, pulser characteristics, frequency filtering on receiver amplifier, and coupling conditions. Existing portable ultrasonic track scanner (ATS- 1) for detailed inspection of large composite structures has been improved. The scanner has been enlarged and is now covering an effective scanning area of 6x0,5 m2. Within the EUCLID RTP3.21 this scanner has proved to be very flexible in different inspection set-ups, from the in- spection of straight and slightly curved panels to the inspection of geometrical com- plicated joints. Within the JP 3.23 THALES project a new 8 channel Multi Probe Scanner (M P S) has been developed and a prototype is now ready to be tested in the laboratory and on-side naval ships. This scanner is developed for very fast spot-check inspection of large composite structures with an effective scanning time of 2,4 m2/min.
Author
Ultrasonic Scanners; Composite Materials; Composite Structures

20040043734 Air Force Systems Command, USA
Experiments D1, D2, and D6: Basic Object, Nearby Object, and Surface Photography
McKee, D.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 169-181; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of Experiments D1, D2, and D6 is to investigate man's ability to acquire, track, and photograph objects in space and objects on the ground from earth orbit. These three experiments use the same equipment, and the experiment numbers primarily designate the type of object which serves as an aiming point. In Experiment D1 the aiming points were celestial bodies and the Rendezvous Evaluation Pod (REP), at relatively long photographic range. Experiment D2 designated the short-range tracking and photographing of the REP, and the D6 aiming points were objects on the ground. The photographic system was designed to provide precise data on techniques of acquisition and tracking for possible future application to manned space flight. The equipment was selected to explore several techniques using different operational modes, different types of film, and lenses with different fields of view. A detailed description of the components of the equipment are given.
Derived from text
Photographic Equipment; Celestial Bodies; Earth Orbits; Manned Space Flight; Astronomical Photography; Spaceborne Experiments

20040043743 Air Force Systems Command, USA

Experiment D4/D7: Celestial Radiometry and Space-Object Radiometry

Brentnall, B.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 141-168; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The study of the spectral irradiance of natural phenomena and man-made objects has been of increasing interest in recent years both to the scientific community and to the Department of Defense. The purpose of the Air Force D4/D7 Experiment has been to obtain accurate measurements form space of emitted and reflected radiance form a comprehensive collection of subjects. The determination of threshold sensitivity values in absolute numbers, and the separation and correlation of specific targets with various backgrounds have been prime objectives. This report in intended to provide a description of the equipment used on Gemini V, its operation, and a discussion of the measurements made. Results will be discussed generally on a quantitative basis.

Author

Spectroradiometers; Celestial Sphere; Interferometers; Spacecraft Instruments; Gemini 5 Flight

20040043849 Air War Coll., Maxwell AFB, AL

Infrared Systems for Tactical Aviation: An Evolution in Military Affairs?

Hept, George B.; Jan. 2002; 50 pp.; In English

Report No.(s): AD-A420757; No Copyright; Avail: CASI; A03, Hardcopy

Evolutionary development is based on using continuous experimentation and adaptation in changing circumstances to reward success, while allowing, but eventually eliminating, failure, Since this approach is agile, flexible, quick reacting, and thrives on change, it contrasts with strategic planning in which systems are developed in a planned and orderly fashion to meet future requirements. A planned system is rigid, slow to react, and resists or ignores change, which contrasts with how the military traditionally develops weapon systems. One word that distinguishes between evolutionary and planned development is 'chaos.' Chaos, like risk, is unavoidable, and hence should be managed rather than avoided. Indeed, a certain degree of chaos is desirable because it generates the necessary set of adaptations and ideas that can eventually be 'selected' for evolutionary improvement. The Darwinian concept of 'survival of the fittest' can be applied to ideas, systems, and organizations that seek to maintain a competitive advantage.

DTIC

Infrared Instruments

20040045157 Computer Sciences Corp., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA

Microscopic Theory and Simulation of Quantum-Well Intersubband Absorption

Li, Jianzhong; Ning, C. Z.; [2004]; 16 pp.; In English; SPIE Photonics West, 26-30 Jan. 2004, San Jose, CA, USA

Contract(s)/Grant(s): NAS2-14303; DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A03, Hardcopy

We study the linear intersubband absorption spectra of a 15 nm InAs quantum well using the intersubband semiconductor Bloch equations with a three-subband model and a constant dephasing rate. We demonstrate the evolution of intersubband absorption spectral line shape as a function of temperature and electron density. Through a detailed examination of various contributions, such as the phase space filling effects, the Coulomb many-body effects and the non-parabolicity effect, we illuminate the underlying physics that shapes the spectra. Keywords: Intersubband transition, linear absorption, semiconductor heterostructure, InAs quantum well

Author

Absorption Spectra; Indium Arsenides; Quantum Wells

20040045173 Christopher Newport Univ., Newport News, VA, USA

Low Temperature SQUID for NDE Applications

Wincheski, Buzz, Technical Monitor; Selim, Raouf; [2003]; 13 pp.; In English

Contract(s)/Grant(s): NAG1-02055; No Copyright; Avail: CASI; A03, Hardcopy

We have developed a low temperature SuperConducting Quantum Interference Device - SQUID measurement system for detection of defects deep under the surface of aluminum structures using eddy current techniques. The system uses a two dimensional planar inducer with two different excitation frequencies to induce a current in the sample. We have developed a data analysis software program that enabled us to distinguish between round defects (holes), straight defects (slots) and slots close to holes simulating cracks starting from rivets in aluminum structures. We were able to detect defects that are 8mm below

the surface. We have also measured the change in phase of the detected signal as a function of depth of the defect. This relationship can be used to determine the depth of hidden flaws. Using this analysis software with the high temperature SQUID system at NASA Langley we were able to detect slots close to holes in layered aluminum sample.
Author
Low Temperature; Product Development; Squid (Detectors); Metal Surfaces; Eddy Currents

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LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20040036245 Texas Technological Univ., Lubbock, TX
Explosive-Driven Pulsed Generation for Directed- Energy Munitions
Kristiansen, M.; Worsey, Paul; Freeman, Bruce; Stefani, Francis; Giesselmann, M.; Sep. 2003; 61 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-98-1-0440
Report No.(s): AD-A420276; AFRL-SR-AR-TR-04-0108; No Copyright; Avail: CASI; A04, Hardcopy

The AFOSR MURI 'Explosive-Driven Power Generation to Directed-Energy Munitions' started in May 1998. The two year option was exercised and a no-cost extension until April 2003 was granted. This report summarizes the activities of the university partners (Texas Tech University, University of Missouri-Rolla, and Texas A&M University. The consortium research staff consists of faculty, postdoctoral fellows, and graduate students from the three universities and involves the departments of Electrical Engineering, Physics, Mechanical Engineering, Mining Engineering, and Nuclear Engineering. The research objectives were to obtain improved basic understanding of the fundamental processes in Magnetic Flux Compression Generators and to develop high efficiency power conditioning techniques for matching the MFCG output to directed energy generator loads. The basic information obtained should aid in designing future compact, high efficiency power sources for directed energy munitions. A handbook based on this research is being finalized.
DTIC
Weapon Systems

20040036251 Arizona Univ., Tucson, AZ
3D Semiconductor Nanocavities
Khitrova, Galina; Deppe, Dennis; Nov. 2003; 12 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0021
Report No.(s): AD-A420280; AFRL-SR-AR-TR-04-0110; No Copyright; Avail: CASI; A03, Hardcopy

Nanocavities with a three-dimensional cavity mode confinement have been fabricated and their properties have been explored experimentally. Exhaustive measurements were made of linear and nonlinear transmission and reflectivity, and photoluminescence using cw and femtosecond lasers. The high quality of the oxide-aperture nanocavities containing a single quantum well resulted in a well resolved normal mode coupling and a record splitting-to-linewidth much larger than previously seen for a 3D photonic structure. The lateral confinement clearly suppresses guided modes responsible for a third peak evolving between the two normal modes in a planar microcavity; thus a longstanding mystery was solved. Lasing from microdisks containing quantum dots has been demonstrated at room and low temperature. A new design for a nanocavity has been developed; an air-bridge upper DBR mirror combined with an epitaxial apertured active region leads to a stronger three-dimensional cavity mode confinement. CW lasing from such a nanocavity occurred at room temperature. The coupling of a single quantum dot to a photonic crystal cavity has been investigated. In resonance the dot linewidth broadened considerably indicating the onset of the intermediate coupling regime.
DTIC
Semiconductor Devices; Semiconductors (Materials)

20040036271 Naval Postgraduate School, Monterey, CA
The Shipboard Employment of a Free Electron Laser Weapon System
Allgaier, Gregory G.; Dec. 2003; 88 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420299; No Copyright; Avail: CASI; A05, Hardcopy

A megawatt (MW) class Free Electron Laser (FEL) shows promise as a new weapon for anti-ship cruise missile defense. An FEL weapon system delivers energy at the speed of light at controllable energy levels, giving the war fighter new engagement options. Considerations for this weapon system include employment, design, and stability. In order to reach a MW class laser, system parameters must be optimized and the high power optical beam must be appropriately managed. In a high power FEL, the optical beam could heat and ultimately damage the optical cavity mirrors. One proposed solution is a short Rayleigh length design, which lowers the intensity on the mirrors, but increases sensitivity to vibrations. This thesis shows a that short Rayleigh length FEL will remain stable using current technology and can be designed to achieve a MW of power. Scenarios are then presented to explore some of the engagement options associated with this weapon system.
DTIC
Free Electron Lasers; Laser Weapons; Weapon Systems

20040036455 Naval Postgraduate School, Monterey, CA
High Power Optical Cavity Design and Concept of Operations for a Shipboard Free Electron Laser Weapon System
Fontana, Timothy S.; Dec. 2003; 94 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420437; No Copyright; Avail: CASI; A05, Hardcopy

A megawatt (MW)class Free Electron Laser (FEL) as a point defense weapon system may lead to a revolution in anti-ship missile defense. Deep magazine low cost per shot proportional engagement capability and speed of light energy delivery provide the FEL with unmatched advantages over kinetic energy weapon systems. Before an FEL is made feet deployable stability system parameter optimization and operational utility all interest be taken into account. A short Rayleigh length FEL design is being considered in order to reduce system size and mitigate resonator minor damage. A short Rayleigh length thought can lead to vibrational sensitivities which must be studied. This thesis demonstrates that utilizing currently available technology and properly defined parameters a short Rayleigh length FEL should be able to achieve a MW of power. This thesis will also establish the viability of the FEE as a fleet deployable point defense weapon system through the development of a Concept of Operations (CONOPS) which draws from current naval warfare doctrine.
DTIC
Antiship Missiles; Design Analysis; Free Electron Lasers; Laser Weapons; Optical Equipment; Weapon Systems

20040036485 Naval Postgraduate School, Monterey, CA
Active Vibration Control for Free Electron Lasers
Stetler, Aaron M.; Dec. 2003; 103 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420462; No Copyright; Avail: CASI; A06, Hardcopy

This thesis is concerned with active control methods for stabilizing the mirror vibrations of free-electron laser weapons on ships so that the laser continues to deliver full power Alignment of the mirrors is critical for proper operation because the electron beam and optical mode must substantially overlap. The alignment is expected to be difficult to maintain in a shipboard environment A theory for controlling the vibrations of a single-degree-of-freedom system is developed and checked by numerical simulations An apparatus consisting of a flexing aluminum strip was constructed in order to probe the fundamental behavior of actual systems which eventually become unstable as the control gains are increased A computer data acquisition system (LabVIEW) was implemented so that experiments could be more efficiently and accurately performed% Proportional and derivative controls were used to stabilize the motion of the strip. Experiments reveal that the derivative control behaves according to the theory In particular, the instability is understood as the result of positive feedback due to a phase shift of the unstable mode However, the instability due to the proportional control does not behave according to the theory Improvements that would allow for greater control gains and thus greater stabilization are suggested
DTIC
Active Control; Electron Beams; Free Electron Lasers; Vibration Damping

20040040160 NASA Langley Research Center, Hampton, VA, USA
Light Detection and Ranging-Based Terrain Navigation: A Concept Exploration
Campbell, Jacob; UijtdeHaag, Maarten; vanGraas, Frank; Young, Steve; [2003]; 9 pp.; In English; Institute of Navigation GPS/GNSS Conference, 9-12 Sep. 2003, Portland, OR, USA
Contract(s)/Grant(s): RTA 23-728-60-30; Copyright; Avail: CASI; A02, Hardcopy

This paper discusses the use of Airborne Light Detection And Ranging (LiDAR) equipment for terrain navigation. Airborne LiDAR is a relatively new technology used primarily by the geo-spatial mapping community to produce highly accurate and dense terrain elevation maps. In this paper, the term LiDAR refers to a scanning laser ranger rigidly mounted

to an aircraft, as opposed to an integrated sensor system that consists of a scanning laser ranger integrated with Global Positioning System (GPS) and Inertial Measurement Unit (IMU) data. Data from the laser range scanner and IMU will be integrated with a terrain database to estimate the aircraft position and data from the laser range scanner will be integrated with GPS to estimate the aircraft attitude. LiDAR data was collected using NASA Dryden's DC-8 flying laboratory in Reno, NV and was used to test the proposed terrain navigation system. The results of LiDAR-based terrain navigation shown in this paper indicate that airborne LiDAR is a viable technology enabler for fully autonomous aircraft navigation. The navigation performance is highly dependent on the quality of the terrain databases used for positioning and therefore high-resolution (2 m post-spacing) data was used as the terrain reference.
Author
Autonomous Navigation; Detection; Terrain; Light (Visible Radiation); Airborne Lasers

20040043824 New Mexico Univ., Albuquerque, NM
Fundamental Studies on Light Strings: Equipment Upgrade
Diels, Jean-Claude; May 31, 2003; 27 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0248
Report No.(s): AD-A420724; AFRL-SR-AR-TR-04-0134; No Copyright; Avail: CASI; A03, Hardcopy

The purpose equipment upgrade to our high peak power laser system was to enable us to produce 'light strings' or 'filaments' at 746 nm and 248 nm. The task of ordering the components, rebuilding the source and accessories has taken over a year. The adaptive optics system developed by Intellite did not provide us with an improved beam quality for filamentation. We have therefore opted for vacuum spatial filtering that has just been implemented. The on-going tests and theory led us to the realization that a high energy (2 J/pulse) solid state source, providing a better beam quality and pulse duration in the range of 200 ps to 2 ns, launched through an aerodynamic window, should create ideal filaments over long propagation distance. Two aerodynamic windows were successfully developed. Because of the operating costs of the system (the aerodynamic window requires a compressor rental for $3,500/month), a series of major tests have been postponed until March 1st, 2004, when all equipment---including the solid state source--- is in place.
DTIC
Lasers

20040043837 Boeing Co., Kirkland AFB, NM
Mid-IR Laboratory Operation, Maintenance and Theory Support
Gallant, David J.; Nov. 2003; 14 pp.; In English
Contract(s)/Grant(s): F29601-00-D-0169; Proj-4866
Report No.(s): AD-A420739; AFRL-DE-TR-2003-1124; No Copyright; Avail: CASI; A03, Hardcopy

This report summarizes the technical activity provided under task order 0015 of the SLIDERS contract. This task provided for semiconductor material processing and characterization expertise for a mid-IR semiconductor laser development laboratory, as well as computer modeling and theoretical analysis of mid-IR semiconductor laser materials and device designs. The goal of this effort was to increase the power, brightness and operating temperature of mid-IR semiconductor lasers and laser arrays. Under this task we continued the development of a semiconductor laser processing and characterization laboratory, which was used to evaluate numerous prototype laser samples and materials. Processing improvements continued which enabled us to provide better quality and repeatable laser devices.
DTIC
Infrared Lasers; Infrared Radiation; Laboratories; Maintenance; Semiconductor Lasers

20040043934 California Univ., Irvine, CA
Equipment for Aero-Optical Flow Imaging
Catrakis, Haris J.; Feb. 29, 2004; 79 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0277
Report No.(s): AD-A420864; AFRL-SR-AR-TR-04-0146; No Copyright; Avail: CASI; A05, Hardcopy

The AFOSR/DURIP Grant has provided the funds to develop a new Aero-Optics Laboratory at UC Irvine, in order to do basic research on aero-optical laser beam propagation through high-speed turbulent flows. The centerpiece of the laboratory is the Aero-Optics Pressurized Flow Facility which is a blow-down wind tunnel especially suited to studies of separated turbulent flows such as the single-stream shear layer. The main pressure vessel can be pressurized to 20 atmospheres, has an internal diameter of 4 feet, an internal height of 8 feet, 5 windows each of 10' diameter and 3.25' thickness made of spectrosil

quartz (which permits both visible and UV flowibeam imaging), and 5 window-retaining units capable of 20-atm pressure. The air supply reservoir is rated at 200 gallons and 3,000 psig (- 200 atm). The facility allows for seeding of air with gaseous acetone. Instrumentation for simultaneous flow/beam imaging includes a custom high-resolution Hartmann sensor, with 4,096 pixels and 1,024 subapertures, and a high-resolution high-sensitivity COD camera with approximately 1,000 x 1,000 pixels and 12 bits of dynamic range per pixel. A nd:YAG pulsed laser provides the illumination source with approximately 100 mJ per pulse at a repetition frequency of 10 Hz. Flow durations are of the order of 2 seconds at high subsonic speeds. The facility is designed to reach a Mach number of 2.5 and Reynolds number of approximately 100 million based on the large-scale shear-layer extent.
DTIC
Flow Visualization; Imaging Techniques; Laser Beams

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MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20040035803 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MB C220 Centering System Capacitor Fire
Worth, Daniel B.; September 03, 2003; 19 pp.; In English; AIAA Working Group on Dynamic Space Simulation, 16-19 Sep. 2003, Sunnyvale, CA, USA; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

A detailed analysis of the MB C220 Centering System Capacitor Fire is presented. The topics include: 1) Description of Incident/Mishap; 2) System Block Diagram; 3) Fault Tree Analysis; 4) Inspection and Repair of Cabinet; 5) Discussions with GSFC Experts; 6) Electrical Measurements of Capacitors; 7) Other Research; 8) Discussions with Capacitor Manufacturers; 9) Findings/Root Cause; and 10) Recommendations. This paper is in viewgraph form.
CASI
Capacitors; Fires; Mechanical Engineering; Electronic Equipment

20040035837 NASA Wallops Flight Center, Wallops Island, VA, USA
A Rational Approach to Determine Minimum Strength Thresholds in Novel Structural Materials
Schur, Willi W.; Bilen, Canan; Sterling, Jerry; [2003]; 9 pp.; In English; American Inst. of Aeronautics and Astronautics ATIO Conference, 17-20 Nov. 2003, Denver, CO, USA; Copyright; Avail: CASI; A02, Hardcopy

Design of safe and survivable structures requires the availability of guaranteed minimum strength thresholds for structural materials to enable a meaningful comparison of strength requirement and available strength. This paper develops a procedure for determining such a threshold with a desired degree of confidence, for structural materials with none or minimal industrial experience. The problem arose in attempting to use a new, highly weight-efficient structural load tendon material to achieve a lightweight super-pressure balloon. The developed procedure applies to lineal (one dimensional) structural elements. One important aspect of the formulation is that it extrapolates to expected probability distributions for long length specimen samples from some hypothesized probability distribution that has been obtained from a shorter length specimen sample. The use of the developed procedure is illustrated using both real and simulated data.
Author
Technology Assessment; Safety; Probability Distribution Functions; Loads (Forces)

20040040137 Bader (Scott) Co. Ltd., Wellingborough, UK
Closed Mould Processing in the Marine Industry
Cooper, M. G.; Proceedings of the ACMCE/SAMPE Conference on Marine Composites; [2003], pp. 11-16; In English; See also 20040040136; Copyright; Avail: Other Sources

Despite several isolated cases in the past, the marine sector of the GRP industry has never really fully capitalised on the advantages of closed mould processing. However, today many companies within this sector are now changing their thinking and there is a definite and growing trend towards the use of closed mould processing for the manufacture of GRP components for sailing yachts and powerboats. This paper will identify some of the issues driving this change, describe the fundamentals

of the moulding techniques involved, discuss the advantages and limitations of the techniques and try to look into the future of closed mould processing in the marine market.
Author
Glass Fiber Reinforced Plastics; Injection Molding

20040040138 Polyworx V.O.F., Ammerstol, Netherlands
How Flow Analysis Technology Improves the Vacuum Infusion Process
Koorevaar, Arjen; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 27-36; In English; See also 20040040136; Original contains black and white illustrations; Copyright; Avail: Other Sources

The vacuum infusion process promises to improve quality of the laminate, better worker conditions, a reduction of labour and better repeatability. Flow analysis makes it possible to use proven engineering techniques to develop and improve the process. This allows for much better control over the considerable investment needed to switch to infusion and also makes it possible to continue improving a working process at minimal risk. However, it will not solve every issue. This paper will outline the modelling, required to understand what it can and can not do. Several case examples will be presented to illustrate the application of flow analysis to infusion of large boat hulls and decks, and also discuss several practical issues that we had to deal with to make the process work.
Author
Resins; Fluid Flow; Injection Molding

20040040140 Strathclyde Univ., Glasgow, UK
The Means to Void Content Reduction in Vacuum Infusion Process
Afendi, M. D.; Banks, W. M.; Kirkwood, D.; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 17-25; In English; See also 20040040136; Original contains black and white illustrations; Copyright; Avail: Other Sources

The vacuum infusion process has been found to be very versatile for making large composite structures. Despite the cost effectiveness and ability to achieve fibre to resin ratios as high as 70:30 by volume, the process, is susceptible to air bubble formation. In fact, some reinforced fibre and sandwich material combination appear to be almost perfect bubble nucleation agents. As void content affects the performance of a composite structure, it is very important to reduce it as far as possible. The nucleation and formation of air bubbles fiom dissolved gas in the resin solution signifies the need of a degassing process, prior to f i s i o n . Recent experiments have shown that a degassing process for vacuum infusion, conducted in batches of a small quantity with bubble nucleation agent (Scotch-Brite) and air-sparging method could reduce void formation. However, using this method, only 40% to 50% of dissolved gas can be extracted fiom the resin. Despite the removing some dissolved gas, some micro-bubbles were found suspended due to viscosity, and these will contribute to void formation during infusion. Even though the results were quite encouraging, the need to design a system to ensure continuous supply of degassed resin is a better way forwards. In the continuous degassing system, it is necessary to establish the relationship between the degassing process quality and void content reduction on the perspective of strength and performance, besides signifying the most viable method of degassing.
Author
Resins; Bubbles; Voids

20040040175 NASA Glenn Research Center, Cleveland, OH, USA
Approximate Solution for Choked Flow in Gas Seal Pads
Fleming, David P.; February 2004; 11 pp.; In English; 10th International Symposium on Transport Phenomena and Dynamics of Rotating Machinery, 7-11 Mar. 2004, Honolulu, HI, USA
Contract(s)/Grant(s): WBS 22-714-09-18
Report No.(s): NASA/TM-2004-212956; ISROMAC10-2004-110; E-14394; No Copyright; Avail: CASI; A03, Hardcopy

Previous analyses of high pressure seals have considered adiabatic flow with friction but neglected effects of seal rotation. Most of this work analyzed a one-dimensional flow field. This works well to calculate stiffness and leakage of full circular seals, either face seals or annular ring seals. However, it cannot provide accurate results for a rectangular seal pad with its strongly two-dimensional flow field and its reliance on hydrodynamic forces to maintain a full fluid film. On the other hand, solutions of Reynolds lubrication equation have been obtained for the two-dimensional flow in a seal pad. But these solutions do not account for choking which occurs at high seal pressure ratios, nor do they consider the pressure loss that occurs in the entrance region of the flow field. The aim of the present work is to build on the Reynolds equation solution by use of an approximate choked flow analysis. This will account for the pressure losses in the flow entrance region, ensure that fluid

velocities remain subsonic, and enable fluid inertial effects within the pad film to be accounted for. Results show that, in general, fluid inertia acts to decrease pad film load capacity and leakage, and increase film stiffness.
Author
Seals (Stoppers); Adiabatic Flow; Choked Flow; Flow Distribution; Pressure Ratio

20040041393 Toledo Univ., OH, USA
Dynamic Engine Simulator Rig Using Magnetic Bearings
Keith, Theo G., Jr.; Buccieri, Carl; March 2004; 2 pp.; In English
Contract(s)/Grant(s): NCC3-943; No Copyright; Avail: CASI; A01, Hardcopy

During this grant period, three major projects were pursued. The first project involved Cryogenic Switched Reluctance Motor Test Bed. This project's principle investigator is Dr. Gerald Brown. Carl Buccieri, a University of Toledo Research Associate, working on this project designed and fabricated four different sets of stator coils. These four designs are currently being investigated to determine which design provides the best thermal conduction. An assembly is currently being used to verify the theoretical calculations of the Cryogenic motor's torque curves. The second project involved the Room Temperature Conical Magnetic Bearing Test Rig. Mr. Buccieri was responsible for the design and fabrication of the rig's mounting system. This research also required the routing and connecting of all support utilities. The intent of this work was to bring the facility to the state of full operation. The third project involved a re-configuration of the Switched Reluctance Motor Test Facility. This facility was previously designed and constructed by Mr. Buccieri. The re-configuration was done in an effort to test new theories on the levitation and rotation of a single magnetic bearing- rotor assembly. In addition to the re-configuration of the rig, Mr.Buccieri was responsible for the choice, mounting and operation of a dynamometer used to supply data on the torque curves of the test rig as a function of rotor angle and current. This data will be compared to the theoretical calculations in an effort to validate the motor's torque and power characteristics.
Derived from text
Fabrication; Magnetic Bearings; Simulators; Test Facilities; Cryogenics; Engine Tests; Dynamic Control

20040042494 NASA Glenn Research Center, Cleveland, OH, USA
Successful Surface Treatments for Reducing Instabilities in Advanced Nickel-Base Superalloys for Turbine Blades
Locci, Ivan E.; MacKay, Rebecca A.; Garg, Anita; Ritzert, Frank J.; March 2004; 28 pp.; In English
Contract(s)/Grant(s): WBS-22-714-30-09
Report No.(s): NASA/TM-2004-212920; E-14360; No Copyright; Avail: CASI; A03, Hardcopy

An optimized carburization treatment has been developed to mitigate instabilities that form in the microstructures of advanced turbine airfoil materials. Current turbine airfoils consist of a single crystal superalloy base that provides the mechanical performance of the airfoil, a thermal barrier coating (TBC) that reduces the temperature of the base superalloy, and a bondcoat between the superalloy and the TBC, that improves the oxidation and corrosion resistance of the base superalloy and the spallation resistance of the TBC. Advanced nickel-base superalloys containing high levels of refractory metals have been observed to develop an instability called secondary reaction zone (SRZ), which can form beneath diffusion aluminide bondcoats. This instability between the superalloy and the bondcoat has the potential of reducing the mechanical properties of thin-wall turbine airfoils. Controlled gas carburization treatments combined with a prior stress relief heat treatment and adequate surface preparation have been utilized effectively to minimize the formation of SRZ. These additional processing steps are employed before the aluminide bondcoat is deposited and are believed to change the local chemistry and local stresses of the surface of the superalloy. This paper presents the detailed processing steps used to reduce SRZ between platinum aluminide bondcoats and advanced single crystal superalloys.
Author
Surface Finishing; Nickel Alloys; Turbine Blades; Stability; Heat Treatment; Heat Resistant Alloys

20040044168 Department of the Navy, Washington, DC
Acoustic Fuel Shutoff
Ruffa, Anthony A., Inventor; Sep. 4, 2003; 14 pp.; In English
Patent Info.: Filed 4 Sep. 2003; US-Patent-Appl-SN-10655633
Report No.(s): AD-D020127; No Copyright; Avail: Defense Technical Information Center (DTIC)

This patent application discloses a system for preventing overflow from a tank being filled. An open-ended elongated tube is disposed in a fuel tank to extend between an opening of the tank at one end and proximate to the bottom of the tank at the other end. A refueling nozzle connected to a source of pressurized fuel or other pressurized liquid has an open end extension

to extend through the tank opening and into the elongated tube. The nozzle creates broadband acoustic signals inside of the elongated tube by the turbulent flow of fuel through the nozzle during filling. A microphone is mounted on the nozzle near the open end extension to sense resonant frequency signals of the acoustic signals to generate representative signals. A processing module is connected to the microphone to receive and process the representative signals such that a close signal is generated when the representative signals represent a critical resonant frequency. The critical resonant frequency is representative of the length of the elongated tube between the opening and the level of fuel in the elongated tube inside of the tank. The critical resonant frequency is predetermined to occur at a level of fuel in the elongated tube corresponding to a full, no-spill level in the tank. A shut-off valve is connected between the fuel source and the nozzle and is responsive to the processing module. The close signal from the processing module closes the flow of pressurized fuel from the source. (1 figure) DTIC

Acoustic Resonance; Closures; Control Valves; Patent Applications; Signal Transmission; Sound Waves; Turbulent Flow; Valves

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QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20040035773 Ljubljana Univ., Ljubljana, Slovenia

A Principal Component Analysis in Fault Detection and Isolation: Hydraulic and Fermentation Process Example

Klancar, Gregor; Skrjanc, Igor; Electrotechnical Review; 2002; ISSN 0013-5852; Volume 69, No. 5, pp. 311-316; In Slovene; Copyright; Avail: Other Sources

Owing to the high level of automation, increased complexity of industrial processes causes higher possibilities of appearance of different faults and failures. Therefore, an efficient fault and failure detection system has to be implemented to have them detected and isolated at an early stage in operation when their effect is not yet harmful or when the product quality is not yet threatened. In the paper, detection and isolation of the process faults and failures by using a principal component analysis (PCA) are addressed. The main idea is to determine a few significant combinations i.e. principal components describing most of the data information of the original variables. An extension of the static PCA method to the dynamic one is implemented and then a common statistics from the values of many variables is generated. Efficient process monitoring is achieved by using score diagrams and two common statistical measures: the Mahalanobis distance and the Q measure. The proposed approach is illustrated on a three-tank test rig example and on a process of bacitracin fermentation. Author

Fault Detection; Principal Components Analysis; Failure

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STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20040035740 Swedish Defence Research Establishment, Tumba

Shock Wave Loading of Concrete Grout using a Plane Wave Generator

Unosson, M.; Dec. 2002; In English

Report No.(s): PB2004-101809; FOI-R-0550-SE; No Copyright; Avail: National Technical Information Service (NTIS)

In the report a series of experiments is presented where solid discs of concrete grout are loaded with plane shock waves. Plane wave generators with high explosives were used for the loading, and registration of stress and times of arrival were made using calibrated piezoelectric stress gauges (PVDR) and piezoelectric pins. Finite element analysis was used to design the experimental set-up. From the experimental results, points on the equation of state for the grout were derived through impedance matching with Lexan. The amplitudes from the gauges, representing the pressure level, were too low due to shortage of the gauges. The grout specimens had been kept in water prior to the experiments to minimize the risk of cracks.

The conclusions were that the experimental technique used is suitable for deriving points on the equation of state at pressure levels above 15 GPa.
NTIS
Shock Waves; Grout; Concretes; Plane Waves

20040035920 Helsinki Univ. of Technology, Espoo (Finland), Espoo, Finland
Mt. Uikku as an Ice Load Measurement Platform
Lensu, M.; 2002; 78 pp.; In English
Report No.(s): PB2004-102786; M-267; Copyright; Avail: National Technical Information Service (NTIS)

Results and products from the project 'Laivan Juaarasitusten seurantajarjestelma' (A monitoring system for ship ice loads') are presented. These are centered around MT Uikku which is the ice load measurement platform of the project. A manual of ice load monitoring software is given. It is intended for those who use the load monitoring system on board. A low pass filtering unit constructed for the system is described. The reparation work of the instrumentation of MT Uikku in 2000 and the repaired system are described. The load data collected in March 2000 is analyzed and compared with the data of March 2001. A database which makes accessible all ice load data measured on board MT Uikku during the ARCDEV voyage in 1998 is finally described.
NTIS
Ice; Loads (Forces); Ships; Mechanical Properties

20040040072 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Material Properties Analysis of Structural Members in Pumpkin Balloons
Sterling, W. J.; [2003]; 6 pp.; In English; American Institute of Aeronautics and Astronautics ATIO Conference, 17-20 Nov. 2003, Denver, CO, USA; No Copyright; Avail: CASI; A02, Hardcopy

The efficient design, service-life qualification, and reliability predictions for lightweight aerospace structures require careful mechanical properties analysis of candidate structural materials. The demand for high-quality laboratory data is particularly acute when the candidate material or the structural design has little history. The pumpkin-shaped super-pressure balloon presents both challenges. Its design utilizes load members (tendons) extending from apex to base around the gas envelope to achieve a lightweight structure. The candidate tendon material is highly weight-efficient braided HM cord. Previous mechanical properties studies of Zylon have focused on fiber and yarn, and industrial use of the material in tensile applications is limited. For high-performance polymers, a carefully plamed and executed properties analysis scheme is required to ensure the data are relevant to the desired application. Because no directly-applicable testing standard was available, a protocol was developed based on guidelines fiom professional and industry organizations. Due to the liquid-crystalline nature of the polymer, the cord is very stiff, creeps very little, and does not yield. Therefore, the key material property for this application is the breaking strength. The pretension load and gauge length were found to have negligible effect on the measured breaking strength over the ranges investigated. Strain rate was found to have no effect on breaking strength, within the range of rates suggested by the standards organizations. However, at the lower rate more similar to ULDB operations, the strength was reduced. The breaking strength increased when the experiment temperature was decreased from ambient to 183K which is the lowest temperature ULDB is expected to experience. The measured strength under all test conditions was well below that resulting from direct scale-up of fiber strength based on the manufacturers data. This expected result is due to the effects of the braiding process and material ageing.
Author
Aircraft Structures; Mechanical Properties; Structural Members; Structural Design; High Altitude Balloons

20040040076 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Flaw Tolerance in Lap Shear Brazed Joints
FLom, Yury; Wang, Liqin; [2003]; 5 pp.; In English; LOT 2004, 15-17 Jun. 2004, Aachen, Germany; No Copyright; Avail: CASI; A01, Hardcopy

A damage zone based failure criterion was experimentally and analytically verified using non-linear Finite Element Analysis (FEA) and was shown to work quite well in understanding the failure of the brazed joints. Excellent correlations were demonstrated between our predicted values and the experimental results published by other researchers for the same base/filler metal combinations. The same analysis were applied to the lap shear test specimens containing flaws deliberately introduced into the brazed joints. The results obtained showed good correlation between the experimental and calculated values and

confirmed that the.failure of the ductile lap shear brazed joints occurs when the damage zone reaches approximately 10% of the overlap width.
Author
Brazing; Lap Joints; Tolerances (Mechanics); Defects; Load Carrying Capacity; Mechanical Properties

20040040080 NASA Glenn Research Center, Cleveland, OH, USA
Composite Fan Blade Design for Advanced Engine Concepts
Abumeri, Galib H.; Kuguoglu, Latife H.; Chamis, Christos C.; February 2004; 17 pp.; In English; SAMPE 2003, 11-15 May 2003, Long Beach, CA, USA
Contract(s)/Grant(s): WBS 22-708-48-11
Report No.(s): NASA/TM-2004-212943; E-14383; No Copyright; Avail: CASI; A03, Hardcopy

The aerodynamic and structural viability of composite fan blades of the revolutionary Exo-Skeletal engine are assessed for an advanced subsonic mission using the NASA EST/BEST computational simulation system. The Exo-Skeletal Engine (ESE) calls for the elimination of the shafts and disks completely from the engine center and the attachment of the rotor blades in spanwise compression to a rotating casing. The fan rotor overall adiabatic efficiency obtained from aerodynamic analysis is estimated at 91.6 percent. The flow is supersonic near the blade leading edge but quickly transitions into a subsonic flow without any turbulent boundary layer separation on the blade. The structural evaluation of the composite fan blade indicates that the blade would buckle at a rotor speed that is 3.5 times the design speed of 2000 rpm. The progressive damage analysis of the composite fan blade shows that ply damage is initiated at a speed of 4870 rpm while blade fracture takes place at 7640 rpm. This paper describes and discusses the results for the composite blade that are obtained from aerodynamic, displacement, stress, buckling, modal, and progressive damage analyses. It will be demonstrated that a computational simulation capability is readily available to evaluate new and revolutionary technology such as the ESE.
Author
Aerodynamic Characteristics; Design Analysis; Subsonic Flow; Fan Blades; Buckling; Boundary Layer Separation

20040040087 NASA Glenn Research Center, Cleveland, OH, USA
Non-Deterministic Dynamic Instability of Composite Shells
Chamis, Christos C.; Abumeri, Galib H.; February 2004; 20 pp.; In English; 44th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics and Material Conference, 7-10 Apr. 2003, Norfolk, VA, USA
Contract(s)/Grant(s): WBS 22-708-48-11
Report No.(s): NASA/TM-2004-212942; E-14382; No Copyright; Avail: CASI; A03, Hardcopy

A computationally effective method is described to evaluate the non-deterministic dynamic instability (probabilistic dynamic buckling) of thin composite shells. The method is a judicious combination of available computer codes for finite element, composite mechanics, and probabilistic structural analysis. The solution method is incrementally updated Lagrangian. It is illustrated by applying it to thin composite cylindrical shell subjected to dynamic loads. Both deterministic and probabilistic buckling loads are evaluated to demonstrate the effectiveness of the method. A universal plot is obtained for the specific shell that can be used to approximate buckling loads for different load rates and different probability levels. Results from this plot show that the faster the rate, the higher the buckling load and the shorter the time. The lower the probability, the lower is the buckling load for a specific time. Probabilistic sensitivity results show that the ply thickness, the fiber volume ratio and the fiber longitudinal modulus, dynamic load and loading rate are the dominant uncertainties, in that order.
Author
Finite Element Method; Dynamic Loads; Buckling; Composite Structures; Structural Analysis

20040040161 NASA Langley Research Center, Hampton, VA, USA
Photogrammetry and Videogrammetry Methods Development for Solar Sail Structures
Pappa, Richard S., Technical Monitor; Black, Jonathan T.; December 2003; 102 pp.; In English
Contract(s)/Grant(s): NCC1-03008; WU 23-629-80-01
Report No.(s): NASA/CR-2003-212678; No Copyright; Avail: CASI; A06, Hardcopy

This report discusses the development and application of metrology methods called photogrammetry and videogrammetry that make accurate measurements from photographs. These methods have been adapted for the static and dynamic characterization of gossamer structures, as four specific solar sail applications demonstrate. The applications prove that high-resolution, full-field, non-contact static measurements of solar sails using dot projection photogrammetry are possible as well as full-field, non-contact, dynamic characterization using dot projection videogrammetry. The accuracy of the

measurement of the resonant frequencies and operating deflection shapes that were extracted surpassed expectations. While other non-contact measurement methods exist, they are not full-field and require significantly more time to take data.
Author
Metrology; Photogrammetry; Solar Sails; Optical Measurement; Aerial Photography; Video Equipment

20040040400 Limerick Univ., Limerick, Ireland
Fabric Integrated GMT
McMahon, T. M.; Mallon, P. J.; Roberts, R. W.; Butler, P. A.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 373-381; In English; See also 20040040360; Copyright; Avail: Other Sources

The integration of woven comingled fabrics on to the surface of glass mat thermoplastic (GMT) has been shown to be a viable option to allow for the use of glass reinforced polypropylene composites in structural applications, where the performance of GMT alone is inadequate. It is therefore necessary to understand the various processes involved in the moulding of such structures. Squeeze flow rheometry has traditionally been used to characterise the flow behaviour of continuous random fibre composite materials. Isothermal squeeze flow testing was undertaken on circular samples of GMT over various plate closing rates. Testing of GMT with different fibre fractions showed that the fibre fraction is not directly proportional to the squeeze load. GMT was then squeezed between two fabric layers in a similar manner. A power law model for extensional flow was successfully applied to the fit the resultant stress strain characteristics. The inclusion of the fabric had little effect at low strain levels (small thickness reductions), while at high strain levels (large thickness reductions) there was a 20% increase in the load and subsequent stress. This indicates that for a similar sized component, 20% greater moulding pressure would be required when the fabric has been included in the structure.
Author
Thermoplasticity; Stress-Strain Relationships; Isothermal Flow; Fabrics; Structural Design

20040045162 NASA Glenn Research Center, Cleveland, OH, USA
Integrated Force Method Solution to Indeterminate Structural Mechanics Problems
Patnaik, Surya N.; Hopkins, Dale A.; Halford, Gary R.; March 2004; 181 pp.; In English
Contract(s)/Grant(s): WBS-22-708-24-08
Report No.(s): NASA/TP-2004-207430; E-10681; No Copyright; Avail: CASI; A09, Hardcopy

Strength of materials problems have been classified into determinate and indeterminate problems. Determinate analysis primarily based on the equilibrium concept is well understood. Solutions of indeterminate problems required additional compatibility conditions, and its comprehension was not exclusive. A solution to indeterminate problem is generated by manipulating the equilibrium concept, either by rewriting in the displacement variables or through the cutting and closing gap technique of the redundant force method. Compatibility improvisation has made analysis cumbersome. The authors have researched and understood the compatibility theory. Solutions can be generated with equal emphasis on the equilibrium and compatibility concepts. This technique is called the Integrated Force Method (IFM). Forces are the primary unknowns of IFM. Displacements are back-calculated from forces. IFM equations are manipulated to obtain the Dual Integrated Force Method (IFMD). Displacement is the primary variable of IFMD and force is back-calculated. The subject is introduced through response variables: force, deformation, displacement; and underlying concepts: equilibrium equation, force deformation relation, deformation displacement relation, and compatibility condition. Mechanical load, temperature variation, and support settling are equally emphasized. The basic theory is discussed. A set of examples illustrate the new concepts. IFM and IFMD based finite element methods are introduced for simple problems.
Author
Structural Analysis; Compatibility; Displacement; Equilibrium Equations

20040045164 Pennsylvania State Univ., State College, PA, USA
Shearography for Non-destructive Inspection with applications to BAT Mask Tile Adhesive Bonding and Specular Surface Honeycomb Panels
Lysak, Daniel B.; March 2003; 24 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC5-508
Report No.(s): TR03-005; No Copyright; Avail: CASI; A03, Hardcopy

The applicability of shearography techniques for non-destructive evaluation in two unique application areas is examined. In the first application, shearography is used to evaluate the quality of adhesive bonds holding lead tiles to the B.4T gamma

ray mask for the NASA Swift program. Using a vibration excitation, the more poorly bonded tiles are readily identifiable in the shearography image. A quantitative analysis is presented that compares the shearography results with a destructive pull test measuring the force at bond failure. The second application is to evaluate the bonding between the skin and core of a honeycomb structure with a specular (mirror-like) surface. In standard shearography techniques, the object under test must have a diffuse surface to generate the speckle patterns in laser light, which are then sheared. A novel configuration using the specular surface as a mirror to image speckles from a diffuser is presented, opening up the use of shearography to a new class of objects that could not have been examined with the traditional approach. This new technique readily identifies large scale bond failures in the panel, demonstrating the validity of this approach.
Author
Honeycomb Structures; Adhesive Bonding; Gamma Rays; Nondestructive Tests; Shearography; Adhesion Tests

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20040045192 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
Calibration of EPS Derived Probabilities
Kok, C. J.; 2001; ISSN 0169-1651; 95 pp.; In English
Report No.(s): WR-2001-04; Copyright; Avail: Other Sources

In medium range forecasting EPS is one of the most important tools. Not only its deterministic information is used (the ensemble mean provides excellent forecasts from day 5 or so), but in particular in probabilistic sense it is one of the main guidelines in operational forecasting. The way in which probabilistic information is usually extracted from EPS is simply by counting the fraction of ensemble members that exceed a particular threshold of interest and then interpreting this fraction as the probability that this threshold will be reached. In this paper we will refer to these probabilities as EPS probabilities. Usually, this information is very qualitatively assessed from the presentation of the EPS output in the form of the so-called plume plots. These plots are available for a fixed set of meteorological quantities (predictands) and locations. For The Netherlands this is at the moment in the order of 6 locations over land and 3 at sea. The predictands are temperature, precipitation, wind and cloudiness for the land stations, and mainly wave height at the sea stations. As is well known, the plumes are constructed from deterministic model output from 51 individual runs of a larger scale version of the operational model. Their values are representative for grid boxes. It is common practice, however, to interpreter the EPS probabilities as being valid for specific locations inside those grid boxes. Depending on the correlation radius of the particular predictand and the characteristics of that location this can be a good or a rather poor assumption. One of the main objectives of this report is to analyze and quanta the validity of this assumption as a function of lead time for all available predictand at all stations for which plume plots are available. There are many more ways in which probabilistic information obtained from EPS can be used. For instance, EPS yields a probability distribution from which the forecaster can deduce the likelihood of different scenarios . There can even be an indication of a bifurcation in the solutions of EPS. In that case a deterministically best forecast could be a value in the least likely part of the probability distribution (e.g. between the two maxima), whereas the forecaster could express the probability of the two distinct scenarios. This is only appropriate, of course, if EPS predictions of bifurcations are skillful. These matters will not be studied explicitly in this report. Another important probability application of the plumes may be in the field of predictand (more or less) extreme events. Sometimes EPS produces a so-called outlier which is climatologically rare. An outlier is a value of the predictand which is more or less isolated from the rest of the plume. It is sometimes believed that this indicates that there is indeed a small possibility for the occurrence of an 'extreme' event. In the analysis of EPS probabilities that we present in this report the subject of extremes will not be addressed explicitly. All probability statements are analyzed together. More explicitly, only the relative order of the values of the ensemble members is considered and whether or not they are isolated from other members is not taken into account. The same is true for bifurcations or any other specific feature in the PDF.
Derived from text
Calibrating; Forecasting; Probability Theory; Mathematical Models

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20040035741 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Use of IKONOS II Data for Urban Analysis: Operational Tests in Eastern Sao Paulo City
Melo, Danilo Heitor Caires Tinoco Bisneto; 2003; 148 pp.; In Portuguese
Report No.(s): INPE-9865-TDI/870; Copyright; Avail: CASI; A07, Hardcopy

This work presents an application methodology of Remote Sensing and Geographic Information Systems (GIS) aiming to analyze the contribution of high resolution image data from IKONOS II satellite, for the implementation of a highway as well as for urban development. The area under study is located at the eastern section of Sao Paulo Metropolitan Region, where the eastern segment of the ring road called 'Rodoanel Metropolitano de Sao Paulo' will be implanted. In order to use Remote Sensing and GIS techniques properly, the fundamentals of the methodology were presented, explaining why they were used. In this study thematic data of Geology, Geomorphology and Topography were used, showing the potential of these information in a GIS. The following image data were used: Landsat 7 ETM+ bands 1,4, and 7, SPOT 4 panchromatic band, IKONOS II multispectral bands 1,2 and 3 and the panchromatic band. Several experiments were done with these data, integrating them through a transformation of the color space. Using relief information associated to IKONOS II data, an animation was done, demonstrating the local topography in 3D. The information on land use/land cover were obtained through an image from the transformation of the color space from IKONOS II, followed by a thematic classification using the new application software eCognition. This package uses a new concept for image analysis: it uses the object oriented classification. The results of this study showed that the integration of the panchromatic IKONOS II image with the multispectral Landsat 7 ETM+ scene, through the transformation in the color space, did not present good results. Nevertheless, the object oriented classification allows new alternatives, such as: discrimination of classes to evaluate spectral bands separately by size, form, texture and number of borders of a thematic class. With this procedure, there is a higher interaction between the classifier and the scene to be classified.
Author
Remote Sensing; Geographic Information Systems; High Resolution; Satellite Observation; Data Integration; Geomorphology

20040036173 Woods Hole Oceanographic Inst., MA
Interdisciplinary Research Programs in Geophysical Fluid Dynamics
Whitehead, John A.; Feb. 19, 2004; 5 pp.; In English
Contract(s)/Grant(s): N00014-97-1-0934
Report No.(s): AD-A420192; No Copyright; Avail: CASI; A01, Hardcopy

The Geophysics Fluid Dynamics (GFD) program consists of a summer study school of ten weeks duration each summer. The primary aim of the program is to visit a different specific area of GFD each summer, review fundamentals, and to help each other to conduct original research. Participants are approximately ten graduate student fellows, visiting graduate students and both visiting and returning scientists. The first two weeks consist of principal lectures in the summer's topic conducted by an expert in that area. Lectures by staff and visitors follow at a rate of roughly one or two per day for the next six weeks. in the last week, the fellows present results of a project and a written report. The fellows also write up the principal lectures. All are collected in a volume and on the web.
DTIC
Fluid Dynamics

20040036545 Naval Postgraduate School, Monterey, CA
Rendering Large-Scale Terrain Models and Positioning Objects in Relation to 3D Terrain
Hittner, Brian E.; Dec. 2003; 133 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420513; No Copyright; Avail: CASI; A07, Hardcopy

Computer generated 3D graphics have been commonplace in computing since the early 1990's. However, most 3D scenes have focused on relatively small areas such as rooms or buildings. Rendering large scale landscapes based on 3D geometry generally did not occur because the scenes generated tended to use up too much system memory and overburden 3D graphics cards with too many polygons. However, there are applications where the terrain is critical and needs to be rendered properly

such as cartography and military simulation. This thesis is focused on methods of rendering terrain for such applications. The data used to build terrain geometry typically comes from elevation postings taken from surveys of the terrain. This thesis does not focus on collecting this data nor does it compare various sources of terrain data. Instead, this thesis is about taking elevation data, producing a rendered 3D scene, and placing objects within the scene relative to the terrain. Having these capabilities makes many military and cartographic applications possible. Some military applications include displaying the results of computer simulations in 3D, planning operations using a 3D landscape, and rehearsing operations in 3D. The military does have some tools that can be used today for these actions but the tools are typically proprietary and expensive. This thesis is focused on using and extending open source tools for 3D terrain rendering. The result is tools that can be freely used, studied, and expanded by anyone without licensing costs.
DTIC
Scene Generation

20040040119 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Evaluation of Recent Gravity Models wrt. Altimeter Satellite Missions
Lemoine, Frank G.; Zelensky, N. P.; Luthcke, S. B.; Beckley, B. D.; Chinn, D. S.; Rowlands, D. D.; [2003]; 1 pp.; In English; TOPEX JASON Science Working Team Meeting, 18-21 Nov. 2003, Arles, France; No Copyright; Avail: Other Sources; Abstract Only

With the launch of CHAMP and GRACE, we have entered a new phase in the history of satellite geodesy. For the first time, geopotential models are now available based almost exclusively on satellite-satellite tracking either with GPS in the case of the CHAMP-based geopotential models, or co-orbital intersatellite ultra-precise ranging in the case of GRACE. Different groups have analyzed these data, and produced a series of geopotential models (e.g., EIGENlS, EIGEN2, GGM0lS, GGMOlC) that incorporate the new data. We will compare the performance of these 'newer' geopotential models with the standard models now used for computations, (e.g., JGM-3, BGM-96, PGS7727, and GRIMS-C1) for TOPEX, JASON, Geosat-Follow-On (GFO), and Envisat using standard metrics such as SLR RMS of fit, altimeter crossovers, and orbit overlaps. Where covariances are available we can evaluate the predicted geographically correlated orbit error. These predicted results can be compared with the Earth-fixed differences between dynamic and reduced-dynamic orbits to test the predictive accuracy of the covariances, as well as to calibrate the error of the solutions.
Author
Gravitation; Geopotential; Geodesy; Earth (Planet); Data Processing

20040040126 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Full-Waveform, Wide-Swath Lidar Imaging of Forested and Urban Areas in Leaf-On Conditions: Development, Results and Future Direction
Blair, James B.; Hofton, M.; Rabine, David; Welch, Wayne; Ramos, Luis; Padden, Phillip; [2003]; 1 pp.; In English; The 2003 Fall American Geophysical Union Meeting, 7-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Full-Waveform lidar measurements provide unprecedented views of the vertical and horizontal structure of vegetation and the topography of the Earth s surface. Utilizing a high signal-to-noise ratio lidar system, larger than typical laser footprints (10-20 m), and the recorded time history of interaction between a short-duration (approx. 10 ns) pulse of laser light and the surface of the Earth, full-waveform lidar is able to simultaneously image sub-canopy topography as well as the vertical structure of any overlying vegetation. These data reveal the true 3-D vegetation structure in leaf-on conditions enabling important biophysical parameters such as above-ground biomass to be estimated with unprecedented accuracy. An airborne lidar mission was conducted July-August 2003 in support of the North America Carbon Program. NASA s Laser Vegetation Imaging Sensor (LVIS) was used to image approximately 2,000 km^2 in Maine, New Hampshire, Massachusetts and Maryland. Areas with available ground and other data were included (e.g., experimental forests, FLUXNET sites) in order to facilitate as many bio- and geophysical investigations as possible. Data collected included ground elevation and canopy height measurements for each laser footprint, as well as the vertical distribution of intercepted surfaces. Data will be publicly distributed within 6- 12 months of collection. Further details of the mission, including the lidar system technology, the locations of the mapped areas, and examples of the numerous data products that can be derived from the return waveform data products will be presented. Future applications including detection of ground and vegetation canopy changes and a spaceborne implementation of wide-swath, full-waveform imaging lidar will also be discussed.
Author
Imaging Techniques; Radar Measurement; Forests; Waveforms; Vegetation; Earth Surface; Topography; Signal to Noise Ratios

20040040129 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Expected Improvements in VLBI Measurements of the Earth's Orientation

Ma, Chopo; [2003]; 1 pp.; In English; American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Measurements of the Earth s orientation since the 1970s using space geodetic techniques have provided a continually expanding and improving data set for studies of the Earth s structure and the distribution of mass and angular momentum. The accuracy of current one-day measurements is better than 100 microarcsec for the motion of the pole with respect to the celestial and terrestrial reference frames and better than 3 microsec for the rotation around the pole. VLBI uniquely provides the three Earth orientation parameters (nutation and UTI) that relate the Earth to the extragalactic celestial reference frame. The accuracy and resolution of the VLBI Earth orientation time series can be expected to improve substantially in the near future because of refinements in the realization of the celestial reference frame, improved modeling of the troposphere and non-linear station motions, larger observing networks, optimized scheduling, deployment of disk-based Mark V recorders, full use of Mark IV capabilities, and e-VLBI. More radical future technical developments will be discussed.

Author

Angular Momentum; Earth Orientation; Time Series Analysis; Mass Distribution; Celestial Reference Systems

20040040297 Florida Space Inst., FL, USA

Assessment of Remote Sensing Technologies for Location of Hydrogen and Helium Leaks

Sellar, R. Glenn; Wang, Danli; February 28, 2000; 39 pp.; In English

Contract(s)/Grant(s): NAG10-0290; SBIR-00.00-0000; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this initial phase of this research effort is to: 1) Evaluate remote sensing technologies for location of leaks of gaseous molecular hydrogen (H2) and gaseous helium (He) in air, for space transportation applications; and 2) Develop a diffusion model that predicts concentration of H2 or He gas as a function of leak rate and distance from the leak.

Derived from text

Helium; Hydrogen; Leakage; Remote Sensing; Mathematical Models; Technology Assessment

20040041352 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Atmospheric Chemistry Data Products

December 2003; 2 pp.; In English; Original contains color illustrations

Report No.(s): NP-2003-11-591-GSFC; No Copyright; Avail: Other Sources; Abstract Only

This presentation poster covers data products from the Distributed Active Archive Center (DAAC) of the Goddard Earth Sciences (GES) Data and Information Services Center (DISC). Total Ozone Mapping Spectrometer products (TOMS) introduced in the presentation include TOMS Version 8 as well as Aura, which provides 25 years of TOMS and Upper Atmosphere Research Satellite (UARS) data. The presentation lists a number of atmospheric chemistry and dynamics data sets at DAAC.

CASI

Atmospheric Chemistry; Total Ozone Mapping Spectrometer; Upper Atmosphere Research Satellite (Uars)

20040043732 NASA, Washington, DC, USA

Manned Space-Flight Experiments: Gemini V Mission

January 06, 1966; 183 pp.; In English; See also 20040043733 - 20040043743; No Copyright; Avail: CASI; A09, Hardcopy

This compilation of papers constitutes an interim report on the results of experiments conducted during the Gemini V manned space flight. The results of experiments conducted on Gemini III and IV manned space flights have been published previously in a similar interim report, 'Manned Space Flight Experiments Symposium, Gemini Missions III and IV,' which is available upon request from MSC Experiments Program Office, Houston, Texas (Code EX, Attention of R. Kinard). The Gemini V mission provided the greatest opportunity to date for conducting experiments; the increased mission duration of eight days provided this added capability. The total mission experiment complement was seventeen. Five experiments were designed to obtain basic scientific knowledge, five were medical, and seven were technological and engineering in nature. Six of the experiments had flown previously on Gemini IV, and eleven were new. The results of the experiments, including real-time modification to preflight plans made necessary by abnormal spacecraft system operation, are presented.

Author

Gemini 5 Flight; Imagery; Earth Observations (From Space); Physiological Effects

20040045159 NASA Stennis Space Center, Bay Saint Louis, MS, USA
SAMZ: Satellite-Derived Management Zones
January 15, 2004; 3 pp.; In English
Contract(s)/Grant(s): NAS13-99034
Report No.(s): NP-2004-01-00001-SSC; SSC-00186; No Copyright; Avail: CASI; A01, Hardcopy

The term 'satellite-derived management zones' (SAMZ) denotes agricultural management zones that are subdivisions of large fields and that are derived from images of the fields acquired by instruments aboard Earth orbiting satellites during approximately the past 15 years. 'SAMZ' also denotes the methodology and the software that implements the methodology for creating such zones. The SAMZ approach is one of several products of continuing efforts to realize a concept of precision agriculture, which involves optimal variations in seeding, in application of chemicals, and in irrigation, plus decisions to farm or not to farm certain portions of fields, all in an effort to maximize profitability in view of spatial and temporal variations in the growth and health of crops and in the chemical and physical conditions of soils. As used here, 'management zone' signifies, more precisely, a subdivision of a field within which the crop production behavior is regarded as homogeneous. From the perspective of precision agriculture, management zones are the smallest subdivisions between which the seeding, application of chemicals, and other management parameters are to be varied. In the SAMZ approach, the main sources of data are the archives of satellite imagery that have been collected over the years for diverse purposes. One of the main advantages afforded by the SAMZ approach is that the data in these archives can be reused for purposes of precision agriculture at low cost. De facto, these archives contain information on all sources of variability within a field, including weather, crop types, crop management, soil types, and water drainage patterns. The SAMZ methodology involves the establishment of a Web-based interface based on an algorithm that generates management zones automatically and quickly from archival satellite image data in response to requests from farmers. A farmer can make a request by either uploading data describing a field boundary to the Web site or else drawing the boundary on a reference image. Hence, a farmer can start to engage in precision farming shortly after gaining access to the Web site, without need for incurring the high costs of conventional precision-agriculture data-collection practices that include collecting soil samples, mapping electrical conductivity of soil, and compiling multi-year crop-yield data. Given the boundary of a field, a SAMZ server computes the zones within the field in a three-stage process. In the first stage, a vector-valued image of the field is constructed by assembling, from the archives, the equivalent of a stack of the available images of the field (see figure). In the second stage, the vector-valued image is analyzed by use of a wavelet transform that detects spatial variations considered significant for precision farming while suppressing small-scale heterogeneities that are regarded as insignificant. In the third stage, a segmentation algorithm assembles the zones from smaller regions that have been identified in the wavelet analysis.
Author
Agriculture; Satellite Orbits; Satellite Imagery; Methodology; Computer Programs

20040045196 Colorado State Univ., Fort Collins, CO, USA
Satellite Soundings and Their Uses, Part 3
Purdom, J. F. W.; [1982]; 365 pp.; In English; Workshop on Satellite Meteorology, 19-23 Jul. 1982, Fort Collins, CO, USA; Copyright; Avail: Other Sources

This preprint volume, one of three parts which cover a workshop, includes papers addressing the following subjects: satellite remote sensing, synoptic scale nanoscale sounding, satellite data in global scale modeling, and Satellite data in regional and global climate studies.
CASI
Satellite Sounding; Remote Sensing

20040045210 Oak Ridge National Lab., TN, USA
Worldwide Historical Estimates of Leaf Area Index, 1932-2000
Scurlock, J. M. O.; Asner, G. P.; Gower, S. T.; December 2001; 40 pp.; In English
Contract(s)/Grant(s): NASA Order S-87079-F; 2013-P289-A1; DE-AC05-00OR-22725
Report No.(s): ORNL/TM-2001-268; No Copyright; Avail: CASI; A03, Hardcopy

Approximately 1000 published estimates of leaf area index (LAI) from nearly 400 unique field sites, covering the period 1932-2000, have been compiled into a single data set. LA1 is a key parameter for global and regional models of biosphere/atmosphere exchange of carbon dioxide, water vapor, and other materials. It also plays an integral role in determining the energy balance of the land surface. This data set provides a benchmark of typical values and ranges of LA1 for a variety of biomes and land cover types, in support of model development and validation of satellite-derived remote sensing estimates of LA1 and other vegetation parameters. The LA1 data are linked to a bibliography of over 300

originalsource references.This report documents the development of this data set, its contents, and its availability on the Internet from the Oak Ridge National Laboratory Distributed Active Archive Center for Biogeochemical Dynamics. Caution is advised in using these data, which were collected using a wide range of methodologies and assumptions that may not allow comparisons among sites.
Author
Leaf Area Index; Remote Sensing; Canopies (Vegetation)

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

20040035818 National Renewable Energy Lab., Golden, CO
Novel Characterization Methods for Microcrystalline Silicon. Final Report May 1999-December 2002
Dexheimer, S. L.; Lynn, K. G.; Oct. 2003; 22 pp.; In English
Report No.(s): DE2003-15004844; NREL/SR-520-34949; No Copyright; Avail: Department of Energy Information Bridge

The work carried out under this subcontract has provided advanced characterization supporting the development of these materials for photovoltaic applications. The studies, using time-resolved optical methods and positron annihilation spectroscopy, focus on characterization of carrier processes and defect states that are important to understand, and thereby control, to optimize photovoltaic efficiency. In this work, systematic studies as a function of key material parameters have been carried out to develop a more detailed understanding of conductivity processes. Femtosecond laser spectroscopic techniques are used to probe photoexcited carrier processes, including carrier trapping and recombination, as well as carrier thermalization, providing key parameters for conductivity models. An important part of the work involves the application of recently developed methods for generation and detection of femtosecond pulses in the far-infrared (or THz) spectral range. Time-resolved measurements of photoexcited carrier dynamics using far-infrared probe pulses provide a direct measure of the photoconductivity on fast time scales.
NTIS
Microcrystals; Silicon; Solar Cells; Photoconductivity; Single Crystals

20040040085 NASA Glenn Research Center, Cleveland, OH, USA
Demonstration of Single Axis Combined Attitude Control and Energy Storage Using Two Flywheels
Kenny, Barbara H.; Jansen, Ralph; Kascak, Peter; Dever, Timothy; Santiago, Walter; February 2004; 24 pp.; In English; 2004 Aerospace Conference, 6-13 Mar. 2004, Big Sky, MT, USA
Contract(s)/Grant(s): WBS 22-755-60-12
Report No.(s): NASA/TM-2004-212935; E-14373; IEEEAC-1261; No Copyright; Avail: CASI; A03, Hardcopy

The energy storage and attitude control subsystems of the typical satellite are presently distinct and separate. Energy storage is conventionally provided by batteries, either NiCd or NiH, and active attitude control is accomplished with control moment gyros (CMGs) or reaction wheels. An overall system mass savings can be realized if these two subsystems are combined using multiple flywheels for simultaneous kinetic energy storage and momentum transfer. Several authors have studied the control of the flywheels to accomplish this and have published simulation results showing the feasibility and performance. This paper presents the first experimental results showing combined energy storage and momentum control about a single axis using two flywheels.
Author
Energy Storage; Flywheels; Attitude Control; Control Systems Design

20040041377 Defence Science and Technology Organisation, Edinburgh, Australia
Modelling of PBX-115 Using Kinetic CHEETAH and the DYNA Codes
Lu, Jing Ping; Kennedy, David L.; September 2003; 25 pp.; In English
Report No.(s): DSTO-TR-1496; DODA-AR-012-899; Copyright; Avail: Other Sources

PBXW-115, a highly non-ideal explosive tailored for underwater effects and composed of 43% ammonium perchlorate, 25 % aluminium, 20% RDX and 12% HTPB binder, has been studied using Kinetic CHEETAH (the Lawrence Livermore National Laboratory CHEETAH 2.0 code), the three-term 'Ignition and Growth' Model incorporated into the explicit finite

element hydrocode LSTC-DYNA, and the CPeX Reactive Model based on the small divergent detonation theory of Wood and Kirkwood in DYNA2D. This report firstly focuses on a series of simulations performed using Kinetic CHEETAH based on the Wood-Kirkwood detonation theory using a pressure exponent of 2 in the pressure-dependent rate law. It was found that CHEETAH could predict the trend of the detonation velocity as a function of charge diameter, but overestimated the detonation velocities. The agreement was improved with further parameter adjustment, by decreasing the pressure exponent in the rate law from 2.0 to 1.0, and then 0.5. The reaction zone widths over a wide range of charge radius were also computed. Attention was then turned to hydrocode modelling, with particular interest in developing reactive models for PBXN-111 and PBXW-115 (Aust). Both the 'Ignition and Growth' Model and the CPeX Model were calibrated against the experimentally observed dependence of detonation velocity on charge diameter in unconfined charges of both PBXW-115 (Aust) and US PBXN-111. These two reactive models were validated by comparing their predictions against experimental data for detonation of charges confined in 2.5 mm and 3 mm thick brass. The Ignition and Growth Model was then applied successfully to the simulation of aquarium tests. Finally, to test whether the two models using parameters derived from small-scale tests can be applied to large-scale devices, these two models were applied to the simulation of mid-scale underwater tests of PBXW-115 (Aust), and comparisons with available data are made. The LS-DYNA simulations of shock front curvature for unconfined charges are also presented and the relationships between the radii of curvature for the detonation fronts and self-propagating detonation velocities are discussed.
Author
Underwater Tests; Ammonium Perchlorates; Detonation; Htpb Propellants; Explosives

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20040035720 Lawrence Livermore National Lab., Livermore, CA
Applications of Computational Fluid Dynamics Simulations in Urban Environments and Experiments Designed to Aid the Development and Evaluation of these Models
Shinn, J. H.; Gouveia, F. J.; Aug. 2001; 12 pp.; In English
Report No.(s): DE2003-15005980; UCRL-JC-142263; No Copyright; Avail: Department of Energy Information Bridge

Progress in development of CFD models has shown their great potential for prediction of air flow, heat dissipation, and dispersion of air pollutants in the urban environment. Work at Lawrence Livermore National Laboratory has progressed using the finite element code FEM3 which has been 'massively parallelized' to produce flow fields and pollutant dispersion in a grid encompassing many city blocks and with high resolution. While it may be argued that urban CFD models are not yet economical for emergency response applications, there are many applications in assessments and air quality management where CFD models are unrivaled in the level of detail that they provide. We have conducted field experiments to define the flow field and air tracer dispersion around buildings as a means of critiquing and evaluating the CFD models. The first experiment, the 'B170 study', was a study of flow field, turbulence, and tracer dispersion in separation zones around a complex, single building. The second was the URBAN 2000 experiment in downtown Salt Lake City where flow fields and tracers were studied in nested resolution from the single building scale up to larger scales of 25 city blocks, and out to 6 km. For the future an URBAN 2003 experiment is being planned. We review the salient features of these experiments.
NTIS
Computational Fluid Dynamics; Air Pollution; Urban Research; Simulation

20040035757 Texas Univ., Austin, TX, USA
CO2 Capture by Absorption with Potassium Carbonate
Oct. 2002; 24 pp.; In English
Report No.(s): DE2003-815771; No Copyright; Avail: Department of Energy Information Bridge

The objective of this work is to improve the process for CO(sub 2) capture by alkanolamine absorption/stripping by developing an alternative solvent, aqueous K(sub 2)CO(sub 3) promoted by piperazine. Progress has been made in this reporting period on three subtasks. A simple thermodynamic model has been developed to represent the CO(sub 2) vapor pressure and speciation of the new solvent. A rate model has been formulated to predict the CO(sub 2) flux with these solutions

under absorber conditions. A process and instrumentation diagram and process flow diagram have been prepared for modifications of the existing pilot plant system.
NTIS
Carbon Dioxide; Potassium; Absorption Spectra

20040035808 National Inst. for Occupational Safety and Health, Cincinnati, OH, USA
NIOSH Health Hazard Evaluation Report: HETA No. 2001-0150-2917, IKI Manufacturing, Edgerton, Wisconsin
Dec. 2003; 18 pp.
Report No.(s): PB2004-103511; HETA-2001-0150-2917; No Copyright; Avail: CASI; A03, Hardcopy

On January 26, 2001, the National Institute for Occupational Safety and Health (NIOSH) received an employee request to conduct a health hazard evaluation (HHE) at IKI Manufacturing (IKI) in Edgerton, Wisconsin. The request cited concerns regarding worker exposure to ethyl ether, methanol, and propylene glycol on a de-icer filling line. Health concerns listed on the HHE request included headaches and dizziness. On October 21-22, 2002, two NIOSH industrial hygienists visited IKI Manufacturing to conduct an industrial hygiene survey. Based upon discussions with management regarding the process and product ingredients, personal breathing zone (PBZ) air samples were collected to assess employee exposure to toluene, heptane, trichloroethylene, and ethyl ether.
NTIS
Physiological Effects; Deicers

20040035827 Texas A&M Univ., College Station, TX, USA
CO2 Sequestration Potential of Texas Low-Rank Coals
McVay, D. A.; Ayers, W. B.; Jensen, J. L.; Feb. 2003; 10 pp.; In English
Report No.(s): DE2003-816715; No Copyright; Avail: Department of Energy Information Bridge

The objectives of this project are to evaluate the feasibility of carbon dioxide (CO(sub 2)) sequestration in Texas low-rank coals and to determine the potential for enhanced coalbed methane (CBM) recovery as an added benefit of sequestration. The main objectives for this reporting period were to work on Tasks 1 and 2, which consisted of the following subtasks: review literature on CO(sub 2) sequestration and the effect of CO(sub 2) injection on methane production from coalbeds; acquire information on power plant flue gas emissions; acquire data on Texas coal occurrences and properties and formation water quality; construct a digital base map; and select geographic areas and geologic formations for study. Flue gas information, including volumes and compositions, were obtained for major Texas power plants and other industrial sources, such as cement plants. We evaluated and obtained computer mapping software and began building a digital base map that will be used to depict industrial emissions, coal occurrence, and water quality information.
NTIS
Carbon Dioxide; Coal; Computer Aided Mapping; Exhaust Emission; Exhaust Gases; Flue Gases; Maps

20040035863 Lawrence Berkeley National Lab., CA, Berkeley, CA, USA
Multiproject Baselines for Evaluation of Electric Power Projects
Sathaye, J.; Murtishaw, S.; Price, L.; Lefranc, M.; Roy, J.; 2003; 26 pp.; In English
Report No.(s): DE2004-820255; LBNL-51917; No Copyright; Avail: Department of Energy Information Bridge

Calculating greenhouse gas emissions reductions from climate change mitigation projects requires construction of a baseline that sets emissions levels that would have occurred without the project. This paper describes a standardized multiproject methodology for setting baselines for electric power projects, using a reference case emissions rate (kg C/kWh). Standardized multiproject emissions rates offer the possibility to significantly reduce the transaction costs of projects. The most challenging aspect of setting multiproject emissions rates is determining the vintage and types of plants to include in the baseline and the stringency of the emissions rates to be considered, in order to balance the desire to encourage no- or low-carbon projects while maintaining environmental integrity. The criteria for selecting power plants to include in the baseline depend on characteristics of both the project and the electricity grid it serves. Two case studies illustrate the application of these concepts to the electric power grids in eastern India and South Africa. We use hypothetical, but realistic, climate change projects in each country to illustrate the use of the multiproject methodology, and note the further research required to fully understand the implications of the various choices in constructing and using these baselines.
NTIS
Computation; Greenhouse Effect; Exhaust Gases

20040035887 ARCADIS Geraghty and Miller, Inc., Research Triangle Park, NC

Measurement of Fugitive Emissions at a Region 1 Landfill

Jan. 2004; 56 pp.; In English

Report No.(s): PB2004-103034; No Copyright; Avail: CASI; A04, Hardcopy

This report discusses a new measurement technology for characterizing emissions from large area sources. This work was funded by EPA's Monitoring and Measurement for the 21st Century Initiative, or 21M2. The site selected for demonstrating this technology is a superfund landfill that is being evaluated for recreational use. Data on methane and air toxics were needed to help determine any increased risk to those using the site. Open-path Fourier transform infrared (OPFTIR) spectrometers were used to provide data on both background and surface emissions. The technology provides concentration maps indicating the spatial variability and areas where additional control may be needed. Horizontal scans to identify any hot spots and vertical scans to determine the mass flux using a multiple-beam configuration were conducted. Optical remote sensing-radial plume mapping provided concentration mapping of the site. These data will be used to make decisions about potential recreational use of this site.

NTIS

Landfills; Water Pollution; Pollution Monitoring; Air Pollution; Environmental Cleanup; Remote Sensing

20040035922 Southern Research Inst., Birmingham, AL

Development of a Validated Model for Use in Minimizing NOx Emissions and Maximizing Carbon Utilization When Co-Firing Biomass with Coal

Felix, L. G.; Bush, P. V.; Jan. 2003; 16 pp.; In English

Report No.(s): DE2003-815767; No Copyright; Avail: Department of Energy Information Bridge

This is the ninth Quarterly Technical Report for DOE Cooperative Agreement No. DE-FC26-00NT40895. A statement of the project objectives is included in the Introduction of this report. The pilot-scale testing phase of the project has been completed. Calculations are essentially completed for implementing a modeling approach to combine reaction times and temperature distributions from computational fluid dynamic models of the pilot-scale combustion furnace with char burnout and chemical reaction kinetics to predict NO(sub x) emissions and unburned carbon levels in the furnace exhaust. The REI Configurable Fireside Simulator (CFS) has proven to be an essential component to provide input for these calculations.

NTIS

Nitrogen Oxides; Biomass; Carbon; Coal

20040037735 National Renewable Energy Lab., Golden, CO

Summary of NO(sub x) Emissions Reduction from Biomass Cofiring

Dayton, D.; May 2002; 14 pp.; In English

Report No.(s): DE2004-15000430; NREL/TP-510-32260; No Copyright; Avail: Department of Energy Information Bridge

NO(sub x) emissions from commercial- and pilot-scale biomass/coal cofiring demonstrations are reduced as the percentage of energy supplied to the boiler by the biomass fuel is increased. This report attempts to provide a summary of the NO(sub x) emissions measured during recent biomass/coal cofiring demonstrations. These demonstrations were carried out at the commercial and pilot-scales. Commercial-scale tests were conducted in a variety of pulverized fuel boiler types including wall-fired, T-fired, and cyclone furnaces. Biomass input ranged up to 20% on a mass basis and 10% on an energy basis.

NTIS

Nitrogen Oxides; Biomass; Boilers

20040037752 Lawrence Livermore National Lab., Livermore, CA

Report of the Joint Development of a Prototype Communications Link to Share Nuclear Accident Dispersion and Dose Assessment Modeling Products between JAERI/WSPEEDI and LLNL/NARAC

Sullivan, T. J.; Belles, R. D.; Ellis, J. S.; Chino, M.; Nagai, H.; 2002; 40 pp.; In English

Report No.(s): DE2003-15005711; No Copyright; Avail: Department of Energy Information Bridge

In June of 1997, under an umbrella Memorandum of Understanding between the Japan Atomic Energy Research Institute (JAERI) and the U.S. Department of Energy (US/DOE) concerning matters of nuclear research and development, a Specific Memorandum of Agreement (SMA) entitled 'A Collaborative Programme of Development of a Prototype Communication Link to Share Atmospheric Dispersion and Dose Assessment Modelling Products' was signed. This SMA formalized an informal collaborative exchange between the DOE's Lawrence Livermore National Laboratory (LLNL) Atmospheric Release Advisory Capability (ARAC) center and the Japan Atomic Energy Research Institute (JAERI) Worldwide System for

Prediction of Environmental Emergency Dose Information (WSPEEDI). The intended objective of this agreement was to explore various modes of information exchange, beyond facsimile transmission, which could provide for the quick exchange of information between two major nuclear emergency dose assessment and prediction national centers to provide consistency checks and data exchange before public release of their calculations. The extreme sensitivity of the general public to any nuclear accident information has been a strong motivation to seek peer preview prior to public release. Other intended objectives of this work are the development of an affordable/accessible system for distribution of prediction results to other countries having no prediction capabilities and utilization of the link for collaboration studies. To fulfill the objectives of this project JAERI and LLNL scientists determined to assess the evolving Internet and rapidly emerging communications application software. Our timing was a little early in 1997-1998 but nonetheless a few candidate software packages were found, evaluated and a selection was made for initial test and evaluation. Subsequently several new candidate software packages have arrived, albeit with limitations. This report outlines the ARAC and JAERI emergency response assessment systems, describes the prototype communications protocol system established and the tools evaluated in that process. Three real-time applications of the information exchange protocol and lessons learned are discussed and then some conclusions and future plans are presented.
NTIS
Accidents; Telecommunication; Emergencies; Communication Networks

20040041292 TDA Research, Inc., Wheat Ridge, CO, USA
Hybrid Sulfur Recovery Process for Natural Gas Upgrading. Quarterly Technical Report for Period January 1, 2003 to March 30, 2003
Dalrymple, D.; Apr. 2003; 14 pp.; In English
Report No.(s): DE2004-820564; No Copyright; Avail: Department of Energy Information Bridge
This first quarter report of 2003 describes progress on a project funded by the U.S. Department of Energy (DOE) to test a hybrid sulfur recovery process for natural gas upgrading. The process concept represents a low cost option for direct treatment of natural gas streams to remove H(sub 2)S in quantities equivalent to 0.2-25 metric tons (LT) of sulfur per day. This process is projected to have lower capital and operating costs than the competing technologies, amine/aqueous iron liquid redox and amine/Claus/tail gas treating, and have a smaller plant footprint, making it well suited to both on-shore and off-shore applications. CrystaSulf(trade name) (service mark of CrystaTech, Inc.) is a new nonaqueous sulfur recovery process that removes hydrogen sulfide (H(sub 2)S) from gas streams and converts it into elemental sulfur.
NTIS
Natural Gas; Hydrogen Sulfide

20040041296 Texas A&M Univ., College Station, TX, USA
Co-Firing Coal: Feedlot and Litter Biomass Fuels. Quarterly Progress Report No. 11
Annamalai, K.; Sweeten, J.; Mukhtar, S.; Priyadarsan, S.; Jun. 2003; 32 pp.; In English
Report No.(s): DE2004-820421; No Copyright; Avail: Department of Energy Information Bridge
Reburn with animal waste yield NOx reduction of the order of 70-80 %, which is much higher than those previously reported in the literature for natural gas, coal and agricultural biomass as reburn fuels. Further, the NOx reduction is almost independent of stoichiometry from stoichiometric to upto 10 % deficient air in reburn zone. As a first step towards understanding the reburn process in a boiler burner, a simplified zero-dimensional model has been developed for estimating the NOx reduction in the reburn process using simulated animal waste based biomass volatiles. However the first model does not include the gradual heat up of reburn fuel particle, pyrolysis and char combustion. Hence there is a need for more rigorous treatment of the model with animal waste as reburn fuel. To address this issue, an improved zero-dimensional model is being developed which can handle any solid reburn fuel, along with more detailed heterogeneous char reactions and homogeneous global reactions.
NTIS
Coal; Biomass; Fuels; Combustion

20040041309 National Inst. for Occupational Safety and Health, Washington, DC, USA
Summary of Health Hazard Evaluations: Issues Related to Occupational Exposure to Isocyanates, 1989 to 2002
Jan. 2004; 46 pp.; In English
Report No.(s): PB2004-104026; NIOSH/PUB-20045-116; No Copyright; Avail: CASI; A03, Hardcopy
The Health Hazard Evaluations and Technical Assistance (HETA) Program responds to requests from employers,

employees, employee representatives, and other Federal, State, and local agencies. Through a staff of industrial hygienists, engineers, occupational physicians, epidemiologists, other health professionals, and support personnel, the Hazard Evaluations and Technical Assistance Branch (HETAB) collaborates with appropriate personnel in other divisions of the National Institute for Occupational Safety and Health (NIOSH) to respond to approximately 450 requests for assistance each year. The typical HETA response to a request for assistance results in (l) an evaluation of whether chemical, physical, biological, or other agents are hazardous as used or found in the workplace and (2) the development of recommendations for control procedures, improved work practices, and medical programs to reduce exposure levels and prevent adverse health effects. Health Hazard Evaluation (HHE) site visits are conducted if warranted, and interim and final reports are developed and distributed to employees, unions, management, and relevant Federal and State agencies. The purpose of this HHE summary document is to amass the past 14 years of isocyanate-related HHEs in a concise format for easy reference and examination by NIOSH researchers, customers, and partners. Any individual report or letter of interest can easily be requested. The scope and presentation of the individual HHEs vary based on the requesters' needs and the project officers' professional judgment. The document is not meant to be a state-of-the-art review, but instead, it is intended to provide general insight into the types of isocyanate HHE requests received, and HETAB's response to them.
NTIS
Safety; Health; Hazards; Exposure

20040041311 National Inst. for Occupational Safety and Health, Washington, DC, USA
Summary of Health Hazard Evaluation: Issues Related to Occupational Exposure to Fire Fighters, 1990 to 2001
Jan. 2004; 36 pp.; In English
Report No.(s): PB2004-104025; No Copyright; Avail: CASI; A03, Hardcopy

Fire fighting continues to be one of the more hazardous industries in this country. The occupational environment for fire fighters is somewhat unique: exposures are varied, often high, and intermittent. They occur in circumstances of extreme physical and mental stress where the only means of exposure control is selfcontained breathing apparatus (SCBAs). Exposures can include smoke and particulate matter, carbon monoxide (CO), nitrogen dioxide (NO2), hydrogen chloride, hydrogen cyanide, sulfur dioxide (SO2)/sulfuric acid, acrolein, formaldehyde and acetaldehyde, benzene and many other organic chemicals, and any chemicals that might be located at the fire scene.
NTIS
Fire Fighting; Health; Hazards; Breathing Apparatus

20040041312 Office of Air Quality Planning and Standards, Research Triangle Park, NC
National Emission Standards for Hazardous Air Pollutants (NESHAP): Surface Coating of Miscellaneous Metal Parts and Products. Summary of Public Comments and Responses on Proposed Rule
Aug. 2003; 188 pp.
Report No.(s): PB2004-104014; EPA-453/R-03-008; No Copyright; Avail: CASI; A09, Hardcopy

On August 13, 2002, the U.S. Environmental Protection Agency (EPA) proposed national emission standards for hazardous air pollutants (NESHAP) for Surface Coating of Miscellaneous Metal Parts and Products. The proposed rule fulfills the requirements of the Clean Air Act (CAA), which requires EPA to regulate emissions of hazardous air pollutants (HAP) listed in section 112(b) of the CAA. This document contains summaries of the 66 public comments that EPA received on the August 13, 2002 proposal to establish NESHAP for Surface Coating of Miscellaneous Metal Parts and Products. In this document, EPA responds to the public comments. This summary of public comments and EPA responses serves as the basis for revisions made to the Surface Coating of Miscellaneous Metal Parts and Products NESHAP between proposal and promulgation.
NTIS
Air Pollution; Coatings; Metals; Hazardous Materials; Metal Surfaces

20040041313 Office of Air Quality Planning and Standards, Research Triangle Park, NC
Economic Analysis of Air Pollution Regulations: NESHAP for Organic Liquids Distribution
Heller, K. B.; Depro, B. M.; Clayton, L.; Aug. 2003; 108 pp.
Report No.(s): PB2004-104013; EPA-452/R-02-017; No Copyright; Avail: CASI; A06, Hardcopy

This report evaluates the economic impacts of the final NESHAP for organic liquids distribution. The industry impacts and social costs of the rule are estimated by incorporating the expected costs of compliance to a partial equilibrium model of the U.S. industry and projecting the market impacts for affected markets (organic chemicals, petroleum liquids, and

commercial distribution). The report also evaluates small business impacts.
NTIS
Economic Analysis; Regulations; Air Pollution

46
GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20040035788 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Effect of Varying Crustal Thickness on CHAMP Geopotential Data
Taylor, Patrick T.; Kis, Karoly I.; vonFrese, Ralph R. B.; Korhonen, Juha V.; Wittmann, Geza; Kim, Hyung Rae; Potts, Larmie V.; [2003]; 10 pp.; In English; 2nd CHAMP Science Meeting, 1-5 Sep. 2003, Potsdam,, Germany
Contract(s)/Grant(s): T-038008; Copyright; Avail: CASI; A02, Hardcopy

Tn determine the effect of crustal thickness variation on satellite-altitude geopotential anomalies we compared two regions of Europe with vastly different values, South and Central Finland and the Pannonian Basin. In our study regions, crustal thickness exceeds 44 km in Finland and is less than 26 km in the Pannonian Basin. Heat-flow data indicate that the thinner and more active crust of the Pannonian Basin has a value nearly three times that of the Finnish Svecofennian Province. An ovoid positive CHAMP gravity anomaly (-4 mGal) is quasi-coincidental with the CHAMP magnetic anomaly traverses the Pannonian Basin while ground based gravity mapping in Hungary shows that the free-air gravity anomalies across the Pannonian Basin are near 0 to +20 mGal with shorter wavelength anomalies from +40 to less than +60 mGal and some 0 to greater than -20 mGal. Larger anomalies are detected in the mountainous areas. The minor value anomalies can indicate the isostatic equilibrium for Hungary (the central part of the Pannonian Basin). Gravity data over Finland bear overprint of de-glaciation. CHAMP gravity data indicates a west-east positive gradient of less than 4 mGal across South and Central Finland. CHAMP magnetic data (400 km) reveal elongated semi-circular negative anomalies for both regions with South-Central Finland having larger amplitude (less than -6 nT) than that over the Pannonian Basin, Hungary (less than -5 nT). In the latter subducted oceanic lithosphere has been proposed as the anomalous body.
Author
Crystal Structure; Thickness; Anomalies; Crusts; Geopotential; Magnetic Anomalies

20040035840 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Vapor Measurements from the GSFC Stratospheric Ozone Lidar
McGee, T.; [2003]; 1 pp.; In English; NDSC Steering Committee Meeting, 2-5 Dec. 2003, Wellington, New Zealand; No Copyright; Avail: Other Sources; Abstract Only

Water vapor measurements from the GSFC Stratospheric Ozone Lidar were made for the first time during a campaign at NOAA's Mauna Loa Observatory. Comparisons were made among the GSFC lidar, the NOAA Lidar and water vapor sondes which were flown from the observatory at times coincident with the lidar measurements.
Author
Optical Radar; Ozone; Stratosphere; Water Vapor

20040035977 Air Force Inst. of Tech., Wright-Patterson AFB, OH
The Application of Secular Perturbation Theory to Explain Warping in the Circumstellar Disk of Beta Pictoris
Novotny, Steven J., Jr; Jan. 2003; 147 pp.; In English
Report No.(s): AD-A420047; AFIT-CI04-102; No Copyright; Avail: CASI; A07, Hardcopy

This research is a numerical investigation into the dynamical influences of planets on the dust disks surrounding young main sequence stars. Motivating this research effort are the observations of the Beta Pictoris circumstellar disk made by the UF Department of Astronomy's mid-IR team. These IR images show with unprecedented clarity the features and asymmetries of the inner < 100 AU, portion of the Beta Pictoris disk; the most interesting of which is the dramatic warping of the disk's mid-plane. Analyses of prior observations have suggested that the features are attributed to the presence of a planet or a planetary system. Past dynamic analysis has focused primarily on the presence of a single planet and the resulting perturbations on the dust disk through hydrodynamic or N-body analysis. This research will show that the type of features observed in these images, specifically the warping of the disk, can also be explained with a system of two (or more) planets

and secular perturbation theory while using more plausible assumptions than did other models.
DTIC
Long Term Effects; Numerical Analysis; Perturbation Theory; Stellar Envelopes

20040036289 Naval Postgraduate School, Monterey, CA
Atmospheric Transmission Windows for High Energy Short Pulse Lasers
Chan, Mun K.; Dec. 2003; 93 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420318; No Copyright; Avail: CASI; A05, Hardcopy

The US Navy is exploring the feasibility of using a high energy laser weapon as a ship-borne self-defense system against sea-skimming cruise missile attacks. Since the attenuation of laser energy by the atmosphere is the highest at low altitudes and varies with frequency, the selection of appropriate wavelengths becomes critical for a laser weapon to be effective. A high energy free electron laser (FEL) is suitable for employment in the envisaged role because it can be designed to operate at any desired frequency and, to a degree, is tunable in operation. This study aims to determine the optimal atmospheric windows for high energy, pico second, short pulse lasers. Computer simulations were carried out by convolving a pulse spectrum with the transmission spectrum and the absorption coefficient from the MODTRAN and FASCODE atmospheric codes. Transmission spectrum and absorption coefficient plots were compared to find the range of suitable wavelengths that give good transmittance and low absorption coefficient values.
DTIC
Atmospheric Physics; Atmospheric Windows; High Power Lasers; Laser Weapons; Pulsed Lasers

20040036463 Cornell Univ., Ithaca, NY
Establishment of a Patrol Imager at AEOS for Space Weather and Mesospheric Studies
Kelley, Michael C.; Dec. 19, 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0064
Report No.(s): AD-A420446; AFRL-SR-AR-TR-04-0103; No Copyright; Avail: CASI; A03, Hardcopy

Researchers at Cornell University have developed, implemented, and begun to reap the scientific benefits of a dual camera/Global Positioning System installed at the Advanced Electro-Optic System on top of the Haleakala Volcano on the island of Maui, Hawaii. This effort was a special AFOSR addition to the joint NSF/AFOSR Maui MLT initiative and constituted a major contribution by the AFOSR to the National Space Weather program. Images of unprecedented quality have been obtained detailing the development and motion of severe convective ionospheric storms and ionospheric thunderstorms. These data have led to three Geophysical Research Letters publications, including one that was featured on the cover. One paper laid the groundwork for using future geostationary images of Space Weather phenomena by providing ground truth for orbital imaging of such storms. Two technology transfers were accomplished: airglow camera software was transferred to a national center, and a method for predicting severe Space Weather was transferred to the Air Force Research Laboratory. A statistical study in press has laid important groundwork for supporting the upcoming Air Force Communication/Navigation Outage Forecast System. The papers are as follows: 'Observations of equatorial spread-F from Haleakala, Hawaii,' by M.C. Kelley, J.J. Makela, B.M. Ledvina, and PM. Kintner, 29(20), 2003; 'Field-aligned 777.4-nm composite airglow images of equatorial plasma depletions,' by J.J. Makela and M.C. Kelley, 30(8), 2003; and 'The first coordinated ground- and space-based optical observations of equatorial plasma bubbles, ' by M.C. Kelley, J.J. Makela, L.J. Paxton, F. Kamaladabi, J.M. Comberiate, and H. Kil, 30(14), 2003. (5 figures, 13 refs.)
DTIC
Space Weather; Spread F; Weather Forecasting

20040036481 Clemson Univ., SC
The Design and Construction of the Second- Generation Optimized Fabry-Perot Doppler Imager (SOFDI)
Meriwether, J. W.; Feb. 16, 2004; 28 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0259
Report No.(s): AD-A420459; AFRL-SR-AR-TR-04-0121; No Copyright; Avail: CASI; A03, Hardcopy

The funding provided by the Air Force DURIP award that was provided in March of 2002 has been used to build a portable multi-purpose state-of the-art triple etalon Doppler imaging Fabry Perot interferometer, which has the name of SOFDI. The application of this instrument is primarily to measure automatically winds and temperatures in the upper atmosphere for the mesosphere and thermosphere regions for both nighttime and daytime periods. In these two atmospheric regions the airglow emissions provided by 01 atoms at 630 nm, 011 ions at 732 nm, and OH molecules (molecular bands)

make possible the monitoring of temperature and winds during the night simultaneously with an accuracy of the order of 5 ms 1 in five minutes. Daytime measurements of thermospheric winds using the 630 nm emission of 01 at a slower rate of observation and with somewhat less accuracy is the main goal of the application of this instrument. Because of the demanding nature of this application, a number of significant innovations was introduced in the design of SOFDI. These include simultaneous measurements of four fields of view that are obtained by four separate articulated telescopes, the use of the QuadCLIO and the QuadCLIO extender(CLIO means circle to line interferometer optic) to image each each high resolution spectrum onto a quadrant of the CCD camera detector.
DTIC
Doppler Effect; Fabry-Perot Interferometers; Image Processing; Optical Equipment

20040036593 Hacettepe Univ., Ankara
The International Symposium on Equatorial Aeronomy (10th) Held in Antalya, Turkey on May 17-23, 2000
Kudeki, E.; Oct. 23, 2000; 398 pp.; In English
Contract(s)/Grant(s): F61775-00-W-F043
Report No.(s): AD-A420570; ISEA-10; EOARD-CSP-00-5043; No Copyright; Avail: CASI; A17, Hardcopy

This is a mulitdisciplinary conference. Topics include: Chemistry, dynamics, and thermodynamics of the low latitude neutral and ionized atmosphere, including ionospheric and thermosphere modeling, ionospheric (E- and F-region) plasma instabilities, effects of the turbulent ionosphere on EM wave propagation, prediction of spread-F events, and remote and in-situ diagnostics of the low latitude upper atmosphere. The final papers are published as a special issue of Journal of Atmospheric and Solar-Terrestrial Physics, Aug-Sep 2002, Vol. 64, numbers 12-14.
DTIC
Equatorial Atmosphere

20040036609 Naval Postgraduate School, Monterey, CA
Investigation of Outer Length Scale In Optical Turbulence
Lin, Steven S.; Dec. 2003; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420590; No Copyright; Avail: CASI; A04, Hardcopy

Atmospheric turbulence degrades the electromagnetic propagation medium and affects many military applications. The strength and spatial distribution of turbulence are critical parameters that arise in theoretical modeling and experimental situations. This thesis investigated three outer scales of turbulence using experimental data from two instruments: microthermal probes carried by a balloon and an acoustic sounder. The outer length scale is the size of the largest energy-containing eddy in a turbulent region of the atmosphere. The length scales considered were the thermal length scale 1m associated with temperature fluctuations, the momentum length scale 1m which represents the size of the velocity fluctuations and the boundary thermal convective cell size. The microthermal balloon data had excessive scatter when the thermal outer scale was expressed in terms of the gradient Richardson number.
DTIC
Atmospheric Circulation; Optical Properties; Spatial Distribution

20040037742 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Atmosphere, Ocean, Land, and Solar Irradiance Data Sets
Johnson, James; Ahmad, Suraiya; [203]; 1 pp.; In English; Fall 2003 AGU Meeting, Dec. 2003, USA
Report No.(s): NP-2003-11-592-GSFC; No Copyright; Avail: Other Sources; Abstract Only

The report present the atmosphere, ocean color, land and solar irradiation data sets. The data presented: total ozone, aerosol, cloud optical and physical parameters, temperature and humidity profiles, radiances, rain fall, drop size distribution.
CASI
Data Acquisition; Aerosols; Atmospheric Temperature; Ozone; Radiance; Solar Radiation; Water Color

20040040130 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Density Anomalies in the Mantle and the Gravitational Core-Mantle Interaction
Kuang, Weijia; Liu, Lanbo; November 2003; 1 pp.; In English; American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Seismic studies suggest that the bulk of the mantle is heterogeneous, with density variations in depth as well as in horizontal directions (latitude and longitude). This density variation produces a three- dimensional gravity field throughout the

Earth. On the other hand, the core density also varies in both time and space, due to convective core flow. Consequently, the fluid outer core and the solid mantle interact gravitationally due to the mass anomalies in both regions. This gravitational core-mantle interaction could play a significant role in exchange of angular momentum between the core and the mantle, and thus the change in Earth's rotation on time scales of decades and longer. Aiming at estimating the significance of the gravitational core-mantle interaction on Earth's rotation variation, we introduce in our MoSST core dynamics model a heterogeneous mantle, with a density distribution derived from seismic results. In this model, the core convection is driven by the buoyancy forces. And the density variation is determined dynamically with the convection. Numerical simulation is carried out with different parameter values, intending to extrapolate numerical results for geophysical implications.
Author
Anomalies; Seismology; Geophysics; Gravitation; Density Distribution; Core-Mantle Boundary; Dynamic Models

20040040132 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Co-Seismic Energy Changes Induced by Earthquakes on a Rotating, Gravitating Earth
Chao, Benjamin F.; Gross, Richard S.; [2003]; 1 pp.; In English; American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Besides operating its own energy budget, an earthquake acts as an agent transferring a much greater amount of energy among the Earth's rotation, elastic field, gravitational field and internal heat. We compute the co-seismic, globally integrated gravitational and rotation changes induced by some 20,000 large earthquakes that occurred in the last quarter century, according to Chao et al. (1995, GJI, 122,776- 783,784-789) and using the Harvard CMT catalog. The result confirms an extremely strong tendency for the earthquakes to decrease the global gravitational energy and to increase the spin energy. It is found that energy is being extracted from the Earth's gravitational field by the action of earthquakes at an average rate of about approx. 2 TeraW during the studied period, larger by far than the approx. 7 GigaW for the average rate of the earthquake-induced rotational energy increase and the approx. 5 GigaW for the seismic energy release. Based on energetics considerations and assuming the inability of the Earth to build up elastic energy continuously over time, it is argued that earthquakes, by converting gravitational energy, may make a significant contribution to the global hedflow.
Author
Seismic Energy; Earthquakes; Gravitational Fields; Earth Rotation

20040043733 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Experiment S-5: Synoptic Terrain Photography
Lowman, Paul D., Jr.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 9-17; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A02, Hardcopy

The Synoptic Terrain Photography Experiment (S-5) was successfully conducted during the Gemini V mission, the second of the Gemini flights on which it was carried. This report summarizes briefly the methods and results of the experiment. Interpretation of the many excellent pictures obtained is in progress, and a full report is not possible at this time; instead, representative pictures will be presented and described. The purpose of the experiment was to obtain a large number of high-quality color photographs of selected land areas from geologic and geographic study. Southern Mexico, eastern Africa, and Australia were given high priority, but it was stressed that good pictures of any cloud-free land area would be useful. The same camera (Hasselblad 500 C) and film (Ektachrome MS) used on the Gemini III and IV missions were carried on the Gemini V flight.
Derived from text
Color Photography; Gemini Flights; Terrain; Synoptic Measurement; Photomapping

20040043802 Air Force Research Lab., Hanscom AFB, MA
NPOESS Scintillation Study
Basu, Bamandas; Oct. 6, 2003; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420686; AFRL-VS-TR-2004-1008; No Copyright; Avail: CASI; A03, Hardcopy

Theoretical study of the total electron content (TEC) in the nighttime equatorial anomaly region shows that linear relationships with statistically significant correlation coefficients exist between the maximum value of the post-sunset enhanced plasma drift velocity and the peak-to- valley ration of anomaly TEC. The maximum value of the post- sunset vertical plasma drift velocity is an important, perhaps the most important, parameter for determining both the intensity and the latitudinal distribution of equatorial scintillation. When this parameter is not available from any direct measurement, the relationships may be used to estimate it from the peak-to-valley ratio of anomaly TEC, which, in turn, can be derived from

the ultraviolet (UV) imagery data of the anomaly region acquired by NPOESS sensors and NPOESS- heritage sensors; e.g. GUVI on TIMED and SSUSI on DMSP. This indicates the possibility of NPOESS data being used for a scintillation-forecasting scheme. The relationships presented here are valid for the longitude sector of the Jicamarca incoherent scatter radar whose drift velocity measurements have been used in the ambient plasma density model for TEC calculations. Similar relationships for other longitudinal sectors need to be investigated.
DTIC
Equatorial Regions; Gravity Anomalies; Scintillation

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20040027546 Colorado Univ., Boulder, CO, USA
Measurement and Interpretation of Temporal Variations of the Earth's Gravity Field Using GPS and SLR Data
Nerem, R. Steven; Leuliette, Eric; Russell, Gary; [2003]; 3 pp.; In English
Contract(s)/Grant(s): NAG5-11192
Report No.(s): CU-1534686; No Copyright; Avail: CASI; A01, Hardcopy

This investigation has had four main thrusts: 1) The analysis of seasonal variations of the Earth's gravitational field using Lageos 1 and 2 SLR data and comparisons to geophysical models. We have estimated the annual variation of the gravity field via a spherical harmonic expansion complete to degree and order 4. We have also constructed a similar model using models of the annual variation in the gravity field due to atmospheric, hydrologic, and ocean mass redistribution. These three models, when combined together, are in excellent agreement with the variations observed by satellite laser ranging. An article on these results was published in the journal Geophysical Research Letters. 2) The second thrust of our investigation has been to analyze the output of a Global Climate Model (GCM) to determine if the GRACE gravity mission can be expected to detect climate change signals. Working with Gary Russell at the Goddard Institute for Space Studies (GISS), we have determined that there are several large secular signals that GRACE might be able to detect, including secular changes in snow cover, sea ice, polar ice, ocean mass, and other variables. It is possible that some of these signals could be detected with 5 years of GRACE measurements - its hard to judge this because the interannual variability in the GCM, which could mask the climate signals, is unreliable. Certainly a follow-on GRACE mission could detect these signals when compared to the data from the initial GRACE mission.). An article on these results will be published in the journal Journal of Geophysical Research. 3) In the last year of the investigation, we developed a new technique for analyzing temporal gravity variations using 'geophysical fingerprints', which was successfully demonstrated on 20 years of satellite laser ranging data [Nerem et al., 20031. 4]. We also participated in a workshop on future satellite gravity measurements, which resulted in paper on measuring ocean mass variations using GRACE [Nerem et al., 20031 and on using laser interferometry for future gravity missions [Bender et al., 20031].
Derived from text
Annual Variations; Global Positioning System; Gravitational Fields; Climate Models; Satellite Laser Ranging; Satellite Observation; Climate Change

20040027570 Embry-Riddle Aeronautical Univ., Daytona Beach, FL, USA
Ground Based Remote Sensing of Upper Atmosphere Dynamics, Thermodynamics and Composition in Support of TIMED Satellite's Scientific Mission
[2004]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-10066; No Copyright; Avail: CASI; A01, Hardcopy

The following research work was accomplished: 1. We operated high throughput spectrophotometers and interferometers at eight observatories in the Arctic, Antarctic and mid-latitude regions to record relatively high-resolution spectra of very low light level airglow and auroral line as well as band emissions. 2. Our Polar observations of auroral emissions from N2 and O emissions have been analyzed to derive the O/N2 ratios around 110 km height in the Polar thermosphere during different auroral events triggered by the precipitation of auroral electrons with average energy of about 10 keV. These results have been compared with similar ratios derived from TIMED satellite s GUVI measurements of N2 LBH and 01 1356A emissions. 3. Our airglow measurements show MLT density and temperature modulations by Planetary, Tidal and Gravity Waves. They also

indicate Mesopause cooling preceding a Stratospheric Warming Event (SWE).
Derived from text
Ground Based Control; Remote Sensing; Upper Atmosphere; Atmospheric Effects; Dynamical Systems

20040035731 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Vertical Profiles of Latent Heat Release over the Global Tropics Using TRMM Rainfall Products from December 1997 to November 2002
Tao, W.-K.; [2003]; 1 pp.; In English; International Latent Heating Algorithm Meeting, 2-4 Sep. 2003, Tokyo, Japan; No Copyright; Avail: Other Sources; Abstract Only

NASA Tropical Rainfall Measuring Mission (TRMM) precipitation radar (PR) derived rainfall information will be used to estimate the four-dimensional structure of global monthly latent heating and rainfall profiles over the global tropics from December 1997 to November 2000. Rainfall, latent heating and radar reflectivity structures between El Nino (DJF 1997-98) and La Nina (DJF 1998-99) will be examined and compared. The seasonal variation of heating over various geographic locations (i.e., oceanic vs continental, Indian ocean vs west Pacific, Africa vs S. America) will also be analyzed. In addition, the relationship between rainfall, latent heating (maximum heating level), radar reflectivity and SST is examined and will be presented in the meeting. The impact of random error and bias in straitform percentage estimates from PR on latent heating profiles is studied and will also be presented in the meeting. The Goddard Cumulus Ensemble Model is being used to simulate various mesoscale convective systems that developed in different geographic locations. Specifically, the model estimated rainfall, radar reflectivity and latent heating profiles will be compared to observational data collected from TRMM field campaigns over the South China Sea in 1998 (SCSMXX), Brazil in 1999 (TRMM- LBA), and the central Pacific in 1999 (KWAJEX). Sounding diagnosed heating budgets and radar reflectivity from these experiments can provide the means to validate (heating product) as well as improve the GCE model.
Author
Precipitation (Meteorology); Latent Heat; Meteorological Radar; Rain; Annual Variations; Atmospheric Models

20040035745 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Recent Climate Variability in Antarctica from Satellite-derived Temperature Data
Schneider, David P.; Steig, Eric J.; Comiso, Josefino C.; [2004]; 46 pp.; In English
Contract(s)/Grant(s): NSF OPP-01-96105; NSF OPP-01-26161; No Copyright; Avail: CASI; A03, Hardcopy

Recent Antarctic climate variability on month-to-month to interannual time scales is assessed through joint analysis of surface temperatures from satellite thermal infrared observations (T(sub IR)) and passive microwave brightness temperatures (T(sub B)). Although Tw data are limited to clear-sky conditions and T(sub B) data are a product of the temperature and emissivity of the upper approx. 1m of snow, the two data sets share significant covariance. This covariance is largely explained by three empirical modes, which illustrate the spatial and temporal variability of Antarctic surface temperatures. T(sub B) variations are damped compared to TIR variations, as determined by the period of the temperature forcing and the microwave emission depth; however, microwave emissivity does not vary significantly in time. Comparison of the temperature modes with Southern Hemisphere (SH) 500-hPa geopotential height anomalies demonstrates that Antarctic temperature anomalies are predominantly controlled by the principal patterns of SH atmospheric circulation. The leading surface temperature mode strongly correlates with the Southern Annular Mode (SAM) in geopotential height. The second temperature mode reflects the combined influences of the zonal wavenumber-3 and Pacific South American (PSA) patterns in 500-hPa height on month-to-month timescales. ENSO variability projects onto this mode on interannual timescales, but is not by itself a good predictor of Antarctic temperature anomalies. The third temperature mode explains winter warming trends, which may be caused by blocking events, over a large region of the East Antarctic plateau. These results help to place recent climate changes in the context of Antarctica's background climate variability and will aid in the interpretation of ice core paleoclimate records.
Author
Atmospheric Temperature; Satellite Observation; Antarctic Regions; Climate Change; Variability; Surface Temperature

20040035761 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Impact of Aerosols and Atmospheric Thermodynamics on Cloud Properties within the Climate System
Matsui, Toshihisa; Masunaga, Hirohiko; Pielke, Roger, Sr.; Tao, Wei-Kuo; [2003]; 13 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

A combination of cloud-top and columnar droplet sizes derived from the multi Tropical Rainfall Measurement Mission (TRMM) sensors reveals the sensitivity of the aerosols effect on cloud-precipitation process due to environmental vertical

thermodynamic structure. First, the magnitude of aerosol indirect effect could be larger with the analysis of columnar droplet sizes than that derived from the cloud-top droplet sizes, since column-droplet size can account for the broader droplet spectra in the cloud layers. Second, a combination of cloud- top and columnar droplet sizes reveals that the warm rain process is prevented regardless of the aerosols concentration under a high static stability such as when a strong temperature inversion exists, while a high aerosol concentration suppresses the warm rain formulation under a low static stability.
Author
Aerosols; Atmospheric Chemistry; Thermodynamics; Cloud Physics; Climate; Meteorological Parameters; Drops (Liquids)

20040035805 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Cloud Property Retrieval and 3D Radiative Transfer
Cahalan, Robert F.; [2003]; 1 pp.; In English; IUGG Symposium 2003, 30 Jun. - 11 Jul. 2003, Sappora, Japan; No Copyright; Avail: Other Sources; Abstract Only

Cloud thickness and photon mean-free-path together determine the scale of 'radiative smoothing' of cloud fluxes and radiances. This scale is observed as a change in the spatial spectrum of cloud radiances, and also as the 'halo size' seen by off beam lidar such as THOR and WAIL. Such of beam lidar returns are now being used to retrieve cloud layer thickness and vertical scattering extinction profile. We illustrate with recent measurements taken at the Oklahoma ARM site, comparing these to the-dependent 3D simulations. These and other measurements sensitive to 3D transfer in clouds, coupled with Monte Carlo and other 3D transfer methods, are providing a better understanding of the dependence of radiation on cloud inhomogeneity, and to suggest new retrieval algorithms appropriate for inhomogeneous clouds. The international 'Intercomparison of 3D Radiation Codes' or I3RC, program is coordinating and evaluating the variety of 3D radiative transfer methods now available, and to make them more widely available. Information is on the Web at: http://i3rc.gsfc.nasa.gov/. Input consists of selected cloud fields derived from data sources such as radar, microwave and satellite, and from models involved in the GEWEX Cloud Systems Studies. Output is selected radiative quantities that characterize the large-scale properties of the fields of radiative fluxes and heating. Several example cloud fields will be used to illustrate. I3RC is currently implementing an 'open source' 3d code capable of solving the baseline cases. Maintenance of this effort is one of the goals of a new 3DRT Working Group under the International Radiation Commission. It is hoped that the 3DRT WG will include active participation by land and ocean modelers as well, such as 3D vegetation modelers participating in RAMI.
Author
Cloud Cover; Three Dimensional Models; Radiative Transfer; Thickness; Photons

20040035834 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
ACTS-A Collection of High Performing Software Tools for Scientific Computing
Drummond, L. A.; Marques, O. A.; 2003; 20 pp.; In English
Report No.(s): DE2003-817261; No Copyright; Avail: Department of Energy Information Bridge

During the past decades there has been a continuous growth in the number of physical and societal problems that have been successfully studied and solved by means of computational modeling and simulation. Further, many new discoveries depend on high performance computer simulations to satisfy their demands for large computational resources and short response time. The Advanced CompuTational Software (ACTS) Collection brings together a number of general-purpose computational tool development projects funded and supported by the U.S. Department of Energy (DOE). These tools make it easier for scientific code developers to write high performance applications for parallel computers. They tackle a number of computational issues that are common to a large number of scientific applications, mainly implementation of numerical algorithms, and support for code development, execution and optimization. The ACTS collection promotes code portability, reusability, reduction of duplicate efforts, and tool maturity. This paper presents a brief introduction to the functionality available in ACTS. It also highlight the tools that are in demand by Climate and Weather modelers.
NTIS
Computerized Simulation; Computer Programs; Weather

20040035876 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Rainfall Variability and Relations with Satellite, Radar and Raingauge Measurements during the WETAMC/LBA
AmarodeLima, Alexandra; 2003; 166 pp.; In Portuguese
Report No.(s): INPE-10132-TDI/897; Copyright; Avail: CASI; A08, Hardcopy

Radiosonde, satellite data, TOGA radar 2 km CAPPI and rainfall collected from the TRMM-WETAMC/LBA experiment are used to investigate the diurnal cycle of the tropical convection, the relationship between brightness temperature and

precipitation and the use of the high level wind divergence to estimate precipitation and convective cloud cover. GOES satellite images were used to describe the diurnal modulation of the total/high/convective cloud fraction. Radar 2km CAPPI were used to describe the diurnal cycle of the rain fraction for different thresholds. An average over the four networks rain gauge was applied to describe the average hourly rainfall. The cloud drift winds from water vapor images was used to compute the upper air wind divergence. High and convective clouds area reach their maximum some hours after the maximum rainfall detected by rain gauge and radar 2 km CAPPI. The minimum cloud cover occurs only a few hours before the maximum precipitation and the maximum cloud cover occurs during the night. These results suggest the following mechanism controlling the diurnal cycle: in the morning, cloud cover decreases as the solar flux increases. In the beginning of the afternoon convection rapidly develops, high and convective clouds fraction increase rapidly and the maximum precipitation. The relationships between the brightness temperature and the radar reflectivity were also verified. Precipitation was estimated based on linear equations integrated in the time interval of 1, 3, 6, 24 hours, it was observed improvements in the estimate when was used larger scales of time. Finally, the diurnal cycle of the upper air wind divergence is very close to the diurnal cycle of the precipitation. The upper air divergence can be used to forecast the convective cloud cover or to evaluate the convective rainfall.
Author
Rain; Diurnal Variations; Rain Gages; Radar Measurement; Meteorological Radar; Satellite Imagery; Radiosondes

20040035896 Helsinki Univ. of Technology, Espoo (Finland), Espoo, Finland
Calibration Method for Full Polarimetric Microwave Radiometers
Lahtinen, J.; Gasiewski, A. J.; Klein, M.; Corbella, I.; Sep. 2001; 50 pp.; In English
Report No.(s): PB2004-102900; REPT-48; Copyright; Avail: National Technical Information Service (NTIS)
A technique for absolute end-to-end calibration of a fully polarimetric microwave radiometer is presented. The technique is based on the tri-polarimetric calibration technique of Gasiewski and Kunkee but extended to provide a means of calibrating all four Stokes parameters. The extension is based around the use of a biaxial phase-retarding microwave plate to provide a precisely known fourth Stokes signal from the Gasiewski-Kunkee (GK) linearly polarized standard. We present the relations needed to determine the Stokes vector produced by the augmented standard, and discuss the effects of non-idealities in the various components. We illustrate the application of the extended standard to determining the complete set of radiometer constants (the calibration matrix elements) for the NOAA Polarimetric Scanning Radiometer (PSR) in a laboratory environment. A calibration matrix inversion technique and error analysis is described.
NTIS
Microwave Radiometers; Error Analysis; Calibrating

20040035905 Helsinki Univ. of Technology, Espoo (Finland), Espoo, Finland
Effects of Meteorological Conditions and Water Management on Hydrological Processes in Agricultural Fields. Parameterization and Modeling of Estonian Case Studies
Tamm, T.; 2003; 200 pp.; In English
Report No.(s): PB2004-102882; TKK-VTR-5; Copyright; Avail: National Technical Information Service (NTIS)
This thesis was a study of the effect of meteorological conditions and water management on hydrological processes in agricultural fields. The emphasis was put on parameterization, validation, and critical analysis of the different models commonly used in field-scale hydrological models. The study object was a two dimensional soil profile covered with cultivated grass that completely shaded the ground. Both energy and water balance components were estimated and compared with observed values and experimental results. A standard procedure for estimating net radiation was parameterized with new values to get a better fit with observed radiation in Estonia. The commonly used set of parameters was found to systematically overestimate net radiation during the summer months and underestimate in winter months. New equations for the net long-wave radiation that may also be used in the Priestley-Taylor equation were developed.
NTIS
Water Management; Parameterization; Hydrology Models; Agriculture; Meteorological Parameters

20040035910 Raytheon Information Technology and Scientific Services, Huntsville, AL, USA, NASA Marshall Space Flight Center, Huntsville, AL, USA
An Analysis of the Automated Meteorological Profiling System Low Resolution Flight Element
Leahy, Frank B.; Overbey, B. Glenn; [2003]; 1 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: Other Sources; Abstract Only

A study was conducted to determine the quality of thermodynamic and wind data measured by or derived from the Low Resolution Flight Element (LRFE) of the Automated Meteorological Profiling System (AMPS). The AMPS LRFE replaced the Meteorological Sounding System (MSS), which was used to provide vertical profiles of thermodynamic and low-resolution wind data in support of spacecraft launch operations at the Cape Canaveral Air Force Station (CCAFS) and NASA Kennedy Space Center (KSC), Florida. Air temperature, relative humidity, and height, which are directly measured by the LRFE, are used to derive air pressure and density. Test flights were conducted where an LRFE sonde and an MSS sonde were attached to the same balloon and the two profiles were compared. MSS data was used as the standard reference data. The objective of the thermodynamic testing was to determine a) if the LRFE met Space Shuttle Program (SSP) accuracy requirements outlined in the Space Shuttle Launch and Landing Program Requirements Document (PRD) and/or, b) if the LRFE met or exceeded MSS data quality. AMPS uses the Global Positioning System (GPS) to determine wind speed and direction. In order to provide a basis for comparison, either an AMPS High Resolution Flight Element (HRFE) or a radar tracked Jimsphere was released simultaneously with each AMPS LRFE at CCAFS. The goal of these tests was to determine if the LRFE wind data met the requirement for low-resolution wind data defined in the Shuttle PRD. Based on the available data, the LRFE is shown to produce more consistent thermodynamic measurements than the MSS. The LRFE is also shown to meet the Shuttle PRD requirements for low resolution wind data.

Author

Accuracy; Atmospheric Pressure; Wind Measurement; Flight Tests; Wind Velocity; Thermodynamics

20040036527 Naval Postgraduate School, Monterey, CA

Integration of the Navy Tactical Environmental Database Service With the Joint Effects Model

Ross, Victor B.; Dec. 2003; 112 pp.; In English

Report No.(s): AD-A420496; No Copyright; Avail: CASI; A06, Hardcopy

The Oceanographer of the Navy is responsible for the maintenance and distribution of the '4-D cube' of environmental data, the Virtual Natural Environment, using an object oriented database and distribution system, Tactical Environmental Database Services (TEDServices) The new military dispersion modeling capability within the military is called the Joint Effects Model (JEM) , and has to have an interface created to allow inclusion of weather data in JEM. This thesis utilizes TEDServices using web protocols to query for available data, and then retrieves the required meteorology data. The software creates a specifically formatted file to be used in JEM. It is now fully functional and submitted to Space and Warfare Command for inclusion in JEM. Much of the testing was to ensure that the data are available and within the reasonable meteorological standards. The thesis also suggests additional changes that should be made to TEDServices to make it more capable of storing and serving environmental data.

DTIC

Data Bases; Data Systems; Meteorological Parameters

20040037766 NASA Goddard Space Flight Center, Greenbelt, MD, USA

CoSSIR: A New Instrument for Exploring the Utility of Submillimeter-wave Radiometry for Earth Observation

Racette, P. E.; Wang, J. R.; Evans, K. F.; Momosmith, B.; Zhang, Z.; [2004]; 1 pp.; In English; 8th Specialist Meeting on Microwave Radiometry and Remote Sensing Application, 24-27 Feb. 2004, Rome, Italy; No Copyright; Avail: Other Sources; Abstract Only

The Conical Scanning Submillimeter-wave Imaging Radiometer (CoSSIR) has been developed to study the application of submillimeter-wave radiometry for remote sensing of cirrus clouds and humidity sounding. Measurements of the global distribution of ice cloud mass and particle size are important for understanding the Earth s energy budget and for evaluating global climate models. The spatial variability and the wide variety of cloud particle shapes and sizes make ice clouds particularly difficult to measure. Ice clouds are essentially undetectable at microwave frequencies due to the low dielectric of ice and small size of the particles relative to wavelength. However, submillimeter wavelengths demonstrate significant response to the presence of ice clouds thus this frequency regime is applicable to measuring ice clouds. Another potentially viable application for submillimeter-wave radiometry is humidity and temperature sounding. The principle of sounding at submillimeter wavelengths is similar to that at microwavelengths. Submillimeter-wave radiometry has the advantage of achieving finer spatial resolution using a smaller antenna aperture which is an important consideration for spaceborne observatories. Submillimeter-wave radiometry also offers the potential of sounding over land and as a surrogate measurement for precipitation. CoSSIR is a new instrument to explore these applications. The CoSSIR is designed to fly aboard the ER-2 aircraft and its modest size (approximately 100 kg) permits it to be configured for other aircraft. A dual-axes gimbals mechanism provides conical, across-track, and along-track scanning capability. In its present configuration CoSSIR has fifteen channels between 183 GHz and 640 GHz. Three channels are centered about the 183 GHz water vapor absorption line, four

channels are centered about the 380 GHz water vapor absorption line, and three dual-polarized channels are centered about the 487 GHz oxygen absorption line. Two channels are located in atmospheric windows at 220 GHz and 640 GHz. All channels are single-linear polarized with the exception of those near 487 GHz. Calibration is achieved by periodically observing two blackbody radiators; one blackbody is heated to approximately 325 K and the other is approximately 250 K during flight. Details of the instrument design as well as measurements from the Cirrus Regional Study of Tropical Anvils and Cirrus Layers - Florida Area Cirrus Experiment will be presented.
Author
Conical Scanning; Earth Observations (From Space); Imaging Techniques; Radiometers; Remote Sensing; Submillimeter Waves; Cirrus Clouds; Humidity

20040037804 Meteorological Satellite Center, Kiyose, Japan
Monthly Report of the Meteorological Satellite Center: October 2003
October 2003; In English; In Japanese; Document files and Satellite data are recorded in either ASCII or shift JIS code; Full Disk Earth's Cloud Images are recorded in Bit-Map (BMP) format; Copyright; Avail: Other Sources

The CD-ROM concerning the October 2003 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.
Derived from text
Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20040040106 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Effects of Snow Depth Forcing on Southern Ocean Sea Ice Simulations
Powel, Dylan C.; Markus, Thorsten; Stoessel, Achim; [2003]; 39 pp.; In English
Contract(s)/Grant(s): NAG5-10641; No Copyright; Avail: CASI; A03, Hardcopy

The spatial and temporal distribution of snow on sea ice is an important factor for sea ice and climate models. First, it acts as an efficient insulator between the ocean and the atmosphere, and second, snow is a source of fresh water for altering the already weak Southern Ocean stratification. For the Antarctic, where the ice thickness is relatively thin, snow can impact the ice thickness in two ways: a) As mentioned above snow on sea ice reduces the ocean-atmosphere heat flux and thus reduces freezing at the base of the ice flows; b) a heavy snow load can suppress the ice below sea level which causes flooding and, with subsequent freezing, a thickening of the sea ice (snow-to-ice conversion). In this paper, we compare different snow fall paramterizations (incl. the incorporation of satellite-derived snow depth) and study the effect on the sea ice using a sea ice model.
Author
Spatial Distribution; Temporal Distribution; Sea Ice; Snow; Air Water Interactions

20040040121 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Time-Variable Gravity and Ocean Connections
Chao, Benjamin F.; Au, Andrew; Cox, Christopher; [2003]; 1 pp.; In English; TOPEX JASON Science Workshop Team Meeting, 18-21 Nov. 2003, Arles, France; No Copyright; Avail: Other Sources; Abstract Only

Any large mass transport in the Earth system produces changes in the gravity field. Low harmonic degree components of such gravity variations have been observed by the satellite-laser-ranging (SLR) technique for the past quarter century, particularly in 52, the Earth's dynamic oblateness. 52 undergoes a slight decrease due primarily to the post-glacial rebound of the mantle, but large interannual anomalies have been observed, notably during 1998-2002. Intriguing evidences for the cause of the latter have been found in the extratropical Pacific basins, especially related to the Pacific Decadal Oscillation, and perhaps in related land hydrology. We will examine the latest results based on ocean altimetry, sea-surface temperature, and ocean and hydrology model outputs. Without firm estimates for the steric effects (which have no gravity signal), we will point out possible underestimation of OGCMs with respect to temporal variabilities. Besides J2, SLR also derived time series for other low-degree gravity components. While the formal uncertainty of these terms is significantly higher, some of these series have significant signal that show correlation to various climatic signals. For example, there is a significant correlation of the

sectoral S2,2 with the Southern Oscillation Index signifying the influence of El Nino/La Nina. Cases such as these demonstrate the utility of assessing the mass component of climate variations, and anticipate the utility of GRACE-type space gravity observations with much higher spatial resolution.
Author
Time Series Analysis; Ocean Models; Sea Surface Temperature; Microgravity; Gravitational Fields

20040040127 NASA Goddard Space Flight Center, Greenbelt, MD, USA
ICESAT Laser Altimeter Pointing, Ranging and Timing Calibration from Integrated Residual Analysis
Luthcke, Scott B.; Rowlands, D. D.; Carabajal, C. C.; Harding, D. H.; Bufton, J. L.; Williams, T. A.; [2003]; 1 pp.; In English; American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

On January 12, 2003 the Ice, Cloud and land Elevation Satellite (ICESat) was successfully placed into orbit. The ICESat mission carries the Geoscience Laser Altimeter System (GLAS), which has a primary measurement of short-pulse laser-ranging to the Earth s surface at 1064nm wavelength at a rate of 40 pulses per second. The instrument has collected precise elevation measurements of the ice sheets, sea ice roughness and thickness, ocean and land surface elevations and surface reflectivity. The accurate geolocation of GLAS s surface returns, the spots from which the laser energy reflects on the Earth s surface, is a critical issue in the scientific application of these data. Pointing, ranging, timing and orbit errors must be compensated to accurately geolocate the laser altimeter surface returns. Towards this end, the laser range observations can be fully exploited in an integrated residual analysis to accurately calibrate these geolocation/instrument parameters. ICESat laser altimeter data have been simultaneously processed as direct altimetry from ocean sweeps along with dynamic crossovers in order to calibrate pointing, ranging and timing. The calibration methodology and current calibration results are discussed along with future efforts.
Author
Ice, Cloud and Land Elevation Satellite; Laser Altimeters; Sea Ice; Surface Roughness; Calibrating

20040040131 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Time-Variable Gravity from Satellite-Laser-Ranging and Doppler Measurements: An Update on the Low-degree components as well as the connections with Geophysical/Climatic Processes
Cox, Christopher M.; Chao, Benjamin F.; Au, Andrew Y.; Boy, J.-P.; [2003]; 1 pp.; In English; American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The oblateness of the Earth's gravity field, 52, has long been observed to undergo a slight decrease due to post-glacial rebound of the mantle. Sometime around 1998 this trend reversed quite suddenly. This reversal persisted until 2001, at which point the atmosphere-corrected time series appears to have reversed yet again. Presently, the time series appears to be returning to the value that would nominally have been reached had the anomaly not occurred. This anomaly signifies a large interannual change in global mass distribution whose J2 effect overshadows that of the post-glacial rebound over such timescales. A number of possible causes have been considered, with oceanic mass redistribution as the leading candidate although other effects, such as glacial melting and core effects may be contributing. The amount by which J2 returns to it's nominal value provides a valuable constraint on the separation of the causes, and will be considered. We will present our latest Satellite Laser Ranging and DORIS Doppler derived time series for J2, and various other low-degree harmonic terms, as well as our investigations into the causes. In addition, we will show the comparison of the J2 results with those derived from CHAMP, as computed at NASA GSFC, and the recently released GRACE gravity model.
Author
Time Series Analysis; Satellite Laser Ranging; Climatology; Geophysics

20040040188 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Tropical Rainfall Measuring Mission (TRMM)
Rui, Hualan; October 2003; 4 pp.; In English; Fall 2003 AGU Meeting, 2003, USA; Original contains color illustrations
Report No.(s): NP-2003-11-597-GSFC; No Copyright; Avail: CASI; A01, Hardcopy

Contents include the following: 1. Hurricane Isabel. TRMM composite images of Hurricane Isabel. TRMM application to monitoring potential floods. 2.TRMM Orbit and Instruments. TRMM Ground Track for 35' Orbit With Ground Truth Verification Sites. 3. TRMM Science Data Products at the GES DAAC. 4. TRMM Data Access and Services at GES DAAC.

TRMM Online Visualization and Analysis System. Selected Recent TRMM Data Applications From Around the World.
CASI
Floods; Hurricanes; Image Processing; Photomapping; Data Acquisition

20040040189 NASA Goddard Space Flight Center, Greenbelt, MD, USA
AIRS Level 2 Data Products
Vicente, Gilberto; [2003]; 1 pp.; In English; Fall 2003 AGU Conference, 2003, USA; No Copyright; Avail: CASI; A01, Hardcopy

The Atmospheric InfraRed Sounder (AIRS) Standard Retrieval Product consists of retrieved cloud and surface properties; profiles of retrieved temperature, water vapor, and ozone; and a flag indicating the presence of cloud ice or water. They contain quality assessment flags in addition to retrieved quantities and are generated for all locations where atmospheric soundings are taken. An AIRS granule consists of 6 minutes of data. This corresponds to approximately 1/15 of an orbit but exactly 45 scan lines of AMSU-A data or 135 scan lines of AIRS and HSB data.
Derived from text
Atmospheric Sounding; Atmospheric Temperature; Cloud Physics; Ice; Ozone; Water Vapor

20040040214 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Data from TRMM Field Experiments at the Goddard Earth Sciences (GES) DISC DAAC Tropical Rainfall Measuring Mission Field Experiments (TRMM FEs)
December 2002; 4 pp.; In English
Report No.(s): NP-2001-3-199-GSFC-(rev 3/03); No Copyright; Avail: CASI; A01, Hardcopy

The basic objectives of TRMM Field Experiments (FEs) are to evaluate the physical assumptions made by TRMM. rainfall algorithms, initialize and validate the cloud resolving models, test latent heating retrievals from TRMM measurements, and evaluate methods to estimate rainfall and latent heating from ground-based radars. The field experiments were designed as a group, so that specific measure ments could be compared between experiments in order to gain insight into the regional dependence of any findings. The TExas FLorida UNderflight Experiments (TEFLUN) were designed to provide validation measurements for TRMM and for the enhancement of TRMM precipitation algorithms. TEFLUN-A focused on east Texas. TEFLUN-B was conducted in close coordination with the Third Convection And Moisture Experiment (CAMEX-3) in Florida. The TRMM-LBA was conducted in coordination with the Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA). The LBA objectives are to further our understanding of the climatological, ecological, bie geochemical, and hydrological processes in Amazonia and the impact of land use/land change on these processes. Specifically, TRMM-LBA addressed issues related to land precipitation algorithms. The Kwa jalein Experiment (KWAJEX), conducted on the Kwajalein Island in the Republic of Marshall Islands (RMI), was designed to address issues of TRMM products over the ocean. The purpose of the South China Sea Monsoon Experiment (SCSMEX) was to study the water and energy cycle of the Asian monsoon in order to provide better understanding and improve prediction. and instruments of the TRMM FEs. The platforms and instruments of the TRMM FEs are given.
Derived from text
Algorithms; Climatology; Earth Sciences; Trmm Satellite; NASA Programs; Precipitation (Meteorology); Data Acquisition

20040041298 Brookhaven National Lab., Upton, NY, University of Northern Arizona, Flagstaff, AZ, USA
Stomatal Responses to CO2: A Comparison of Woody and Herbaceous Species in Arid and Humid Climates
Koch, G. W.; Ellsworth, D.; 2003; 14 pp.; In English
Report No.(s): DE2004-820420; No Copyright; Avail: Department of Energy Information Bridge

The project involved a study of a fundamental response of terrestrial vegetation to rising atmospheric carbon dioxide (CO2) concentration, namely, the change in leaf conductance to gas diffusion associated with a change in the aperture of the microscopic pores (stomata) on the surface of leaves. This 'stomatal conductance' determines the rate at which water is lost from vegetation during transpiration and the rate at which CO2 is taken up by leaves during photosynthesis. Many previous studies have documented a decrease in stomatal conductance when leaves are exposed to elevated CO2 levels similar to those expected toward the latter half of the 21st century (c. 550 ppm vs. c. 360 ppm in 1999). The consequences of a reduction in stomatal conductance are several and important: a reduction in water use by vegetation, assuming the transpiring surface area of leaves is unchanged, 2. a smaller enhancement in photosynthesis than would be realized if stomatal conductance remained

unchanged in elevated CO2, 3. an increase in leaf temperature because evaporative heat loss is reduced when lower stomatal conductance cause a decrease in transpiration.
NTIS
Carbon Dioxide; Atmospheric Composition; Gaseous Diffusion; Photosynthesis

20040041307 MBC Applied Environmental Sciences, Inc., Costa Mesa, CA
Physical Oceanography of the Beaufort Sea. Workshop Recommendations
Weingartner, T.; Jul. 2003; 52 pp.; In English
Report No.(s): PB2004-104183; OCS-MMS-2003-045; No Copyright; Avail: CASI; A04, Hardcopy

This report summarizes the results of a 2.5-day workshop on the physical oceanography of the Alaskan Beaufort Sea, held in Fairbanks, Alaska in February 2003. Dr. Thomas Weingartner, University of Alaska Fairbanks, served as chair of the workshop. The workshop reviewed knowledge of the physical oceanography of the Beaufort shelf and recommended studies to support Minerals Management Service's mission with respect to industrial development on this shelf or along the coast. There are fundamental unknowns pertaining to the ocean and ice circulation, ocean density field, and the forcing mechanisms that influence sea ice and ocean dynamics. The study recommendations consist of a mix of field (observational) and idealized model studies to improve understanding of poorly understood physical processes and boundary conditions and to provide data sets necessary for the proper evaluation of regional pollutant transport models.
NTIS
Oceanography; Beaufort Sea (North America); Ocean Dynamics; Support Systems

20040041395 North Dakota Univ., Grand Forks, ND, USA
Microphysical Characteristics of Tropical Clouds
Grainger, Cedric A.; Anderson, Nicholas; [2004]; 55 pp.; In English
Contract(s)/Grant(s): NAG5-9656; No Copyright; Avail: CASI; A04, Hardcopy

This report summarizes the analysis of data collected by the University of North Dakota Citation II measurement platform during three TRMM Field measurement campaigns. The Citation II made cloud measurements during TEFLUN B in Florida, the LBA program in Brazil, and KWAJEX in Kwajalein. The work performed can be divided into two parts. The first part consisted of reformatting the Citation data into a form more easily used to compare to the satellite information. The second part consisted of examination of the cloud data in order to characterize the properties of the tropical clouds. The reformatting of the Citation data was quite labor intensive and, due to the fact that the aircraft was involved in three of the field campaigns, it required a substantial number of person-hours to complete. Much of the analysis done on the second part was done in conjunction with the thesis work of Nicholas Anderson, then a graduate student at the University of North Dakota.
Derived from text
Cloud Physics; Tropical Regions; Trmm Satellite; Clouds (Meteorology)

20040041408 Colorado Univ., Boulder, CO, USA
Balloon Borne Soundings of Water Vapor, Ozone and Temperature in the Upper Tropospheric and Lower Stratosphere as Part of the Second SAGE III Ozone Loss and Validation Experiment (SOLVE-2)
Voemel, Holger; [2004]; 14 pp.; In English
Contract(s)/Grant(s): NAG2-1575; No Copyright; Avail: CASI; A03, Hardcopy

The main goal of our work was to provide in situ water vapor and ozone profiles in the upper troposphere and lower stratosphere as reference measurements for the validation of SAGE III water vapor and ozone retrievals. We used the NOAA/CMDL frost point hygrometer and ECC ozone sondes on small research balloons to provide continuous profiles between the surface and the mid stratosphere. The NOAA/CMDL frost point hygrometer is currently the only lightweight balloon borne instrument capable of measuring water vapor between the lower troposphere and middle stratosphere. The validation measurements were based in the arctic region of Scandinavia for northern hemisphere observations and in New Zealand for southern hemisphere observations and timed to coincide with overpasses of the SAGE III instrument. In addition to SAGE III validation we also tried to coordinate launches with other instruments and studied dehydration and transport processes in the Arctic stratospheric vortex.
Derived from text
Ozone; Stratosphere; Troposphere; Water Vapor; Sage Satellite; Balloon-Borne Instruments; Balloon Sounding; Atmospheric Temperature

20040043670 NASA Ames Research Center, Moffett Field, CA, USA

Multi-Year Characterization of PSCs Using Solar Occultation Satellite Observations

Strawa, A. W.; Drdla, K.; Bokarius, K.; Fromm, M.; Alfred, J.; [2004]; 1 pp.; In English; American Geophysical Union (AGU) Meeting Fall 2003, 2003, Unknow; No Copyright; Avail: Other Sources; Abstract Only

POAM solar occultation observations from1994 to present are studied for the purpose of determining Type I PSC formation characteristics and winter-long evolution. This information is critical to an improved understanding and predictive capability of stratospheric ozone depletion. Solar occultation satellite observations of these clouds yields more continuous and wide-spread information than can be obtained from aircraft, balloon, or ground-based observations. This multi-winter PSC study is augmented by the use of our Type Ia/Ib discrimination scheme. Recent studies of PSC formation made with POAM observations and simulations during the 1999-2000 Arctic winter have shown characteristics that shed light on the formation mechanisms responsible for Type Ia solid phase PSCs. This study examines PSC observations from many years on a common basis to see if the characteristics observed & cuing the 1999-2000 Arctic winter ai-e observed in other years and if other characteristics can be identified. The results show that Type Ia PSCs form at the beginning of the winter, within several days of the fxst drop in temperature below TNAT, and peak early in the winter. Type Ia PSCs typically outnumber Ib PSCs over the winter, especially at the beginning of the winter. Type Ia and Ib PSC observations continue throughout the winter. Micro-physical models of PSC formation must match these observed characteristics. Some models predict that temperatures must be more 5 K below T-NAT for five days before significant freezing can occur. This is not seen in the POAM observations. Differences in PSC characteristics between the first two Arctic winters (1 994- 1995 and 1995- 1996) and later winters also suggest the influence of volcanic perturbations on PSC formation. Type Ia and Ib PSC characteristics observed by POAM III and SAGE III for the 2002-2003 Arctic winter are compared.

Derived from text

Ozone Depletion; Prediction Analysis Techniques; Stratosphere; Clouds; Formation

20040043720 NASA Ames Research Center, Moffett Field, CA, USA

Cavity Ring-Down Measurement of Aerosol Optical Properties During the Asian Dust Above Monterey Experiment and DOE Aerosol Intensive Operating Period

Ricci, K.; Strawa, A. W.; Provencal, R.; Castaneda, R.; Bucholtz, A.; Schmid, B.; [2004]; 1 pp.; In English; American Geophysical Union (AGU) Fall 2003, 2003; No Copyright; Avail: Other Sources; Abstract Only

Large uncertainties in the effects of aerosols on climate require improved in-situ measurements of extinction coefficient and single-scattering albedo. This paper describes preliminary results from Cadenza, a new continuous wave cavity ring-down (CW-CRD) instrument designed to address these uncertainties. Cadenza measures the aerosol extinction coefficient for 675 nm and 1550 nm light, and simultaneously measures the scattering coefficient at 675 nm. In the past year Cadenza was deployed in the Asian Dust Above Monterey (ADAM) and DOE Aerosol Intensive Operating Period (IOP) field projects. During these flights Cadenza produced measurements of aerosol extinction in the range from 0.2 to 300/Mm with an estimated precision of 0.1/Mm for 1550 nm light and 0.2/Mm for 675 nm light. Cadenza data from the ADAM and Aerosol IOP missions compared favorably with data from the other instruments aboard the CIRPAS Twin Otter aircraft and participating in those projects. We present comparisons between the Cadenza measurements and those from a TSI nephelometer, Particle Soot Absorption Photometer (PSAP), and the AATS 14 sun-photometer. Measurements of the optical properties of smoke and dust plumes sampled during these campaigns are presented and estimates of heating rates due to these plumes are made.

Author

Absorption Spectroscopy; Aerosols; Cavities; Dust; In Situ Measurement; Optical Measurement; Optical Properties

20040043727 Nippon Telegraph and Telephone Public Corp., Tokyo, Japan

Toward the Dissemination of Environmental Information Designed to Improve the Quality of Life

Delaunay, Jean-Jacques; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 6-11; In English; See also 20040043721; Copyright; Avail: Other Sources

NTT Energy and Environment Systems Laboratories is making good progress on an environ- mental information system that collects and stores environmental data on air, water, and soil using sensing networks. The system then publishes information derived from this environmental data. What significance could this environmental information hold for you and me? And what does the development of such a system require on the provisioning side? We put these questions to Research Engineer Jean-Jacques Delaunay, who is in charge of developing a cedar pollen forecasting system that will be used to offer a pollen forecasting service on a commercial basis starting in January 2004.

Author

Data Acquisition; Forecasting; Information Dissemination; Pollen

20040043735 Weather Bureau, USA

Experiment S-6: Synoptic Weather Photography

Nagler, Kenneth M.; Soules, Stanlet; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 19-30; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

As part of the continuing effort to obtain a selection of high resolution color pictures of cloud systems, well over a hundred views of meteorological interest were obtained by the Gemini V crew. A number of these are being studied by various investigators.

Author

Weather; Synoptic Measurement; Color Photography; Cloud Photographs; Gemini 5 Flight

20040043739 Maryland Univ., MD, USA

Experiment S-7: Cloud-Top Spectrometer

Saiedy, F.; Wark, D. Q.; Morgan, W. A.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 31-44; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

TIROS weather satellites have presented meteorologists and weather forecasters with cloud pictures which show the geographic distribution of cloudiness and permit the qualitative judgement of cloud types. Cloud types are classified according to their altitudes. Meteorologists are interested in cloud altitudes because altitudes indicate the dynamic and thermodynamic state of the atmosphere upon which weather forecasts are based. In 1961, Hanel suggested the utilization of the absorption by the 2.0 micron CO2 band in the sunlight reflected from the cloud for the determination of cloud altitude. The same year, Yamamotto and Wark pointed out that the CO2 band lies ont he wing of the H2O band at 1.87 microns. The acuracy of such determination would, then, be compromised by variations in the amount of water vapor in the atmosphere. They proposed the use of the oxygen A band at 7600 Angstroms; measurements in this band would not be affected by water vapor. Basically, the method of this experiment consists of comparing the cloud's radiance at a specfied wavelength inside the band with its radiance in an atmospheric window outside the band. This ratio will show the absorption or transmission of oxygen in the atmosphere above the cloud top. Since oxygen is uniformly mixed with air, the transmission of oxygen is a function of the pressure altitude of the cloud and the atmospheric path traversd by light form the sun to the cloud top and, after reflection, form the cloud top to the measuring instrument. The mathematical representation is presented.

Derived from text

Cloud Cover; Meteorological Satellites; Spectrometers; Clouds (Meteorology); Gemini 5 Flight; Cloud Photographs

20040043758 Naval Postgraduate School, Monterey, CA

Improving Wind-Based Upwelling Estimates Off the West Coasts of North and South America

Pickett, Mark H.; Dec. 2003; 132 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420612; No Copyright; Avail: CASI; A07, Hardcopy

Weekly upwelling was estimated at 25 sites off the North and South American west coasts from August 1999 to December 2001 using geostrophically derived winds, model- derived winds from the U.S. Navy's global atmospheric (NOGAPS) model, and QuikSCAT satellite-measure winds. Satellite- measured winds, verified with 15 U.S. west coast buoys, were within 1.3 m s-1 and 26 RMS. Upwelling estimates derived from geostrophic winds using the Pacific Fisheries Environmental Laboratory (PFEL) technique were compared to those derived from both satellite-measured winds and model- derived winds. Upwelling estimates from model-derived winds agreed with satellite-based estimates at all 14 North American sites and 9 of 11 South American sites. Estimates from geostrophic winds agreed with satellite-based estimates at 12 of 14 North American sites and 7 of 11 South American sites. These comparisons showed that upwelling estimates based on the Navy's global model winds were accurate in more regions than those based on geostrophic winds. A fine-scale upwelling investigation using the Navy's high-resolution atmospheric model (COAMPS) revealed narrow near-shore bands of strong wind- stress and wind-stress-curl missed in the above upwelling estimates. Improvements in the depiction of coastal upwelling will require wind data and upwelling estimates with at least a 10 km resolution.

DTIC

Coasts; Geostrophic Wind; North America; South America; Upwelling Water; Wind Measurement

20040043785 Naval Postgraduate School, Monterey, CA

Turbulence Parameterizations for Convective Boundary Layers in High-Resolution Mesoscale Models

Whisenhant, Michelle K.; Dec. 2003; 160 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420654; No Copyright; Avail: CASI; A08, Hardcopy

Several issues associated with grid resolution and the sub-grid scale (SGS) parameterizations in a mesoscale model are addressed in this study. Of particular concern is related to increasingly high-resolution mesoscale atmospheric numerical models, in that sub-grid scale parameterization of atmospheric processes becomes unclear when the grid resolution becomes comparable to the length scale of the phenomenon. These issues are studied through the careful analysis of in situ observations and mesoscale model testing. In this study, we perform observational analysis to better understand the scales of turbulence in various environmental conditions. We then explore the capability of the U.S. Navy's current Coupled Ocean-atmosphere Mesoscale Prediction System (COAMPS(trademark)), using a case study of boundary layer roll vortices in cold air outbreak conditions over the Japan/East Sea. We analyze the model's ability to perform accurately within the resolvable scales and to accurately represent the boundary layer turbulence mixing when the resolution is high. Based on results from the above analysis, we modify the existing parameterizations towards more realistic representations of the turbulent processes over a relatively wide range of grid resolution, and test this modification within COAMPS(trademark).
DTIC
Atmospheric Models; Boundary Layers; Convection; High Resolution; Mesoscale Phenomena; Meteorological Parameters; Parameterization; Turbulence; Turbulent Boundary Layer

20040043888 Georgetown Univ., Washington, DC
Advanced Medical Technology and Network Systems Research (Medical Vanguard Program)
Mun, Seong K.; Sep. 2003; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-94-V-4015
Report No.(s): AD-A420808; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study was to develop basic climatic and ecological profiling for the District of Columbia using ground meteorological and remotely sensed data provided by NOAA for transmission risk assessments for endemic and exotic mosquito-vectored pathogens. Key research pathogens. Key research outcomes: 1) Successful compilation of ground meteorological and remotely sensed data provided by NOAA for the District of Columbia for an assessment of seasonal climatic and environmental change. 2) Successful merging of enviro-climatic profiling with avian and mosouito collection data provided by the DC Department of Health (DOH) for use in delineating the seasonal changes in population densities. The merger of this data was produced within a Geographic Information System (GIS) mapping environment in partnership with the Utah State University GIS Program. 3) Provided a briefing in August 2003 to DC DOH public health officers in the use of meteorological and remotely sensed data for future analyses. Established a permanent, ongoing collaboration for biosurveillance system development in the District. 4) Initial development of the first data security matrix for integrated biodefense that objectively places RSEPIS within the proper context for management of data sources.
DTIC
Biotechnology; Information Systems; Medical Equipment; Medical Science; Wide Area Networks

20040045190 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
Quality Control and Wind Retrieval for SeaWinds
Portabella, M.; Stoffelen, A.; February 2002; ISSN 0169-1651; 130 pp.; In English
Report No.(s): WR-2002-01; Copyright; Avail: Other Sources

This report contains a description of the EUMETSAT QuikSCAT fellowship work, which was carried out at the Royal Netherlands Meteorological Institute (KNMI) in De Bilt (The Netherlands), within the research group of the Research & Development Observations Division of the Observations and Modeling Department. The project started in February 1999 and had a duration of 3 years. The main goals of the fellowship were to perform a Quality Control (QC) procedure, using the experience gained on previous scatterometer missions such as ERS and NSCAT, and to potentially contribute to improve wind retrieval in the regions of the QuikSCAT swath where the inversion skill decreases. The American Ku-band scatterometer missions present a bridge to cover the gap between past and future European missions. On the one hand, ERS-2 scatterometer data stream was interrupted on January 2001 due to an attitude problem of the satellite and it is not clear yet whether the data stream will be reactivated or not. On the other hand, the next European scatterometer on board METOP satellite will be launched not before the end of 2005. Therefore, since 1999, EUMETSAT and KNMI are investing, through the NSCAT and QuikSCAT fellowships and more recently through the NWP- SAF, in gaining knowledge on Ku-band scatterometry. Important progress has been made in the interpretation and use of the data. KNMI has set up a preliminary processing stream, visible through a web interface (http://www.knmi.nl/scatterometer) and used for nowcasting purposes at several national meteorological services. Also, through a collaboration with ECMWF, the QuikSCAT data are used for operational assimilation purposes at ECMWF. In view of the next American scatterometer mission, SeaWinds on ADEOS-2, more Research & Development activities are planned in the framework of the NWP-SM. By doing so, the European involvement in spaceborne

scatterometry and its applications is ensured for the benefit of the European meteorological community.
Author
Quality Control; Wind (Meteorology); Meteorological Services; Data Flow Analysis; Scatterometers

20040045195 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
Analysis of Global Irradiance Measurements from Pyranometer and AVHRR
vanGeel, G. J.; Roebeling, R.; Feijt, A. J.; April 2003; ISSN 0169-1708; 71 pp.; In English
Report No.(s): TR-251; Copyright; Avail: Other Sources

This thesis is about analysis of the accuracy of downwelling solar surface irradiance (DSSI) retrieval schemes for satellites with ground-based measurements for different atmospheric conditions. A two- step retrieval scheme is used to obtain DSSI values from satellite measurements. The first step of the retrieval scheme uses bi-directional reflectivities as input to obtain narrowband cloud optical depths. The second step uses these cloud optical depths to obtain broadband atmospheric transmissivities (BAT). However, a conversion from narrowband to broadband cloud optical depths has to be made first. At the end of this two-step approach, the BAT is used to calculate DSSI. Inversely, the second step is used in order to obtain broadband cloud optical depths from derived BAT values measured by the pyranometer. For the interpretation of the AVHRR channel 1 reflectivity and the pyranometer BAT, calculations are performed on mean atmospheric state. Look up tables (LUTs) store values of both the 0.63 pm bi- directional reflectance and the BAT as calculated for a wide range of satellite viewing geometries and solar zenith angles for 14 values of cloud optical depths. For a single satellite pixel, multilinear interpolation in the geometrical parameters and the vertically integrated water vapour is used to extract the corresponding pairs of reflectance/ transmissivity for a given measurement at all values of cloud optical depth included in the LUTs. Then, the relation of reflectance and transmissivity is established by bicubic spline interpolation and the transmissivity corresponding to the AVHRR channel 1 measurement is determined.
Derived from text
Solar Radiation; Light (Visible Radiation); Optical Measurement; Clouds (Meteorology); Depth Measurement; Computation; Optical Thickness

20040045209 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Welcome to NASA's Earth Science Enterprise
Winter 2001; In English
Report No.(s): NASA/NP-1999-01-005-GSFC; No Copyright; Avail: CASI; C01, CD-ROM

There are strong scientific indications that natural change in the Earth system is being accelerated by human intervention. As a result, planet Earth faces the possibility of rapid environmental changes that would have a profound impact on all nations. However, we do not fully understand either the short-term effects of our activities, or their long-term implications - many important scientific questions remain unanswered. The National Aeronautics and Space Administration (NASA) is working with the national and international scientific communities to establish a sound scientific basis for addressing these critical issues through research efforts coordinated under the U.S. Global Change Research Program, the International Geosphere-Biosphere Program, and the World Climate Research Program. The Earth Science Enterprise is NASA's contribution to the U.S. Global Change Research Program. NASA's Earth Science Enterprise will use space- and surface-based measurement systems to provide the scientific basis for understanding global change. The space-based components will provide a constellation of satellites to monitor the Earth from space. A major component of the Earth Science Enterprise is the Earth Observing System (EOS). The overall objective of the EOS Program is to determine the extent, causes, and regional consequences of global climate change. EOS will provide sustained space-based observations that will allow researchers to monitor climate variables over time to determine trends. A constellation of EOS satellites will acquire global data, beginning in 1998 and extending well into the 21st century.
Derived from text
Earth Observing System (Eos); NASA Programs

48
OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20040035746 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Spin-Down of the North Atlantic Subpolar Circulation
Hakkinen, S.; Rhines, P. B.; [2004]; 15 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Dramatic changes have occurred in the mid-to-high-latitude North Atlantic Ocean as evidenced by TOPEX/Poseidon observations of sea surface height (SSH) in the subpolar gyre and the Gulf Stream. Analysis of altimeter data shows that subpolar SSH has increased during the 1990s and the geostrophic velocity derived from altimeter data shows a decline in the gyre circulation. Direct current-meter observations in the boundary current of the Labrador Sea support the trend in the 199Os, and, together with hydrographic data show that in the mid-late 1990s the trend extends deep in the water column. We find that buoyancy forcing over the northern North Atlantic has a dynamic effect consistent with the altimeter data and hydrographic observations: a weak thermohaline forcing and the subsequent decay of the domed structure of the subpolar isopycnals would give rise to the observed anticyclonic circulation trend.
Author
Poseidon Satellite; Ocean Surface; Polar Regions; Hydrography; Gyres

20040035786 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Studies of the Antarctic Sea Ice Edges and Ice Extents from Satellite and Ship Observations
Worby, Anthony P.; Comiso, Josefino C.; [2003]; 38 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Passive-microwave derived ice edge locations in Antarctica are assessed against other satellite data as well as in situ observations of ice edge location made between 1989 and 2000. The passive microwave data generally agree with satellite and ship data but the ice concentration at the observed ice edge varies greatly with averages of 14% for the TEAM algorithm and 19% for the Bootstrap algorithm. The comparisons of passive microwave with the field data show that in the ice growth season (March - October) the agreement is extremely good, with r(sup 2) values of 0.9967 and 0.9797 for the Bootstrap and TEAM algorithms respectively. In the melt season however (November - February) the passive microwave ice edge is typically 1-2 degrees south of the observations due to the low concentration and saturated nature of the ice. Sensitivity studies show that these results can have significant impact on trend and mass balance studies of the sea ice cover in the Southern Ocean.
Author
Antarctic Ocean; Satellite Observation; Antarctic Regions; Sea Ice; Sensitivity

20040037776 Massachusetts Inst. of Tech., Cambridge, MA, USA
Hydrocarbon Biomarker Stratigraphy of C-Isotopic Excursions Marking Chemical Changes in the Ocean with Contemporanious Biotic Extinction-Radiation Events
Summons, Roger E.; January 2004; 6 pp.; In English
Contract(s)/Grant(s): NAG5-12356; No Copyright; Avail: CASI; A02, Hardcopy

One paper recording progress in this topic has been accepted for publication. We report a method for the rigorous identification of biomarkers (crocetane and PMI) that may be specific for methanotrophic and methanogenic archaea and, perhaps, the process of anaerobic oxidation of methane. If catastrophic methane efflux from sub-sea methane hydrate is responsible for extinction events, as has been hypothesized by many workers, then we might expect to find biomarkers for methane oxidation in sediments marking some extinction boundaries. Unfortunately, identifying crocetane and PMI with certainty is not a trivial exercise and these biomarkers appear to have been mis-identified in a recent publication by workers from Curtin University. Barber et al. (2001) identified crocetane and PMI in sediments deposited in the basal Triassic of the Perth Basin, Australia. However, Barber et al. (2001) also found crocetane and PMI in many other sediments and oils in a way that was inconsistent with our knowledge of these systems.
Author
Hydrocarbons; Biomarkers; Stratigraphy; Isotopes; Chemical Analysis; Oceans

20040040120 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Simultaneous Ocean Wave Measurements by the JASON and TOPEX Satellites, With Buoy and Model Comparisons
Ray, R. D.; Beckley, B. D.; [2003]; 1 pp.; In English; TOPEX JASON Science Working Team Meeting, 18-21 Nov. 2003, Arles, France; No Copyright; Avail: Other Sources; Abstract Only

The verification phase of the Jason-1 satellite altimeter mission presents a unique opportunity for comparing near-simultaneous, independent satellite measurements. We here examine simultaneous significant wave height measurements by the Jason-1 and Topex/Poseidon altimeters. These data are also compared with in-situ measurements from deep-ocean buoys and with predicted wave heights from the WaveWatch 111 operational model. The rms difference between Jason and Topex wave heights is 28 cm, and this can be lowered by half through improved outlier editing and filtering of high-frequency noise. Noise is slightly larger in the Jason dataset, exceeding Topex by about 7 cm rms at frequencies above 0.05 Hz, which is the frequency at which the coherence between Topex and Jason measurements drops to zero. Jason wave heights are more

prone to outliers, especially during periods of moderate to high backscatter. Buoy comparisons confirm previous reports that Topex wave heights are roughly 5% smaller than buoy measurements for waves between 2 and 5m; Jason heights in general are 3% smaller than Topex. Spurious dips in the Topex density function for 3- and 6-meter waves, a problem that has existed since the beginning of the mission, can be solved by waveform retracking.
Author
Ocean Bottom; Poseidon Satellite; Topex; Buoys; Mathematical Models; Satellite Altimetry; Space Missions; Water Waves

20040040256 Naval Surface Warfare Center, Bethesda, MD, USA
Marine Vortices and their Computation
Gorski, Joseph J.; Symposium on Advanced Flow Management. Part A: Vortex Flows and High Angle of Attack for Military Vehicles. Part B: Heat Transfer and Cooling in Propulsion and Power Systems; March 2003; 13 pp.; In English; See also 20040040215; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Some of the physics involved in marine vortices and their generation for surface ships and submarines is examined in this paper. Surface ships can generate bow, bilge, and stern vortices from the hull in addition to vortices from any appendages or protrusions, such as bilge keels and shafts. Submarines, with their axially symmetric hull forms, often have more benign flow fields than surface ships, but generated vortices can have a significant influence on the behavior of the vehicle. The ability to compute such vortical flows has advanced rapidly and progress that has been made in computing such flows with Reynolds Averaged Navier-Stokes (RANS) solvers is discussed. Some of the areas where RANS computations are being used for surface ships and submarines are described and an indication is given of where the naval community is in its ability to accurately predict these complex flow phenomena.
Author
Vortices; Marine Transportation; Hydrodynamics; Ships

20040042486 Ohio Aerospace Inst., Brook Park, OH, USA
Manual of Scaling Methods
Bond, Thomas H., Technical Monitor; Anderson, David N.; March 2004; 78 pp.; In English
Contract(s)/Grant(s): NCC3-884; WBS-22-728-41-17
Report No.(s): NASA/CR-2004-212875; E-14272; No Copyright; Avail: CASI; A05, Hardcopy

This manual reviews the derivation of the similitude relationships believed to be important to ice accretion and examines ice-accretion data to evaluate their importance. Both size scaling and test-condition scaling methods employing the resulting similarity parameters are described, and experimental icing tests performed to evaluate scaling methods are reviewed with results. The material included applies primarily to unprotected, unswept geometries, but some discussion of how to approach other situations is included as well. The studies given here and scaling methods considered are applicable only to Appendix-C icing conditions. Nearly all of the experimental results presented have been obtained in sea-level tunnels. Recommendations are given regarding which scaling methods to use for both size scaling and test-condition scaling, and icing test results are described to support those recommendations. Facility limitations and size-scaling restrictions are discussed. Finally, appendices summarize the air, water and ice properties used in NASA scaling studies, give expressions for each of the similarity parameters used and provide sample calculations for the size-scaling and test-condition scaling methods advocated.
Author
Ice Formation; Manuals; Analogies; Deposition

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LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20040035770 Nuklearni Inst. Jozef Stefan, Ljubljana, Slovenia
Human-Centred and Socially Appropriate Automation
Cernetic, Janko; Electrotechnical Review; 2002; ISSN 0013-5852; Volume 69, No. 5, pp. 298-304; In Slovene; Copyright; Avail: Other Sources

Advanced technologies, particularly in the form of various automation and control systems (ACS), have become, during the last decade, an integral part of the human and social life both at work and during leisure time. However, owing to the fast

development complexities of advanced ACS's, their use has led to problems that can to large extent be attributed to non-technicalreasons. The non-technical aspects of ACS's have been paaid a lot of attention by reseachers, developers and practioners of this technology. The main concern is the impact that the ACS's have on humans, economy, society and natural environment. The aim of this paper is to present a short overview of human-centred and socially appropriate automation as being currently dealt with by the IFAC Technical Committee (TC) 'Social Impact of Automation'
Author
Automatic Control; Human Factors Engineering

20040035959 Air Force Inst. of Tech., Wright-Patterson AFB, OH
An Ergonomic and Human Factors Comparison Between Manual and Telerobotic Simulated Endoscopic Surgery
Lee, Ernest C.; Rafiq, Azhar; Merrell, Ronald; Dennerlein, Jack; Jan. 8, 2004; 30 pp.; In English
Report No.(s): AD-A420031; AFIT-CI-04-25; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this study was to perform an ergonomic and human factors comparison between manual and telerobotic simulated endoscopic surgery. Methods: To evaluate and compare the ergonomics of endoscopic surgery using manual and telerobotic techniques, 13 participants without experience as primary surgeons in endoscopic surgery were selected to perform a set of simulated tasks at random. The tasks consisted of passing a pompom through rings, suturing, running a 32-in ribbon, and cannulation. The Job Strain Index (JSI) and Rapid Upper Limb Assessment (RULA) were used for ergonomic evaluation. Participants completed a questionnaire comparing intuitiveness and mental stress. Results: JSI and RULA scores for all four tasks demonstrated that the telerobotic technique is ergonomically more favorable than the manual technique. The telerobotic technique is as intuitive and no more stressful than the manual technique. Conclusions: Telerobotic endoscopic surgery is ergonomically more favorable, equally intuitive, and no more mentally stressful than manual endoscopic surgery.
DTIC
Human Factors Engineering

20040035967 RAND Corp., Santa Monica, CA
Policy and Health in Asia: Financing and Allocating Public Expenditures
Jan. 2003; 2 pp.; In English
Report No.(s): AD-A420035; RAND/RB-5069; No Copyright; Avail: CASI; A01, Hardcopy

Financing clinical services by tapping public sources and mobilizing private sources is a role all governments use to intervene in the health sector. Public sources come from general or earmarked taxes, while private sources are mobilized by mandatory user fees paid by individuals, families, or enterprises. In turn, governments allocate these public revenues toward public health activities that benefit society above and beyond curative services that mainly benefit the individual. How countries finance and allocate public expenditures determines how they meet their populations' health needs. Research by John Peabody and colleagues takes a closer look at this issue in Asia and proposes that governments intervene in the health sector to address competing objectives; however, this often means making trade-offs among the objectives. User fees can be mobilized to help meet competing objectives. Social insurance (SI) is another policy that offers promise for relatively wealthier countries to avoid some of the difficult trade-offs.
DTIC
Clinical Medicine; Medical Services

20040035985 Army Research Inst. of Environmental Medicine, Natick, MA
Effect of Hypoxia on Gene Expression by Human Hepatocytes (HepG2)
Sonna, L. A.; Cullivan, M. L.; Sheldon, H. K.; Pratt, R. E.; Lilly, C. M.; Jan. 2003; 14 pp.; In English
Report No.(s): AD-A420060; M02-51; No Copyright; Avail: CASI; A03, Hardcopy

The full extent to which hypoxia produces gene expression changes in human cells is unknown. We used late- generation oligonucleotide arrays to catalog hypoxia-induced changes in gene expression in HepG2 cells. Five paired sets of cultures were subjected to either control (room air-5% CO2) or hypoxic (1% 02-5% CO2) conditions for 24 h, and RNA was analyzed on an Affymetrix cDNA array containing 12,600 sequences. A statistically significant change in expression was shown by 2,908 sequences (1,255 increased and 1,653 decreased). The observed changes were highly concordant with published literature on hypoxic stress but showed relatively little overlap (12-22%) with changes in gene expression that have been reported to occur after heat stress in other systems. Of note, of these 2,908 sequences, only 387 (213 increased and 174 decreased) both exhibited changes in expression of twofold or greater and were highly expressed in at least three of the five experiments. We conclude that the effect of hypoxia on gene expression by HepO2 cells is broad, has a significant component

of downregulation, and includes a relatively small number of genes whose response is truly independent of cell and stress type.
DTIC
Gene Expression; Heat Tolerance; Stress (Physiology)

20040035989 Yale Univ., New Haven, CT
Outcome Based Screening for Prognostic Phospho-RTK (Receptor Tyrosine Kinase) Antibodies Using Tissue Microarrays
Rimm, David L.; Aug. 2003; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0463
Report No.(s): AD-A420064; No Copyright; Avail: CASI; A03, Hardcopy

Receptor Tyrosine Kinases (RTKs) have been identified as potential targets for both breast cancer prognosis and therapy. We proposed use of tissue microarrays to evaluate the prognostic value of RTKs with emphasis on the phosphorylation status of these receptors. Analysis of a series of phospho-receptor antibodies on large cohorts on tissue microarrays should reveal which RTKs are most likely to be of prognostic and therapeutic value. As of this progress report, we have completed construction of the tissue microarrays and completed collection of the clinical data. We have also completed and submitted a pilot study of RTKs using conventional analysis of this array. In the proposal we show automated analysis of the arrays has potential to reveal relationships that are undetectable by conventional methods. We have now completed our efforts in construction of the device capable of high through-put automated array analysis. We have begun using this device with some phospho-specific antibodies to EGFR and Met.
DTIC
Mammary Glands

20040035991 Case Western Reserve Univ., Cleveland, OH
TIG3-A Novel Inhibitor of Breast Cancer Cell Proliferation
Eckert, Richard L.; Sep. 2003; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9115
Report No.(s): AD-A420065; No Copyright; Avail: CASI; A03, Hardcopy

The mechanism of inhibition of cancer cell proliferation by vitamin A is poorly understood because many of the targets that mediate the retinoid-dependent growth suppression are not known. We have recently identified a novel retinoid-responsive gene target, TIG3, that we believe may be a key player in mediating the retinoid-dependent suppression of tumor cell proliferation. Understanding the mechanism of TIG3 action may provide insights that lead to innovative new anti-breast cancer therapies. Exploiting this potential requires that we understand how TIG3 inhibits cell proliferation - the major goal of this proposal. Specific Aim I Subcellular location plays a major role in determining function, and knowing location provides clues about function. Therefore, our first goal is to localize TIG3 in breast cancer cells. Specific Aim 2 Most proteins contain distinct functional domains, some responsible for localization and others for function. We hypothesize that TlG3 is divided into distinct functional domains that are important for growth suppression. We are testing this hypothesis. Specific Aim 3 The TIG3 amino acid sequence/structure reveals no obvious catalytic functional domains, suggesting that TIG3 acts by modulating the function of other proteins. A major goal of the study is to identify these targets. We have 1) constructed a plasmid-based TIG3 expression systems and used it to express TIG3 in cells, 2) identified a perinuclear localization of TIG3 in cells, 3) demonstrated that the TlG3 carboxy-terminal hydrophobic domain guides appropriate subcellular localization, 4) shown that the TIG3 carboxy-terminal tail is required for optimal cell killing, 5) constructed an adenovirus expression system that permits efficient TIG3 expression for biochemical studies, and 6) we identified type I transglutaminase as a TIG3 target in cells.
DTIC
Cells (Biology); Mammary Glands; Regeneration (Physiology)

20040035997 Alabama Univ., Birmingham, AL
The Influence of Stromal Transforming Growth Factor-Beta Receptor signaling on Mouse Mammary Neoplasia
Crowley, Michael R.; Aug. 2003; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0201
Report No.(s): AD-A420069; No Copyright; Avail: CASI; A03, Hardcopy

Our laboratory has developed transgenic mice that express a zinc-inducible, kinase-defective dominant-negative TGF-beta type II receptor in the mammary stroma (DNIIR). Recent evidence has accumulated implicating the stroma in regulating tumor formation. To determine if loss of TGF-beta signaling in the stroma affects tumor development transgenic

and wild type mice were given pituitary isografts, zinc water and either left untreated or treated with 7, 12-dimethylbenz (a) anthracene (DMBA). Fifteen tumors developed in the wild type group on a full regiment (pituitary isograft, zinc and DMBA) while 16 tumors arose in the transgenic group with the same treatment. Both wild type and transgenic mice had an average of 1.5 tumors per mouse with an average latency of approximately 14 weeks. To identify genes regulated by TGF- beta in the mammary stroma a filter based array, commercial gene chip microarray and a custom mammary gland specific microarry were screened. Fifty-one genes have been analyzed by RT-PCR and 17 were confirmed for altered expression. The custom mammary gland specific microarry was verified and approximately 40% of the genes were found to be regulated 2 fold above or below the mean. Expression analysis of these genes is currently underway.
DTIC
Mammary Glands

20040036001 Georgetown Univ., Washington, DC
Examination of the Contribution of VEGF to the Metastatic Dissemination of c-Myc Overexpressing Breast Cancer Cells
Johnson, Michael D.; Jul. 2003; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0255
Report No.(s): AD-A420071; No Copyright; Avail: CASI; A02, Hardcopy

Metastasis to the lung is a common occurrence accounting for approximately 60-70% of metastasis. We have developed a transgenic model of lung metastasis using a MMTV-c- myc/MMTV-VEGF bitransgenic mouse system. We are using this system to evaluate the mechanism by which VEGF is able to dramatically increase metastasis to the lung. Solid progress has been made during a no-cost extension year granted to allow us to re-group and overcome technical challenges that have slowed the anticipated accrual of tumor material for the study. Three publications are in the final stages of publication which have been directly supported by this award.
DTIC
Mammary Glands

20040036003 Georgetown Univ., Washington, DC
An Epithelial-Derived Integral Membrane Kunitz- Type Serine Protease Inhibitor in Breast Cancer
Lin, Chen-Yong; Aug. 2003; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0252
Report No.(s): AD-A420072; No Copyright; Avail: CASI; A02, Hardcopy

In the current research plan, we proposed to study the anti-tumor and anti-protease activity of a membrane-bound Kunitz-type serine protease inhibitor (KSPI; also known as HAI- 1). In order to investigate how HAI-1 regulates matriptase function, we have constructed mutants of the HAI-1 proteins, including point mutations at the active center of both Kunitz domains and the calcium cage of the LDL receptor class A domain, and the deletion of entire LDL receptor class A domain.
DTIC
Mammary Glands; Cancer; Tumors

20040036005 Pittsburgh Univ., Pittsburgh, PA
Hormonal Determinants of Mammographic Density
Simpson, Jennifer K.; Modugno, Francemary; Aug. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0553
Report No.(s): AD-A420073; No Copyright; Avail: CASI; A03, Hardcopy

Hormone Replacement Therapy (HRT) has been shown to increase breast cancer risk as well as to increase breast density. Breast density, a reflection of the histologic composition of the breast, is one factor shown to affect mammographic sensitivity and specificity, and it is predictive of breast cancer risk. Thus, the use of HRT, through its effect on breast density, may compromise the well-established reduction in mortality gained by mammographic screening. However, not all women on HRT will experience an increase in breast density. We propose a novel hypothesis to explain in part the individual variability in breast density * seen among women on HRT: differences in breast density are associated with differences in estrogen metabolism, and this association may be attenuated by individual factors such as body mass index and HRT regimen. Our work and the work of others provide compelling evidence to support this hypothesis.
DTIC
Mammary Glands; Hormone Metabolisms; Cancer

20040036007 Duke Univ., Durham, NC

Relationships of Stress Exposures to Health in Gulf War Veterans

Fairbank, John A.; Oct. 2003; 38 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8662

Report No.(s): AD-A420074; No Copyright; Avail: CASI; A03, Hardcopy

Research on Gulf War (6W) illnesses leaves many questions unanswered about diagnostic syndromes of 6W illnesses, dimensions of stressor exposures encountered by 6W veterans, relations among stressor exposures and GW syndromes or symptoms, and factors that may mediate these relationships. The proposed study has five key aims intended to address these gaps and enhance understanding of illnesses reported by 6W veterans: (1) to identify and examine dimensions of illnesses and health problems commonly reported by 6W veterans; (2) to assess exposures to environmental toxins and psychosocial stresses comprehensively and to identify the dimensions of these exposures; (3) to examine the extent to which particular types of dimensions of exposure experienced during deployment and participation in Operation Desert Shield/Desert Storm (ODS/S) are associated with the commonly reported and undefined post-war health problems of 6W veterans; (4) to clarify how preliminary and predeployment adversities, risk factors, and protective factors affect 6W illness outcomes; (5) to examine the mediating role of post-ODS/S factors (e.g., instrumental and emotional social support, general psychological functioning, specific comorbid psychiatric disorders, such as posttraumatic stress disorder and depression) on 6W illness outcomes. These aims will be achieved by obtaining in-depth data from a national probability sample of 6W veterans, including men and women in active and reserve components.

DTIC

Stress (Psychology)

20040036009 Michigan Univ., Ann Arbor, MI

Influences of Nutrition and Physical Forces on Bone Structure/Function Properties

Goldstein, Steven A.; Oct. 2003; 30 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0809

Report No.(s): AD-A420075; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this research program is to contribute towards two major objectives in support of advancing our ability to prevent or treat bone failure or fragility: I. Developing and characterizing methods of evaluating bone properties in animal models that goes beyond measures of bone density and global mechanical properties. 2. Evaluating the influence of physical forces and nutritional status on bone biomechanical integrity. Specifically, it was the purpose of this study to apply a hierarchical approach to quantifying the properties of murine bone to the level of the extracellular matrix. Furthermore, the study was designed to test hypotheses concerning the interplay between vitamin D and calcium nutritional support and physical forces. Progress during the second year of study has followed the proposed statement of work. All of the microtesting systems have been fabricated and are being utilized to prepare specimens for study. Most importantly, 394 animals have been entered into the study and the morphology, geometry and mechanical properties of the femurs and vertebrae have been documented for many of the animals. The data demonstrated significant effects of strain and calcium nutrition, with no effect of exercise to date.

DTIC

Bone Demineralization; Bone Mineral Content; Calcium; Nutrition; Physical Exercise

20040036011 Fox Chase Cancer Center, Philadelphia, PA

Cognitive-Affective Predictors of the Uptake of and Sustained Adherence to Lymphedema Symptom Minimization Practices in Breast Cancer Survivors

Miller, Suzanne M.; Aug. 2003; 15 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0382

Report No.(s): AD-A420076; No Copyright; Avail: CASI; A03, Hardcopy

Approximately 20-30% of women develop lymphedema (LE) following breast cancer treatment; this condition has been associated with psychological distress and diminished quality of life. Effective symptom management requires that women not only recognize early signs of this condition, but that they uptake and maintain precautionary practices over their lifetime. Yet, the limited data available indicate that knowledge and use of symptom minimization precautions are poor, particularly over time. Unfortunately, little is known about how breast cancer survivors perceive their LE risk status, and the cognitive-affective factors that promote the uptake of, and adherence to, LE symptom minimization precautions. Further, the moderating role of individual differences in attentional style has not been explored. Guided by the Cognitive-Social Health Information Processing (C- SHIP) model, we will conduct a longitudinal study, to assess the barriers and facilitators associated with

knowledge about, and adherence to, LE symptom- minimization practices among breast cancer survivors currently unaffected by LE. We will explore the mediating role of cognitive-affective variables, and the moderating role of attentional style, on knowledge, uptake and adherence over time. Toward this end, we will survey levels of knowledge, and the practice of symptom minimization precautions at baseline, and again at 6-, and 12- month follow-up.
DTIC
Mammary Glands; Signs and Symptoms

20040036013 Hutchinson (Fred) Cancer Research Center, Seattle, WA
Modifiable Risk Factors for Lymphedema in Breast Cancer Survivors
Rossing, Mary A.; Oct. 2003; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0387
Report No.(s): AD-A420077; No Copyright; Avail: CASI; A02, Hardcopy

Lymphedema of the arm is a common, yet dreaded consequence of breast cancer treatment that can result in substantial functional impairment and distress in affected women. Axillary surgery and radiation treatment are known risk factors for Lymphedema. However, other potentially modifiable characteristics or behaviors that may influence risk of this condition have not yet been studied. In this study, we will assess whether modifiable factors, including body weight, physical activity, smoking and breast reconstruction, influence risk of arm Lymphedema among women treated for breast cancer. Women aged 21-74 years diagnosed with a first primary invasive breast cancer will be identified through a population-based cancer registry. Enrollment will be limited to women who have had axillary node dissection, as the occurrence of Lymphedema is most common in these women. The incidence and timing of arm edema following breast cancer will be assessed using physical measures (arm volume) and self- report of symptoms, at regular intervals throughout the study. Each time they undergo arm measurement, women will complete questionnaires detailing and updating information on the exposures of interest and potential confounding factors. The study will be conducted over a 4-year period.
DTIC
Mammary Glands

20040036015 Dana Farber Cancer Inst., Boston, MA
Characterization of IBC-1 A Novel Putative Breast Cancer Prognostic and Survival Factor
Allinen, Minna; Merlos-Suarez, Anna; Polyak, Kornelia; Aug. 2003; 15 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0221
Report No.(s): AD-A420078; No Copyright; Avail: CASI; A03, Hardcopy

Using SAGE (Serial Analysis of Gene Expression) we identified a SAGE tag that was only present in invasive breast carcinomas and their lymph node metastases. The transcript corresponding to this SAGE tag, IBC-l (Invasive Breast Cancer-l)/dermcidin (DCD) encodes a secreted protein normally expressed only in the pons of the breain and sweat glands. Array CGH, FISH, and immunohistochemical analyses determined that IBC-1/DCD is overexpressed in approximately 10% of invasive breast carcinomas, in some cases its overexpression is coupled with a focal copy number gain of its locus at 12q13. 1, and its expression is associated with advanced clinical stage and poor prognosis. Expression of IBC-1/DCD in breast cancer cells promotes cell growth and survival, and reduces serum dependency. Putative high and low affinity receptors for IBC-1/DCD are present on the cell surface of breast carcinomas and neurons of the brain. Based on this data we hypothesize that TBC-1/DCD may play a role in tumorigenesis via enhancing cell growth and survival in a subset of breast carcinomas.
DTIC
Mammary Glands

20040036017 Tripler Army Medical Center, Honolulu, HI
Vasopressin Regulation and Renal Fluid and Electrolyte Handling in Rat Models of Acute and Chronic Alcohol Exposure
Uyehara, Catherine F.; Oct. 2003; 21 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0673
Report No.(s): AD-A420081; No Copyright; Avail: CASI; A03, Hardcopy

Fluid and electrolyte balance is affected differently at different stages of alcohol use. In this study, we examine the role of vasopressin (VP), an important hormone in body fluid regulation, in the physiological response to alcohol. A transient decrease in circulating VP levels occurs immediately after acute alcohol administration, but VP levels return to baseline levels while alcohol is still present in the blood, and there is no prolonged deficiency of VP associated with blood alcohol levels.

Rather, alcohol-induced changes in renal responsiveness to VP appear to be responsible for the pattern of diuresis impaired water excretion, and recovery in the different phases of alcohol exposure. Up- and down-regulation of renal VP V2 receptors involved with renal tubular water reabsorption cause differentially altered renal function in the different phases of alcohol exposure. Further, this alcohol-induced renal receptor regulation is specific to the V2 receptors in the inner medulla region of the kidney. In addition, chronic alcohol exposure disrupts the relationships between VP synthesis, brain VP Vi receptors, and blood tonicity. Thus, alcohol-induced changes in VP regulation may affect the ability to respond to physiologic stimuli. Sensitivity of the VP system is currently being further examined with salt load stimulation studies.
DTIC
Blood Volume; Physiological Effects

20040036019 Baylor Coll. of Medicine, Houston, TX
Identifying the Molecular Mechanism of Tumor Suppression by Maspin in Breast Cancer
Zhang, Ming; May 2003; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0294
Report No.(s): AD-A420082; No Copyright; Avail: CASI; A03, Hardcopy

Maspin is a unique member of the serpin family that shares extensive homology with monocyte-neutrophil elastase inhibitor, PAI-2 and other serpins. Initially identified as a class II tumor suppressor gene, maspin has been shown to inhibit invasion and motility of mammary tumors. When maspin gene was introduced into breast tumor cells, it was demonstrated that tumor transfectants expressing maspin exhibited significant decrease in breast tumor growth and metastasis in nude mice. Maspin gene expression is not detected in most breast tumors and loss of its expression is correlated with tumor invasiveness. Maspin is also found to be a potent angiogenesis inhibitor. Based on the previous work by my laboratory and other colleagues, I hypothesize that maspin possesses multiple functionality that requires its interaction with multiple target proteins. Maspin could act intracellularly or be secreted to act in a paracrine fashion on adjacent cells. I propose to isolate maspin target(s) by combined genetic and biochemical approaches. Once the target is identified, deletion and mutagenesis studies will be carried out to identify the functional domain of maspin that is responsible for such protein-protein interaction. Finally, such interaction will be verified in mammalian cells.
DTIC
Mammary Glands

20040036021 HyperMed, Inc., Watertown, MA
Evaluation and Refinement of a System and a Method for the Use of Hyperspectral Imaging for Metabolic Monitoring
Mansfield, James R.; Sep. 2003; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0714
Report No.(s): AD-A420083; No Copyright; Avail: CASI; A03, Hardcopy

The primary hypothesis was that the mean grayscale intensity of hyperspectral oxygen saturation images in a region of interest (ROT) will change during hemorrhagic shock and during hypothermia. Secondary endpoints included the qualitative appearance of the ROT in the HST images, and a quantitative measure of tissue heterogeneity (including patterns of diffuse heterogeneity and mottling). The relationship of skin blood flow, of sympathetic nerve activity, and of catecholamine levels to these changes were also to be explored. Using the HSTMM methodologies developed for this study, it was possible to clearly differentiate ($p << 0.01$) between control and bleed groups in a porcine hypovolemia model. A stable hypovolemia model and data processing methods were developed to enable the transition of the technology and methodology into routine use at the Institute of Surgical Research. A pilot hypothermia study was performed, and HSTMM parameters were found to vary both with core temperature and skin contact temperature during hypothermia.
DTIC
Blood Volume; Imaging Techniques; Skin (Anatomy)

20040036023 Colorado Univ., Aurora, CO
NSAIDS and the Osteogenic Response to Mechanical Stress in Prememopausal Women
Kohrt, Wendy M.; Oct. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0805
Report No.(s): AD-A420084; No Copyright; Avail: CASI; A02, Hardcopy

This is a study of the effects of ibuprofen, a non- steroidal anti-inflammatory drug (NSAlD), on the osteogenic response to 9 months of exercise training in healthy, premenopausal women, aged 21 to 40 years (N=1 02). The hypotheses are: H1a:

taking short-acting NDSAIDS before exercise will diminish increases in bone mineral density (BMD) in response to exercise training H1a: taking short-acting NSAIDS after exercise will not diminish the increases in BMD in response to exercise training Participants take either ibuprofen (4OOmg) or placebo capsules before and after each exercise session. Women are randomized to three treatment arms: 1) NSAID before exercise, placebo after exercise (NSAIDIplacebo; n=34); 2) placebo before exercise, NSAID after exercise (placebo/NSAID; n=34); and 3) placebo before exercise, placebo after exercise (placebo/placebo; n=34). Fifty-three subjects have completed baseline testing and are currently enrolled in the study. Fifteen subjects are presently scheduled for or are undergoing baseline testing. These studies could lead to the development of new strategies to reduce the incidence of, and treatment for, stress fractures that occur in response to vigorous physical activity. DTIC

Exercise Physiology; Stress (Physiology)

20040036025 Health Research, Inc., Rensselaer, NY

Antibody Probes to Transcript-Specific Peptides Provide a Novel Tool to Investigate the Role of Alternate Estrogen Receptor Promotor Use in Breast Cancer

Pentecost, Brian T.; Jul. 2003; 25 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0529

Report No.(s): AD-A420085; No Copyright; Avail: CASI; A03, Hardcopy

Estrogen receptor alpha (ER) plays an important role in the development and progression of breast cancer, and it is routinely used as a marker for hormone sensitivity in breast cancer patients. Positive ER status is a useful indicator for a first-line therapy with antiestrogens. ER is expressed from at least two promoters (Fig.l) . The resulting transcripts from these two promoters differ only in the non- coding region upstream of the major ER open reading frame (ORF); the ER proteins from these two promoters are identical. The proximal promoter transcript contains a 20 residue ORF which closes 52 nt upstream of the main ER ORF. Which affects expression from the downstream ER ORF. Our central hypothesis is that the action of the proximal transcript uORF is exerted at the translation level. C-terminal truncated (Phe2O or Gly 19 to stop) prox-uORFs are highly effective and enhanced inhibitors of expression from the downstream ORF. We have data from the funded studies that supports the translational control hypothesis. The study has demonstrated conseouences of alternate promoter use beyond relative strength of the alternate promoters.

DTIC

Mammary Glands; Transcription (Genetics)

20040036027 Tulane Univ., New Orleans, LA

Development of an EBV-Mammay Epithelial Cell Model for Addressing the Role of EBV in Breast Cancer

Flemington, Erik K.; Aug. 2003; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0511

Report No.(s): AD-A420086; No Copyright; Avail: CASI; A02, Hardcopy

In this grant, we proposed to generate an EBV infected mammary epithelial system that could be used to characterize the life cycle and oncogenic properties of EBV in this unique tissue. We have been utilizing primary human mammary epithelial cell lines generated in Myles Brown's laboratory. By Fluorescence Activated cell Sorting (FACS), we determined that these cells are positive for the EBV receptor, CR2 and we have been carrying out infection studies to determine the infectability of these cells to EBV. To date, we have found that despite the presence of the CR2 receptor, infectability is relatively low. This makes transient studies more difficult. We have therefore, begun exploring additional methods for obtaining high infection efficiencies. We believe that we are making encouraging progress which has been facilitated by the funding of this application. We are confident that our studies will lead to the development of important reagents and ultimately further funding in this area of research.

DTIC

Mammary Glands

20040036029 AMC Cancer Research Center, Denver, CO

DNA Damage, Fruits and Vegetables and Breast Cancer Prevention

Thompson, Henry J.; Aug. 2003; 83 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9062

Report No.(s): AD-A420088; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of this project was to evaluate the effect(s) of increasing fruit and vegetable intake on oxidative DNA damage

and lipid peroxidation in a population of women at elevated risk for breast cancer. The rationale that underlies the work conducted was based on evidence that the occurrence of DNA mutations are essential steps in carcinogenesis and that these mutagenic events can result from oxidative stress, even in the absence of exogenous carcinogens. The effects of consuming a recipe-defined diet designed to provide on average three (control) or ten (intervention) servings of fruits and vegetables per day for a total of 8 weeks on measures of oxidative damage to DNA and lipids was determined. The accrual goal of enrolling 200 subjects in this project was exceeded. A total of 213 individuals completed the dietary intervention. Sample analysis and data evaluation are reported.
DTIC
Deoxyribonucleic Acid; Mammary Glands

20040036031 Beth Israel Deaconess Medical Center, Boston, MA
Biological Function of BRCA1 and Its Regulation by Extracellular Matrix and PTEN in Breast Cancer
Miralem, Tohomir; Avraham, Hava; May 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0152
Report No.(s): AD-A420089; No Copyright; Avail: CASI; A02, Hardcopy

Inherited mutations in the breast and ovarian cancer susceptibility gene BRCAl are associated with a high risk for developing breast and ovarian cancers. while numerous studies link BRCAl to transcriptional regulation, DNA repair, apoptosis and growth/tumor suppression, the overexpression of the ErbB-2 family of receptor tyronsine kinases has been linked to the development of non-familial or sporadic breast cancer. Activation of HRG signaling, mediated by the binding of HRG to ErbB receptors, has been implicated in the development of aggressive phenotype in breast cancer cells. The mechanisms through which HRC regulates the progression of breast cancer cells to a more invasive or motile phenotype are currently unknown. Our specific aims are: 1) To determine the effect of ECM/ integrins on BRCAl expression, phosphorylation and nuclear translocation. 2) To generate inducible stable transfected T47D clones that overexpress BRCAl protein, in order to characterize its biological functions in breast cancer cells. 3) To determine the effect of PTEN on BRCAl phosphorylation.
DTIC
Mammary Glands; Receptors (Physiology)

20040036041 Department of Defence, Canberra
Defence Health Service Mentoring Program Evaluation 2001
Highfield, Jane; Mar. 2002; 69 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420095; No Copyright; Avail: CASI; A04, Hardcopy

The Defense Health Services (DHS) Steering Committee has considered the concept of Mentoring as part of an effort to assist in the development of future health leaders in the Australian Defense Force (ADF). DHS commissioned the Directorate of Strategic Personnel Planning and Research (DSPPR) to evaluate a recent Mentoring Program trial in order to assess the effectiveness and organizational value of Mentoring within DHS. This report explores various factors which were associated with the application of the proposed mentoring trial within a DHS environment and the subsequent evaluation and perceptions of the serving members who took part in the trial.
DTIC
Medical Services; Military Operations

20040036043 Columbia Univ., New York, NY
Role of Nitric Oxide in MPTP-Induced Dopaminergic Neuron Degeneration
Przedborski, Serge; Jackson-Lewis, Vernice; Sep. 2003; 203 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9474
Report No.(s): AD-A420096; No Copyright; Avail: CASI; A10, Hardcopy

This four year grant proposal investigates the role of nitric oxide (NO) in dopaminergic (DA) neuron death in the MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) mouse model of Parkinson's Disease (PD). The PI's work suggests that both superoxide radicals and nitric oxide (NO) contribute to MPTP toxicity. Using this mouse model of PD, Specific Aim (SA) I identifies which nitric oxide synthase (NOS) enzyme is the main culprit in the death of DA neurons in the substantia nigra of MPTP-treated mice. SA II (1) characterizes the upregulation of iNOS following MPTP in wild-type mice, and (2) assesses the effects of MPTP on the nigrostriatal DA pathway of iNOS ko mice. SA III quantifies brain levels of dityrosine and nitrotyrosine, main markers of the deleterious effects of peroxynitrite on brain proteins while SA-IV assesses several candidate

proteins and identifies others that are at risk of oxidative/ nitrative attack following MPTP administration. All of our data confirm that both the superoxide radical and NO are indeed involved in the MPTP neurotoxic process in the SNpc of mice and point to peroxynitrite, the product of the superoxide radical/NO reaction, as the agent most likely damaging these DA neurons.
DTIC
Nitric Oxide

20040036045 Sensimetrics Corp., Somerville, MA
Auditory Peripheral Processing of Degraded Speech
Ghitza, Oded; Jan. 2003; 13 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0173
Report No.(s): AD-A420098; AFRL-SR-AR-TR-04-0098; No Copyright; Avail: CASI; A03, Hardcopy

This is a final report for a stand-alone grant supporting the first 9 months of a 4-year research program entitled 'Auditory peripheral processing of degraded speech'. The underlying thesis is that the auditory periphery contributes to the robust performance of humans in speech reception in noise through a concerted contribution of the efferent feedback system (which stabilizes the operating point of the cochlea) and post-auditory-nerve functions (such as acoustic-edge detectors). The 4-year program includes psychophysical experiments aimed at documenting the role of these two peripheral components; developing a computational model; and using the emerging model as a front end to an automatic speech recognition system. The proposed timetable allocates the first 12 months for psychophysical experiments. This report describes efforts to assess the role of the MOC efferent system in speech reception in the presence of sustained background noise, by using a test of initial consonant reception (the Diagnostic Rhyme Test) performed by subjects with normal hearing. Activation of selected parts of the efferent system was attempted by presenting speech and noise in various configurations (gated/continuous, monaural/binaural) . Initial results support the hypothesis of a significant efferent contribution to initial phone discrimination in noise.
DTIC
Speech Recognition

20040036057 Pittsburgh Univ., Pittsburgh, PA
Gadd45 Mediates the BRCA1-Induced Cell Cycle Arrest
Zhan, Qimin; Aug. 2003; 24 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0414
Report No.(s): AD-A420106; No Copyright; Avail: CASI; A03, Hardcopy

We have previous demonstrated that Gadd45, a p53- regulated stress protein that plays an important role in cell cycle G2-M checkpoint, is transcriptionally up-regulated by BRAC1. In this report, we have shown that BRAC1-induced cell cycle G2-M arrest is disrupted in Gadd45 deficient cells, indicating that Gadd45 mediates BRAC1's role in the control of cell cycle G2-M arrest. In agreement with this finding, disruption of endogenous of Gadd45 in cells is found to result in impaired capability of BRAC1 in growth suppression. These results further support Gadd45 as a BRAC1 downstream effector gene. In addition, we have demonstrated that BRAC1 activation of the Gadd45 gene is mediated through OCT-1 and CAAT motifs that localize at the Gadd45 promoter. BRAC1 protein can directly bind to the Gadd45 promoter and this binding is mediated via the associations of BRAC1 with Oct-1 and NF-YA transcription factors. Importantly, ATR kinase is found to be involved in the signaling pathway that mediates BRCA1 activation of the Gadd45 promoter. The current study demonstrates a novel pathway (BRAC1-GADD45) involved in cellular response to DNA damage, particularly in the control of cell cycle checkpoint.
DTIC
Mammary Glands

20040036063 Kansas Univ., Kansas City, KS
Real-Time Palpation Imaging for Improved Detection and Discrimination of Breast Abnormalities
Hall, Timothy J.; Oct. 2003; 84 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0596
Report No.(s): AD-A420109; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of our work is to develop and test a new kind of imaging system we call 'palpation imaging'. We expect that palpation imaging will be a useful tool for improving the discrimination between benign and malignant breast tumors. The scope of the effort in our first two years of funding was to implement our algorithm for imaging tissue elasticity on a

commercial ultrasound imaging system and to begin testing that new imaging system. These images are produced at substantially real-time frames rates with normal ultrasound B-mode and strain images displayed side-by-side. These algorithms are fully integrated into the commercial system and require no system modifications. Year two efforts also involved increasing the clinical testing of these tools and investigating other elasticity imaging techniques. Breast exams performed on volunteers have shown that palpation imaging techniques are almost identical to the standard clinical breast ultrasound exam. Elasticity image information appears useful for differentiating atypical cysts, fibroadenomas, and invasive ductal carcinomas. Further testing is required to evaluate statistical performance.
DTIC
Imaging Techniques; Mammary Glands; Real Time Operation

20040036065 Georgia Tech Applied Research Corp., Atlanta, GA
Intraoperative Imaging of Sentinel Lymph Nodes
Greene, Carmen M.; Hertel, Nolan E.; Aug. 2003; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0400
Report No.(s): AD-A420110; No Copyright; Avail: CASI; A04, Hardcopy

The main objective of this investigation is to determine the feasibility and value of the intraperative use of a small field of view (FOV) camera gamma camera for sentinel lymph node (SLN) localization in breast cancer patients. Two cameras, on with a 1' x 1' FOV and one with a 5 x 5' FOV are being investigated. Clinical experience with 14 subjects using the 1 in x 1 in FOV and 15 subjects using the 5 in x5 in FOV suggests that the 5 x 5 FOV is more valuable for SLN localization in breast cancer patients than is the 1' x 1' FOV. The task of verifying the content of two databases one consisting of data form 121 breast cancer patients and the other consisting of data from 50 was carefully done. Data from the database consisting of data from 50 was carefully done. Data from the database consisting of 50 patients were presented at the 8% Congress of the World Federation of Nuclear Medicine and Biology 2002 in Santiago, Chile by the senior nuclear medicine technologist at Atlanta VAMC. The data for the other database are currently being analyzed statistically to determine correlation factors. Initial assessment of the data of the 15 subjects images with 5' x 5' FOV camera suggests use of the device is feasible and of value for SLN localization in cases which preoperative imaging is not performed.
DTIC
Clinical Medicine; Imaging Techniques; Lymphatic System; Mammary Glands; Sentinel System

20040036067 Massachusetts Univ. Medical Center, Worcester, MA
Neuroprotective Ganglioside Derivatives
Ullman, M. D.; Sep. 2003; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0779
Report No.(s): AD-A420111; No Copyright; Avail: CASI; A03, Hardcopy

In this study, neuroprotective ganglioside derivatives are examined so they can be targeted to specific points in cell death pathways. Here, ganglioside functional groups required for neuroprotection and blood-brain barrier permeance are determined. Cell death mechanisms and the mechanism(s) by which semisynthetic gangliosides intervene in the cell death process are also studied. In the second year C2, C4, CS, C14, C20, and C26 fatty acid GMl derivatives were synthesized. Experiments on semisynthetic ganglioside cytoprotection using a retinoic acid- differentiated SH-SY5Y human neuroblastoma cell/MPP+ model have been initiated. Each derivative requires analysis at different concentrations and preincubation times. Of the compounds studied to date (C2GM1, dichloroC2GM1, C4GM1, Cl4GM1), the C4GM1 derivative is the most cytoprotective, being 1.4 times more effective than the+ parent GM1. cDNA microarray analysis of changes in gene expression associated with MPP toxicity revealed that MPP+ exposure resulted in decreased RMB3 expression, increased GADD153 expression, and increased c-Myc expression. Further findings suggest that increased pancreatic protein disulfide isomerase (PDIp) expression in MPP+ stressed SH-SY5Y cells may promote Lewy body formation and perhaps contribute to neurotoxicity and neurodegeneration.
DTIC
Blood-Brain Barrier; Gene Expression

20040036069 Beth Israel Deaconess Medical Center, Boston, MA
Rb Associated Protein 46: Roles in Progression of Proliferation Breast Cancer
Yamin, Moshe; Wang, Zhaoyi; Jul. 2003; 35 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0156
Report No.(s): AD-A420116; No Copyright; Avail: CASI; A03, Hardcopy

Our research program is focused on Rb associated protein 46 (RbAp46), a novel tumor suppressor gene that we recently identified and cloned. Our major goal is to understand the role of RbAp46 in the early development of breast cancer. During the project period (2000-2003), we accomplished all of the tasks proposed in our application. We demonstrated RbAp46 tumor suppressor function in the early development of breast cancer, revealing cellular and molecular mechanisms by which RbAp46 functions as a tumor suppressor. Using MCFl0AT3B cells derived from a xenograft model of human proliferative breast disease, we discovered that RbAp46 overexpression strongly inhibits abnormal growth and tumorigenicity of neoplastigemc MCFl0AT3B cells. RbAp46 overexpression also facilitates stress-induced apoptosis in MCFl0AT3B cells through consistent activation of the JNK/SAPK pathway. We also found that restoration of RbAp46 expression in breast cancer cells strongly inhibits malignant features of these tumor cells. Importantly, we found that inducible RbAp46 expression in established breast cancer xenografts strongly suppressed progressive growth of breast cancer in vivo. Furthermore, we demonstrated that constitutive RbAp46 expression in MCFl0AT3B cells inhibits estrogen-stimulated growth of these cells in vitro and tumorigenicity in vivo. Finally, we revealed that several signaling pathways, including the JNK/SAPK pathway and the catenin pathway, are involved in RbAp46 function as a potent tumor suppressor.
DTIC
Cells (Biology); Mammary Glands

20040036073 Illinois Univ., Chicago, IL
1 A-Hydroxyvitamin D5 as a Chemotherapeutic and Possibly Chemopreventive Agent
Das Gupta, Tepas K.; Sep. 2003; 82 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9223
Report No.(s): AD-A420118; No Copyright; Avail: CASI; A05, Hardcopy

We identified a novel vitamin D analog, la-hydroxy- 24 ethyl vitamin D5 (1alpha(OH)D5) that showed potent growth inhibitory and cell-differentiating actions in breast cancer cells. Based On our findings in vitro and in vivo, we hypothesized that 1alpha(0H)Ds(D5)when administered to women with breast cancer, will induce differentiation of dedifferentiated cells and thereby prevent progression of malignancy. 1999-2000, we completed preclinical studies in rats, showing that D5 has no serious toxicity; a hypercalcemic effect was observed at high dose, which was reversible. In vitro study in tissues obtained from patients show that D5 has no effect on normal breast epithelial cells but induces apoptosis in breast cancer and showed apoptotic effect in fibroadenomas. We completed 5 steps in the synthesis of D5in preparation for phase I clinical study. 2001-2002, under GMP, we completed preclinical toxicity studies in dogs and completed synthesis of 1alpha(OH)D5 . In vitro studies in clinical specimens suggest that D5 has-no effect on normal breast tissues; it inhibits cell proliferation in tumor cells. D5 or its active metabolite possibly interacts with estrogen receptor. 2002-2003, all the requirements for the clinical trial are completed; we submitted an application for IND to FDA. The FDA responded back with a few questions. These have been completed and the revised application is once again submitted. We will initiate studies as soon as the approval is granted. In the present report we have included the clinical portion of the brochure, since the summary of results on the efficacy and mechanism of action of 1alpha(OH)D5 were submitted in previous years.
DTIC
Clinical Medicine; Mammary Glands

20040036075 Georgetown Univ. Hospital, Washington, DC
Characterization of Early Genomic Changes in Mammary Glande of High Risk Women
Haddad, Bassem R.; Jul. 2003; 47 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9193
Report No.(s): AD-A420119; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this project was to address the critical question of identifying early genomic changes that occur in the mammary glands of patients with increased predisposition to breast cancer due to germ-line mutations in BRCAl/2 genes. Identification of these early changes will improve our understanding of the mechanisms of tumorigenensis in these high-risk patients and therefore should aid in devising early detection, diagnosis, and prevention strategies for such women at risk. Over the course of the project, we tested the hypothesis that genomic changes may be detected, not only in histologically abnormal and malignant breast tissues, but also in morphologically normal tissues as well as in areas with pathologically benign changes. We have clearly shown that genetic changes in areas with pathologically benign changes. We have clearly shown that genetic changes in the form of LOH are present in the non-malignant breast tissues in addition to the tumor, suggesting that these non-malignant tissues already harbor significant genetic alterations that may predispose them to malignant transformation. Our results support the hypothesis that there is a 'field effect' of early genetic events preceding morphologic changes in the mammary glands of BRCA mutation carriers. To follow up on these findings we have recently initiated a study aiming at

developing and testing molecular markers for early detection and diagnosis of hereditary breast cancer in BRCAl/2 carriers.
DTIC
Mammary Glands

20040036077 Veterans Medical Research Foundation, San Diego, CA
The Effects of Total Sleep Deprivation and Recovery Sleep on Cognitive Performance and Brain Function
Gillin, J. C.; Drummond, Sean P.; Brown, Gregory; Aug. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0201
Report No.(s): AD-A420120; No Copyright; Avail: CASI; A01, Hardcopy

An ever-increasing number of military personnel and civilians alike must work daily without adequate sleep. Although considerable data show sleep deprivation alters many aspects of behavior, little is known about changes in the brain substrate underlying the behavioral effects.. Even less is known about the cerebral effects of recovery sleep. The objective of this study is to investigate the effects of 2 full nights of sleep loss and 2 full nights of recovery sleep on cognitive performance and brain function. We will study 40 individuals for 6 nights and 6 days. Over the course of this period, subjects will receive 4 polysomnograms and 10 functional magnetic resonance imaging (FMRI) sessions. During the FMRI sessions, functional brain imaging data will be collected while subjects perform each of 3 cognitive tasks: sustained attention, arithmetic working memory, and verbal learning. In addition to these 40 individuals in the sleep deprivation protocol, we will recruit 10 separate individuals who will participate only in the FMRI portion of the protocol, not the sleep or sleep deprivation portions. These data will allow us to determine the effects on FMRI measures of brain activation due to repeated measurements, independent of any sleep or sleep deprivation related effects.
DTIC
Imaging Techniques; Magnetic Resonance; Mental Performance; Sleep Deprivation

20040036079 Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM
The Effects of Antioxidants and Experience on the Development of Age Dependent Cognitive Dysfunction and Neuropathology in Canines
Muggenburg, Bruce A.; Oct. 2003; 112 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-98-1-8622
Report No.(s): AD-A420121; No Copyright; Avail: CASI; A06, Hardcopy

Progression of individual rates of age-dependent cognitive dysfunction and the potential for antioxidants and environmental enrichment to slow the rate of decline are being evaluated over a 3-year span in beagle dogs. The study started with dogs between the ages of 9 and 13 years. Dogs underwent baseline screening of cognitive function and general health evaluation including clinical pathology and physical examinations. Magnetic resonance image scans (MRIs) are being used to obtain in vivo measures of brain and cerebrovascular function. Each dog has been placed into one of four groups counterbalanced with respect to cognitive ability, sex, and age: 1) control, 2) enriched environment, 3) dietary enrichment, and 4) combined dietary and environmental enrichment. A broad spectrum of antioxidants is added for dietary enrichment. The environmental enrichment condition consists of additional cognitive experience and enriched sensory environment. Cognitive function, physical health, and brain MRIs are being monitored yearly to establish ongoing effects of the treatment. We now demonstrate significant improvements in learning and memory, particularly in animals receiving the combined treatment. In addition, we provide the first evidence that cognitive function can be maintained in treated animals, and hippocampal atrophy, measured by MRI volumetric analysis, has been slowed in animals receiving either or both of the interventions. We have now begun the neurobiological studies proposed for the study and are currently measuring the extent of beta-amyloid deposition and several endpoint markers of oxidative damage. Neuroanatomical endpoint measures, once collected, will be correlated with cognitive function and MRI measures of brain atrophy and cerebrovascular function to establish the effectiveness of the treatments on delaying or preventing the development of age- dependent neuropathologies.
DTIC
Age Factor; Aging (Biology); Imaging Techniques; Magnetic Resonance; Physical Examinations

20040036081 Duke Univ., Durham, NC
Identification of Proteins Essential for Telomere Elongation
Banik, Soma; Aug. 2003; 39 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0228
Report No.(s): AD-A420122; No Copyright; Avail: CASI; A03, Hardcopy

A critical challenge in creating novel therapeutic agents in the treatment of breast cancer is the identification of cellular processes and molecular targets that differentiate normal and neoplastic tissue. One of the most consistent changes to occur n breast cancer is cellular immortalization through the upregulation of hTERT, which encodes the catalytic subunit of the telomerase ribonucleoprotein holoenzyme. Recently, we have identified the RNA binding domain of hTERT, and found that small substitutions to this region impede the binding of the hTR telomerase template RNA, and completely abrogate telomerase catalytic activity, thus defining and attractive region of hTERT that might be targeted for therapeutic targets. Interestingly, I have shown that this region of the protein also binds the endogenous inhibitor Pinxl. I have demonstrated that the mechanism of PinXl action may be distinct from inhibition of hTR binding, thus defining a separate mechanism for telomerase inhibition. We plan to identify molecules that bind hTERT and inhibit its action through displacement of hTR binding, to generate lead compounds that might be exploited for telomerase inhibition in cancer cells.
DTIC
Mammary Glands

20040036083 Mount Sinai School of Medicine, New York, NY
Molecular Mechanisms of Dopamine Receptor Mediated Neuroprotection
Sealfon, Stuart C.; Aug. 2003; 91 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9558
Report No.(s): AD-A420123; No Copyright; Avail: CASI; A05, Hardcopy

Selective dopamine agonists acting at the D2 receptor (D2R) inhibit the toxicity caused by oxidative stress through a novel growth factor dependent and G protein independent signaling pathway. In response to oxidative stress, PC12 cells activate signaling pathways of both homeostasis, as represented by activation of extracellular regulated kinase (ERK) and pro-apoptotic responses as indicated by p53 activation. Individual cells segregate into two populations within the first hour of stress, either showing the activation of ERK or pre-apoptotic p53 activation. The D2 agonist, bromocriptine caused protein kinase B (Akt) activation in PC12- D2R cells and the inhibition of either phosphoinositide 3- kinase (PI3-K), epidermal growth factor receptor (EGFR) or c- Src eliminated the Akt activation and the cytoprotective effects of bromocriptine against oxidative stress. Co- immunoprecipitation and EGFR repression by inhibitor or by RNA interference, studies showed a cross-talk between these receptors in mediating the activation of Akt. D2R stimulation by bromocriptine induced c-Src and EGFR tyrosine phosphoryation. Furthermore, Src tyrosine kinase inhibitor or dominant negative Src interfered with Akt translocation and phosphorylation. We conclude that the predominant signaling cascade mediating cytoprotection by the D2 receptor involves c- Src/EGFR transactivation by D2R, activating PI3-K and Akt.
DTIC
Nervous System

20040036085 Washington Univ., Saint Louis, MO
Education and Outreach for Breast Imaging and Breast Cancer Patients
Farria, Dione M.; Jul. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9435
Report No.(s): AD-A420124; No Copyright; Avail: CASI; A03, Hardcopy

In October 2003, we completed data collection on 123 subjects for the research project: Evaluating the Effect of Inormed Consent and Procedure Scheduling on Breast biopsy Patient Outcomes. This project evaluated the impact of visual educational aids during biopsy consent on patient understanding of the biopsy procedure, patient satisfaction with the biopsy experience, and patient anxiety. These patients are also asked a series of questions about the scheduling of their procedure (same day as work-up vs. days later) to determine women's preferences and expectations.
DTIC
Imaging Techniques; Mammary Glands

20040036087 Johns Hopkins Univ., Baltimore, MD
Molecular Epidemiology of Breast Cancer in Korean Women
Gabrielson, Edward W.; Aug. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0283
Report No.(s): AD-A420125; No Copyright; Avail: CASI; A01, Hardcopy

This project is testing the hypothesis that populations of women with significantly different demographic characteristics may not only have different incidences of breast cancers, but also different types of breast cancers. We are testing this

hypothesis by examining gene expression profiles of breast cancers from two populations that differ apparently by only a single major variable: age. Specifically, we are measuring gene expression profiles by gene array technology and by immunohistochemistry in breast cancer tissues from young and elderly Korean women. Recently published studies have shown that this approach has great potential for classifying breast cancer at the molecular level. Korean breast cancers have been selected for tijis project because there is much less cultural and genetic diversity in the Korean population than in the North American population.
DTIC
Mammary Glands

20040036089 Nebraska Univ., Omaha, NE
Control of Metastasis-Associated Gene Expression by Cell-Surface Beta-1,6 Branched Oligosaccharide Levels
Chaney, William G.; Jun. 2003; 7 pp.; In English
Contract(s)/Grant(s): Proj-DAMD17-91-1-0570
Report No.(s): AD-A420126; No Copyright; Avail: CASI; A02, Hardcopy

Metastatic breast cancer cells expresss cell- surface Beta-1,6 branched oligosaccharide structures, which are reduced/ absent in normal breast tissue. The biosynthesis of these structures ininitiated by the Golgi-localized glycosyltransferase N-Acetylglucosmaminyl-transferase V (GlcNAc-T V). The altered expression of GlcNAc-T V in animal mammary cancer models also influences metastasis. Furthermore, altered transcription of metastasis-associated genes has also been observed incells with a reduced expression of beta-1,6 branched oligosaccharide expression. The aim of this project is to characterize the altered expression of mRNA in mouse and human mammary cancer-derived cell lines as a function of altered Beta-1,6 branched oligosaccharide expression. This will be accomplished by using DNA Microarray technology to assess the mRNA levels in cell lines transfected with GlcNAc-T V expression vectors. After identification of mRNA molecules that are altered by changes (elevations or reduction) in cell- surface Beta-1,6 branched oligosaccharide expression, the kinetics of induction will be characterized using cell lines with GlcNAc-T V under the control of an inducible promoter.
DTIC
Gene Expression; Mammary Glands

20040036091 New England Medical Center Hospitals, Boston, MA
A Molecular Connection Between Breast Cancer Proliferation and Metastasis Mediated by Akt Kinase
Weber, Georg F.; Aug. 2003; 31 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0510
Report No.(s): AD-A420127; No Copyright; Avail: CASI; A03, Hardcopy

Death from cancer is most frequently caused by metastases. While research of the past 20 years has identified genes whose malfunction causes cancer to grow. It has not been clear why these defects also induce the ability to metastasize. We have defined molecules that form a connection between signals that make cancer cells grow and signals that cause them to metastasize. In breast cancer cells, a molecule called Akt kinase bridges these two functions. Here we study the exact mechanism by which Akt kinase connects mechanisms of growth with mechanisms of cancer spread. The identification of a single defined defect as responsible for growth and metastasis enhances our molecular insights into cancer and it defines candidate targets for therapeutic intervention.
DTIC
Mammary Glands

20040036093 Boston Univ., Boston, MA
Tumor Specific Genetic Fingerprints in the Peripheral Blood of Women with Breast Cancer
Rosenberg, Carol L.; Sep. 2003; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9573
Report No.(s): AD-A420128; No Copyright; Avail: CASI; A03, Hardcopy

The importance of DNA abnormalities to tumorigenesis is not in doubt but their clinical utility has not yet been fully elucidated. We performed a pilot study to evaluate detection of occult circulating tumor DNA using tumor- specific microsatellite alterations in subjects previously diagnosed with breast cancer. Using 22 microsatellite markers located at sites of frequent loss of heterozygosity (LOH) in breast cancer, we analyzed DNA from 16 primary tumors (Stage IIA or more advanced) and 30 longitudinally collected plasma specimens. Clinical data at time of plasma collection was obtained. Every tumor (16/16, 100%) was characterized by an individual pattern of LOH, its tOH fingerprint. LOH in plasma DNA was

detected in 12/30(40%) plasma DNA samples, from 8/14(57%) subjects. However, the number of LOH in plasma DNA was small (n=15), and the mean proportional Loli was much lower than in tumors (0.05vs0.52). Although they were infrequent, most LORs in plasma DNA (12/15, 80%) were concordant with abnormalities in the paired tumors, suggesting that they were authentic tumor-derived abnormalities. Despite this, we found no association between plasma DNA LOH and original tumor stage or clinical status at time of blood collection (i. e., LOH was seen as often in subjects who had no evident disease as in those with evident disease). In addition, detection of LOH was not consistent between serial samples from half of subjects (5/11, 45%), despite stable clinical condition. No association with clinical outcome was evident, although the sample size may be too small to be conclusive. Microsatellite instability (MI) in plasma DNA was infrequent, non-concordant with paired tumor, and inconsistent in serial samples. The results of this study suggest that detecting microsatellite abnormalities in plasma DNA of breast cancer subjects may nOt be useful either for detecting occult metastases or for monitoring disease. Other techniques may be more promising but it is possible
DTIC
Mammary Glands

20040036095 LifeCell Corp., Branchburg, NJ
Non-Immunogenic Structurally and Biologically Intact Tissue Matrix Grafts for the Immediate Repair of Ballistic-Induced Vascular and Nerve Tissue Injury in Combat Casualty Care
Bachrach, Nathaniel; Dec. 2003; 40 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0177
Report No.(s): AD-A420129; No Copyright; Avail: CASI; A03, Hardcopy

In the first year of this graft processes were developed that provided a decellularized, cryopreserved, and freeze-dried human umbilical artery and vein for use as off- the-shelf vascular grafts. Short term animal studies indicated that the vein graft had potential as a hemodialysis graft. However, close evaluation of those tissues indicated that there were defects that may have clinical impact. This past year the source of he defects was determined to be the freeze- drying process. Ongoing efforts toward process optimization and design modifications that will provide undamaged tissue grafts are presented in this report. Essential processing modifications, procurement systems and a total quality plan were also developed and implemented. Biocompatibility testing was performed and when it was appropriate biomechanical verification testing was completed. In addition, the umbilical artery was evaluated for the first time in large animals. Graft related adverse events led to further tissue processing optimization. That work is presented in this report but artery process development is still ongoing.
DTIC
Cardiovascular System; Skin Grafts

20040036097 Columbia Univ., New York, NY
Development of Genetic Therapies for the Hemidesmosol Subtypes of Junction Epidermolysis Bullosa
Christiano, Angela M.; Nov. 2003; 108 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0053
Report No.(s): AD-A420130; No Copyright; Avail: CASI; A06, Hardcopy

During the final award period of this project, we focused on creating the model systems for the in vitro gene therapy experiments, in particular, the in vitro skin model. We worked extensively on development of the in vitro skin model, and succeeded in generating recombinant skin between keratinocytes and dermal cells in skin equivalents. To extend these studies and make them more widely applicable for wound care enhancement in blistering diseases as well as in chemically induced wounding, we then went on to develop a model for in vitro epithelial reprogramming, in which we have begun to utilize different epithelial cell types as donor cells, in addition to keratinocytes, specifically, amnion and cornea cells. Collectively, we have shown that the use of gene delivery combined with epithelial cell-skin equivalent models, show significant promise toward developing a cellular bandage' for both genetically and chemically induced skin blistering.
DTIC
Gene Therapy; In Vitro Methods and Tests; Epidermis; Cornea

20040036099 California Univ., San Francisco, CA
Reliability Security and Authenticity of Meta Medical Image Archive for the Integrated Healthcare Enterprise
Gould, Robert G.; Oct. 2003; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0585
Report No.(s): AD-A420131; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this investigation was to develop a broker system to manage connections between PACS located at multiple institutions, allowing secure and reliable retrieval of selected image data. The project proposed to design and establish a Meta Medical Image Archive (MMIA) testbed that would connect remote PACS, allowing end user transactions between these systems, and permit storage of studies within the MMIA for future retrieval. This testbed has been implemented in our Laboratory of Radiological informatics. A software infrastructure has been developed that minimizes the likelihood of misidentification of a patient between institutions with different medical record systems. DICOM applications have been implemented that permit commands of find, move and store of study data. A database for studies stored within the MMIA has also been implemented. The project also developed a hardware configuration utilizing state-of-the- art failover components. Since computer cluster technology has evolved rapidly, this configuration differs somewhat from what was initially proposed. Hardware has been purchased, configured and connected to simulated PACS for testing. One intra-institutional connection has been made and a second connection is imminent. Security of transactions between institutions is being implemented by data encryption using commercial software. A no-cost extension is being requested.
DTIC
Computer Techniques; Data Bases; Information Retrieval

20040036103 California Univ., Los Angeles, CA
Angiogenesis Inhibitors in Breast Cancer
Luque, Alfonso; Iruela-Arispe, Luisa; Apr. 2003; 50 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0329
Report No.(s): AD-A420135; No Copyright; Avail: CASI; A03, Hardcopy

METH1/ADAMTS1 is a metalloprotease with a disintegrin motif and three thrombospondin anti-angiogenic domains in the carboxy. terminal. METH1 was previously shown to inhibit angiogenesis in a variety of in vitro and in vivo assays. In the present study, 1 demonstrate that METH1 significantly blocks VEGFR2 phosphorylation with consequent suppression of endothelial cell proliferation. The effect on VEGFR2 function was due to direct binding and sequestration of the VEGF165 by ADAMTS1. Binding was confirmed by co- immunoprecipitation and crosslinking analysis. Inhibition of VEGF function was reversible, as active VEGF could be recovered from the complex. The interaction required the heparin-binding domain of the growth factor, as VEGF(sub 121) failed to bind to ADAMTS1. Structure/function analysis with independent ADAMTS1 domains indicated that binding to VEGF(sub 165) was mediated by the carboxy terminal (CT) region. ADAMTS1 and VEGF(sub 165) were also found in association in tumor extracts. These findings provide a mechanism for the anti- angiogenic activity of ADAMTS1 and describe a novel modulator of VEGF bioavailability.
DTIC
Mammary Glands; Cancer; Inhibitors

20040036107 Yale Univ., New Haven, CT
Predoctoral Training Program in Breast Cancer Research
Stern, David F.; Aug. 2003; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9461
Report No.(s): AD-A420141; No Copyright; Avail: CASI; A03, Hardcopy

Breast cancer is one of the leading causes of cancer deaths of women in the USA. Fortunately, this disease is no longer a 'black box' that can only be studied empirically. Recent advances in understanding of normal mammary development and carcinogenic processes have identified a number of specific genes and processes that are dysregulated in breast cancer. This means that research on breast cancer has finally advanced to the stage where a concentrated effort in translational research will yield great strides in detection, diagnosis, and treatment. The Molecular Medicine graduate training program at Yale was recently developed to address these issues. This program was developed to offer an interdisciplinary course of study that will foster an integrated view of disease, built upon a rigorous foundation of basic sciences. The emphasis on disease mechanisms and translational research is unique to Molecular Medicine, and distinguishes it from other pre-doctoral programs at Yale. The Predoctoral Training Program in Breast Cancer Research will recruit individuals interested in careers in breast cancer research to the Molecular Medicine Program, provide specialist training in breast cancer-specific areas, and integrate their training experience with scientists and clinicians investigating breast cancer at Yale.
DTIC
Mammary Glands; Medical Science

20040036121 Indiana Univ.-Purdue Univ., Indianapolis, IN

NF-kappaB-Mediated Repression of GADD153/CHOP: A Role in Breast Cancer Initiation

Nakshatri, Harikrishna; Aug. 2003; 25 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0274

Report No.(s): AD-A420151; No Copyright; Avail: CASI; A03, Hardcopy

Cells exposed to stresses such as nutrient deprivation, bypoxia, ultraviolet light and environmental toxicants that damage DNA or disrupt endoplasmic reticulum function show induced expression of GADDl53/CHOP, a pro- apoptotic C/EBP family transcription factor. Interestingly, cellular stress also induces the activity of the transcription factor NF-kB, which promotes cell survival by inducing transcription of anti-apoptotic proteins, such as Bcl-2, Bcl- XL, x-TAP, and c-IAP-2. GADDl53 mRNA expression was previously shown in this laboratory to be inhibited by the p65 transactivating subunit of NF-kB. Therefore, cell expressing constitutively active NF-kB, as is the case in 30% of breast cancers, may be predisposed to transformation following cellular stress due to p65-mediated inhibition of GADDl53 expression. To address this possibility, we have generated immortalized mammary epithelial cell line MCF-lOA overexperssing p65. p65 overexpressing cells showed hallmarks of epithelial to mesenchymal transition (ENT) including reduced expression of E-cadherin and Occludin and increased expression of Vimentin. Although the role of EMT in breast cancer initiation is not known, it is essential for invasive growth and motility of breast cancer cells. We also observed that the environmental toxicant methyl methanesulfonate (MMD) induces the expression of the transcription repressor Snail, which has been implicated in EMT. Furthermore, in transient transfection assay, we observed Snail-mediated repression of GADDl53 expression. Interestingly. Sequences with in the first exon of GADDl53 in involve din repression by both NF-kB and Snail. Because Snail expression in Drosophila is regulated by NF-kB homologue dorsal, we propose that NF-kB similarly regulates expression of Snail family transcription repressors, which intern promotes breast cancer progression through enhanced EMT.

DTIC

Deoxyribonucleic Acid; Mammary Glands

20040036123 Colorado State Univ., Fort Collins, CO

Identification of Novel Genes Affected by Gamma Irradiation Using a Gene-Trapped Library of Human Mammary Epithelial Cells

Malone, Jennifer; Ullrich, Robert; Apr. 2003; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0349

Report No.(s): AD-A420152; No Copyright; Avail: CASI; A03, Hardcopy

We propose that the expression of several unknown genes is affected by gamma radiation. Abnormal expression of these genes maybe one of the early steps in breast carcinogenesis induces by radiation. We plan to establish an assay that will allow us to screen for breast cells that contain a single mutation by gene trapping. We will be able to detect changes in the expression of a gene upon treatment with different doses of radiation. These radiation-responsive genes will be identified through the rapid amplification of cDNA end procedure and sequenced. Cells that are affected by radiation will be isolated and analyzed to see if the changes can lead to transformation of the normal breast epithelial cell into a neoplastic cell. This assay may prove to be a powerful tool in the identification of novel genes that are affected by gamma irradiation in the early stages of breast cancer progression.

DTIC

Mammary Glands

20040036125 Fox Chase Cancer Center, Philadelphia, PA

FCCC Institutional Breast Cancer Training Program (FCCC-IBCTP)

Russo, Jose; Jul. 2003; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0249

Report No.(s): AD-A420153; No Copyright; Avail: CASI; A03, Hardcopy

The present report covers the fork performed by four different trainees working in: i-Predispostion to genomic instability in breast cancer: analysis of molecular mechanisms. The goal of this research is to better understand intrinsic genetic factor leading to genome instability, with the intent of improving diagnosis and treatment for breast cancer. ii- Proline 47 is important in mediating p53-dependent apoptosis. We are studying a rare polymorphism of p53 that changes the praline. Residue at amino acid 47 to Serine. iii- Development of a Mouse Model for the Targeted Disruption of the Appl Gene in Mammary Gland. To date, APPL is the only adaptor reported to interact with AKT kinases. Since AKT2 appears to play a more prominent role in human neoplasia than other members of he AKT family, the characterization of APPL may provide important insights regarding oncogenic mechanisms involving AKT2. iv-Cloning of a new gene/s in chromosome 17p13.2-13.1 that control

apoptosis. The aims are to isolate in the precise location in chromosome 17p13.2- p13.1 the gene(s) responsible for the control of Fas-receptor ligand complex function and to test the cloned gene/s functionality in cell transformation by cDNA transfection studies in vitro.
DTIC
Mammary Glands

20040036127 Colorado Univ., Aurora, CO
Analysis of a Causal Role for ESX in Human Breast Cancer
Prescott, Jason D.; Aug. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0352
Report No.(s): AD-A420155; No Copyright; Avail: CASI; A02, Hardcopy

A growing body of evidence supports an oncogenic role for the ETS transcription factor ESX in breast cancer. ESX over-expression is detected in human breast cancer tissues and we have previously reported that the ESX-negative and nontransformed human breast cell line, MCF-12A, is transformed by stable ESX expression. In our current snidies, we identify a unique 50-amino acid ESX domain, the SAR domain, that is sufficient to transform MCF-12A cells and whose transforming function is mediated by a novel cytoplasmic mechanism. Indeed, deletion of domains required for transcription factor function do not abrogate ESX-mediated MCF-12A cell transformation, whereas fusion of the SV4O large T antigen nuclear localization signal to either full-length ESX or to the ESX SAR domain alone blocked their transforming functions. Further, we find that ESX expression in transiently transfected cells is initially nuclear and mediates apoptosis. Together, our studies demonstrate two separate functions for the ESX transcription factor, apoptosis and transformation. Further, these two functions have distinct mechanisms: ESX-mediated apoptosis depends on nuclear ESX protein localization and appears to result from ESX function in transcription regulation. In contrast, ESX function in mammary epithelial cell transformation is mediated by the cytoplasmic function of its novel SAR domain.
DTIC
Mammary Glands

20040036129 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Anxiety is not Manifested by Elevated Heart Rate and Blood Pressure in Acutely Ill Cardiac Patients
DeJong, Marla J.; Moser, Debra K.; An, Kyungeh; Chung, Misook L.; Jan. 2004; 6 pp.; In English
Report No.(s): AD-A420156; AFIT-CI-04-120; No Copyright; Avail: CASI; A02, Hardcopy

Patients with acute myocardial infarction and heart failure are often anxious. Anxiety after acute myocardial infarction may cause in-hospital complications and increased mortality. Clinicians often use heart rate and blood pressure as indicators of anxiety; however, little is known about whether these measures accurately reflect anxiety in acutely ill patients. The purpose of this study was to determine whether heart rate and blood pressure were related to level of anxiety at the time of measurement in patients with chronic advanced heart failure, patients with acute myocardial infarction, and healthy individuals.
DTIC
Blood Pressure; Heart Rate; Myocardial Infarction

20040036131 New South Wales Univ., Sydney
Formulated Delivery of Enzyme/Pro-Drug and Cytokine Gene Therapy to Promote Immune Reduction of Treated and Remote Tumors in Mouse Models of Prostate Cancer
Russell, Pamela J.; Both, Gerald W.; Molloy, P. L.; Lockett, T.; Jan. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0107
Report No.(s): AD-A420157; No Copyright; Avail: CASI; A03, Hardcopy

Prostate cancer is the second highest cause of cancer death in Western society men. Early stages are treatable, but late stage disease is incurable with palliative care the only option. Purpose: We will use a combination of gene therapy approaches to target prostate cancer locally and in other organs (metastases). Gene directed enzyme/pro-drug therapy (GDEPT) is delivered in the prostate. This kills cancer cells and generates an immune reaction, To augment this immune response, and reduce metastatic tumor growth, locally delivered cytokine gene therapy, is injected with the GDEPT.
DTIC
Gene Therapy; Prostate Gland

20040036133 Case Western Reserve Univ., Cleveland, OH

Molecular Imaging for IMRI-Guided Minimally Invasive Treatment of Prostate Cancer

Fei, Baowei; Wilson, David L.; Duerk, Jeffrey L.; Sodee, D. B.; Mar. 2003; 214 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0230

Report No.(s): AD-A420158; No Copyright; Avail: CASI; A10, Hardcopy

Our long-range objective is to develop an image- guided, minimally invasive thermal ablation treatment method for the prostate cancer. Before this method can he achieved, significant engineering developments are required.

DTIC

Image Processing; Imaging Techniques; Magnetic Resonance; Pattern Registration; Prostate Gland

20040036135 Michigan Univ., Ann Arbor, MI

Digital Mammography: Advanced Computer-Aided Breast Cancer Diagnosis

Chan, Heang P.; May 2003; 44 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0214

Report No.(s): AD-A420159; No Copyright; Avail: CASI; A03, Hardcopy

The goal of (he project is to develop a computer aided diagnosis (CAD) system for full field digital mammography (FFDM) using advanced computer vision techniques and image information fusion from multiple views and bilateral mammograms to improve lesion detection and characterization. When fully developed, the CAD system can assist radiologists in mammographic interpretation. During this project year, we have performed the following tasks: (I) Collected a data set of FFDM cases that contain mammographic lesions. (2) Developed a database management program to store the coded case information to facilitate archiving and retrieval of the cases. (3) Developing a pyramid image enhancement technique for preprocessing the raw image from the FFDM system, which is then as the input to our CAD system. (4) Compared me mass detection accuracy of our CAD algorithm when applied to our processed images and the GE's processed images and found that the detection Sensitivities on the two sets of images were within a few percent over the entire FP range of interest. (5) Compared the performance of the mass detection system on digitized film mammograms and DMs, and found that, with adjustment of the processing parameters in the algorithm, the detection accuracies of the algorithms on both sets of images are comparable. (6) Investigated the effects of the image enhancement filter on the accuracy of mass detection and found that, by replacing the DWCE filter with an adaptive ring filter, the sensitivity of mass detection can be improved up to 15%. (7) Compared the mammographic density segmented from digitized film mammograms and DMs from the same patients, and found that the correlation of the segmented breast density between the two types of images is very high but the estimated percent dense area on DMs it, on average, about 5% lower than that estimated from digitized film mammograms.

DTIC

Computer Techniques; Mammary Glands

20040036137 Duke Univ., Durham, NC

CBP and Extracellular Matrix-Induced Apoptosis in p53(-) HMECs: A Model of Early Mammary Carcinogenesis

Seaweldt, Victoria L.; Sep. 2003; 75 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0375

Report No.(s): AD-A420160; No Copyright; Avail: CASI; A04, Hardcopy

Interactions between normal mammary epithelial cells (HMECs) and extracellular matrix (ECM) are important for mammary gland homeostasis and loss of ECM-sensitivity is an early event in mammary carcinogenesis. The purpose of this grant is to investigate how the CREBP-binding protein (CBP) might target the elimination of damaged HMECs. We have observed that 1) suppression of CBP results in apoptosis- resistance through impaired laminin expression and 2) CBP promotes induction of interferon-regulated genes during apoptosis. These findings will provide novel targets for chemoprevention and are being used to develop markers for response to current prevention strategies.

DTIC

Mammary Glands

20040036139 Vanderbilt Univ., Nashville, TN

Molecular Markers of Estrogen Metabolism and Progression From High-Grade Prostatic Intraepithelial Neoplasia (HGPIN) to Prostate Cancer

Fowke, Jay H.; Parl, Fritz; Cai, Quiyin; Shappell, Scott; Mar. 2003; 92 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0139

Report No.(s): AD-A420161; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of this case-control study is to investigate the association between genetic and endocrine markers of estrogen metabolism and prostate cancer progression. Androgens (e.g., testosterone) may be critical in prostate cancercinogenesis, but there is accumulating evidence that estrogens facilitate progress during the later stages of prostate cancer formation (1-4). To explore the role of estrogens in human prostate carcinogenesis, we proposed to investigate the association between genetic and endocrine markers of estrogen metabolism and the detection of high-grade prostatic intraepithelia neoplasia (HGPIN) and stage II/III prostate cancer. This study has completed its first full year of funded activity. Specific accomplishments include the development and pilot testing of all data and biospecimen collection procedures. We had a computer-guided interview created specifically for this project. We have hired a Project Coordinator, and have obtained IRB approvals for all protocols. Participant recruitment started in January, and we have Successfully recruited the first 10 eligible participants (100%). Anticipate successful project completion, and further details provided below are in parallel with the statement of work.
DTIC
Prostate Gland

20040036141 Mount Sinai School of Medicine, New York, NY
COX-2 and Prostate Cancer Angiogenesis
Levine, Alice C.; Mar. 2003; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0090
Report No.(s): AD-A420162; No Copyright; Avail: CASI; A03, Hardcopy

Cyclooxygenase-2 (COX-2) is an inducible enzyme which catalyzes the conversion of arachidonic acid to prostaglandins and has previously been demonstrated to play a role in carcinogenesis. We demonstrated that COX-2 and one of its major prostaglandin products, PGE2, are mediators of hypoxia-induced increases in a potent angiogenic factor, VEGF, in a human prostate cancer cell line. In these studies we determined (1) The optimal dosing and timing of administration of a cox-2 inhibitor (NS-398) in an animal model of prostate cancer (2) and (3) the mechanisms underlying the observed effects of COX-2 and PGE2 on hypoxia-induced upregulation of VEGF and tumor angiogenesis. Over the past year, we have completed our in vivo studies and determined that NS-398 inhibits prostate tumor growth significantly, whether it is given before or after tumor cell inoculation. We also completed our studies demonstrating that PGE2 induces the protein expression of a central regulator of hypoxic effects, hypoxia-inducible factor-1 alpha (HIF-1 alpha-1) and induces its nuclear localization. Our data indicates that NS-398 blocks hypoxic effects on HIF-1 alpha protein while PGE2 restores hypoxic effects, even in the presence of NS-398. Several kinase pathways are involved in PGE2 effects on HIF-1 alpha protein stabilization.
DTIC
Prostate Gland

20040036143 Virginia Commonwealth Univ., Richmond, VA
Regulation of Sphingosine Kinase in Prostate Cancer Cells
Maceyka, Michael W.; Mar. 2003; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0240
Report No.(s): AD-A420163; No Copyright; Avail: CASI; A02, Hardcopy

Sphingosine kinase 1 (SphK1) and its product sphingosine 1-phosphate (S1P) have been shown to promote cell growth and inhibit apoptosis of tumor cells (reviewed in (1)). Moreover, sphingosine kinase has been shown to be responsible for radioresistance -of certain prostate cancer cells (2). In an effort to understand the regulation of SphK1, we undertook a two-hybrid screen for SphK1-interacting proteins. We found eleven potential interactors. Over the course of the report period, we have focused our efforts on one of these interactors, aminoacylase 1 (Acyl) . Acyl is a metalloprotein that removes amide-linked acyl groups from amino acids, and may play a role in regulating oxidative damage. We have shown that both the C-terminal fragment and full length Acyl co- immunoprecipitate with SphK1. Both proteins also cause a redistribution of SphK1 as observed by immunocytochemistry. Though both 0-terminal and full length proteins reduce SphK1 activity measured in vitro, the C-terminal fragment inhibits while the full length potentiates the effects of SphK1 on proliferation and apoptosis.
DTIC
Prostate Gland

20040036145 Stanford Univ., Stanford, CA

Integrating Organ Motion and Setup Uncertainty into Optimization of Modulated Electron Beam Treatment of Breast Cancer

Pawlicki, Todd A.; Aug. 2003; 45 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0444

Report No.(s): AD-A420164; No Copyright; Avail: CASI; A03, Hardcopy

This document describes the research accomplishments of the Department of Defense funded research to develop, implement, and evaluate models of organ motion and setup uncertainty for dose calculation of modulated electron radiotherapy (MERT) treatment of the breast. The premise is that MERT treatments will deliver a more conformal dose to the breast while minimizing the dose to normal tissues over conventional photon techniques. We have completed the following tasks: (1) developed theoretical models of organ motion and setup uncertainty based on published data, (2) implemented those models into a Monte Carlo dose calculation code, (3) validated our Monte Carlo implementation, and (4) evaluated the efficacy of MERT compared to both conventional photon breast treatment and intensity modulated radiotherapy (IMRT) for breast treatment. In the course of this research, we have found that MERT treatments give a lower peak lung and heart dose when compared to conventional treatments and organ motion/setup uncertainty have the effect of reducing hot spots and mean dose in the target while spreading the low dose components over a slightly larger anatomical area. This project and the other related DOD funded research have allowed the development of MERT as new treatment paradigm for breast cancer.

DTIC

Electron Beams; Mammary Glands; Radiation Therapy

20040036147 Houston Univ., TX

New Agents for Taxol-Resistant Breast Adenocarcinoma

Klostergeard, Jim; Jul. 2003; 14 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0313

Report No.(s): AD-A420165; No Copyright; Avail: CASI; A03, Hardcopy

Taxol has proven to be very active in breast cancer; however, evidence for resistance to Taxol has emerged. One approach to overcoming drug resistance involves drug copolymers. The paclitaxel copolymer, PGA-TXL, has shown both reduced toxicity and greater tumor localization in animal models. It has also demonstrated reduced toxicity and greater ease of administration compared to Taxol in the clinic, and has shown activity in patients with Taxol-refractory tumors. MDA-MB-361 human breast adenocarcinoma cells were implanted orthotopically in the mammary fat pad of female nude mice. When tumor volumes reached 20 mm3, one group was treated with pGA-TXL, 180 mg/kg i.p. Two other groups received a multiple- dose regimen of either S or 10 mg/kg Taxol, i.p. Control tumor volumes increased 5.89+1- 0.43-fold (mean +1- SEM) over the next 35 days. Treatment with PGA-TXL was highly efficacious: the increase in tumor volumes in this group was 2.96+1- 0.31- fold during the same time period (p = 0. 0006). The two Taxol- treated groups failed to demonstrate significant responses: tumor volumes increased 6.06+1- 0.25-fold (p = 0.74) and 4. 29+1- 0.61 -fold (p = 0.101) for the 5 and 10 mglkg groups, respectively. The key results from this study indicates that even single-dose PGA-TXL is active against MDA-MB-3 61, an orthotopically-implanted human Her-2/neu over-expressing breast tumor model that is highly resistant to a multiple-dose regimen of Taxol. Our pre-clinical studies suggest that among the patients who could be considered for trials with PGA-TXL are those with tumors over-expressing HER-2/neu and refractory to conventional taxanes.

DTIC

Mammary Glands

20040036149 Northwestern Univ., Evanston, IL

Identification and Characterization of a Perinucleolar Compartment-Associated Protein

Leary, Daniel J.; Huang, Sui; Sep. 2003; 8 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0387

Report No.(s): AD-A420169; No Copyright; Avail: CASI; A02, Hardcopy

During transformation, ribosome synthesis increases concurrently with the size and number of nucleoli. U3 snoRNA-associated complexes are involved in the cleavage of pre-rRNA and 4OS preribosome assembly and contain a number of proteins whose roles in the complex are unclear. Our research focused on characterizing the functional roles of human U3 snoRNA-associated factors by examining their localization and dynamics in live cells. We found that these factors can be divided into subclasses based on their localization and dynamics and showed for the first time that U3 snoRNA- associated proteins shuttle between nucleoli and the nucleoplasm and between nuclei and the cytoplasm. These studies have led us to propose a model for the assembly and function of U3 snoRNA-associated complexes. We also carried out more extensive

studies of the U3 SNORNA-associated protein Sof1 which defined the protein domains necessary and sufficient for its localization, characterized its interactions, and disrupted its function. These studies have indicated that Sof1 has characteristics that distinguish it from other U3 snoRNA-associated proteins. Overall, these experiments have clarified the roles of Sof1 and other U3 snoRNA-associated factors in ribosome synthesis and have contributed to our understanding of ribosome synthesis as a whole.
DTIC
Mammary Glands

20040036151 Northern Illinois Univ., De Kalb, IL
Antizyme Activation in Chemotherapy and Chemoprevention
Moore, Sandra L.; Mitchell, John L.; Mar. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0354
Report No.(s): AD-A420170; No Copyright; Avail: CASI; A02, Hardcopy

Antizyme is a small, labile protein central to the regulation of polyamines and a likely candidate to mediate polyamine depletion as cancer therapy. Antizyme exists in several different forms in cells that may reflect variable function or cellular localization. To sort out the origin, modification, function and localization of the various forms of antizyme, a cell line with an inducible Az-I construct that can only result in protein synthesized from the first start site was produced. Western blot analysis showed that the mutated antizyme gene, when expressed in cells, produces two proteins distinct in molecular weight. One of the forms appears to be derived by proteolytic truncation of the N- terminus. These forms of antizyme behave as native antizyme with respect to activity in binding and inhibiting ODC, as well as down-regulating the polyamine transport system. Characterization of the N-terminal truncation of antizyme was attempted by various means. Unfortunately, a specific cleavage site could not be determined. These results suggest that native antizyme is post-translationally modified and this modification may play a role in the regulation of antizyme.
DTIC
Mammary Glands

20040036153 Toronto Univ., Ontario
The Effects of Folate on the Development of Breast Cancer in a Chemical Rodent Model of Mammary Carcinogenesis
Young-In, Kim; Aug. 2003; 26 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0428
Report No.(s): AD-A420172; No Copyright; Avail: CASI; A03, Hardcopy

Epidemiological studies suggest that dietary folate intake and blood levels of folate are inversely related to breast cancer risk. Because only few modifiable risk factors for breast cancer exist, the role of folate in modifying breast cancer risk merits further consideration. Folate is an ideal agent for chemoprevention of breast cancer. It is a natural vitamin, inexpensive, virtually free of side effects, and possesses biologically plausible mechanisms for cancer prevention. However, folate appears to possess dual modulatory effects on carcinogenesis depending on the timing and dose of folate intervention. Folate deficiency has an inhibitory, whereas folate supplementation has a promoting, effect on progression of established neoplasms. By contrast, folate deficiency in normal tissues predisposes them to neoplastic transformation, and modest levels of folate supplementation suppress, whereas supraphygiologic doses enhance, the development of tumors in normal tissues. Therefore, the potential effect of folate chemoprevention needs to be clearly established in appropriate animal models before folate supplementation can be considered in humans. Given these considerations, this proposal investigates the effects of dietary folate deficiency and supplementation on mammary tumorigenesis and potential molecular and cellular mechanisms by which folate modulates mammary tumorigenesis in the well established carcinogen rat model of breast cancer.
DTIC
Mammary Glands

20040036157 Brigham and Women's Hospital, Boston, MA
Discovery and Development of Inhibitors That Selectively Interfere With Cyclin-Dependent Kinase Substrate Recognition
Tear, Jamie; Dutta, Anindya; Aug. 2003; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0163
Report No.(s): AD-A420174; No Copyright; Avail: CASI; A03, Hardcopy

The Origin Recognition Complex is thought to recognize Origins of Replication and recruit replication initiation factors

in mammalian cells. The loading of this complex on DNA origins is required for replication in lower organisms, and it is thought that these proteins are important for replication control in higher eukaryots. In this funding cycle we show that both ORC1 and ORC2 are important for DNA replication in the breast cancer cell line MCFl0A. Furthermore, ORC1 seems to be required for the chromatin loading for not only Pre-replicative complex components such as MCM's, but for the other Orc proteins as well. Interestingly, depletion of ORC2, but not ORC1 results in a cell cycle checkpoint that blocks the cells in Gi phase with low S-phase CDK activity. This suggests that benign breast cancer cells have a mechanism to prevent replication when ORC2 levels are low.
DTIC
Cells (Biology); Mammary Glands

20040036163 Dana Farber Cancer Inst., Boston, MA
Cancer Immunology in an Inducible Model of Breast Cancer
Khazaie, Khashayarsha; Klein, Ludger; Gounari, Fotini; Chen, Mei L.; Siermann, Anja; Apr. 2003; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0361
Report No.(s): AD-A420181; No Copyright; Avail: CASI; A03, Hardcopy

In the first year we have demonstrated rapid initiation of mammary metaplasia upon tissue specific stabilization of Beta-catenin, made fundamental observations on the role of the thymus and antigen specific regulatory T cells in suppressing active immune response against a defined antigen, and have embarked on improving tissue specific expression of our model antigen. Transgenic mice expressing low levels of HA, harbored antigen specific regulatory CD4 T cells. This was largely due to intra-thymic expression of this antigen. Adoptive T cell transfer experiments demonstrated that these cells proliferate as extensively as naive CD4(+) T cells upon immunization, without losing their phenotypic characteristics. Regulatory T cells eventually dominated the response expressing mostly IL-10 but not IL-2 or IFN-gamma. Thus, the capacity of suppressive T cells to expand upon antigen encounter is an essential component of immune regulation in vivo. These observations support the view that depletion or de-programing of regulatory cells prior to immunotherapy can he beneficial, in controlling cancer. We are currently pursuing vaccination strategies that could reverse the state of tolerance, by deprogramming tolerance.
DTIC
Mammary Glands

20040036169 Rush-Presbyterian-Saint Luke's Medical Center, Chicago, IL
Telemedicine Information Analysis Center (TIAC)
Zajtchuk, Russ; May 2003; 82 pp.; In English
Contract(s)/Grant(s): DAMD17-02-2-0020
Report No.(s): AD-A420186; No Copyright; Avail: CASI; A05, Hardcopy

This pilot program is funded by the Army Medical Department (AMEDD)and mandated by Congress to demonstrate the feasibility of establishing a Department of Defense (DoD) Telemedicine Information Analysis Center (TIAC). The TIAC core capabilities include applying the science of classification (taxonomy) to telemedicine to identify key words, creating a bibliographic database using these key words, providing analyses by subject matter experts for clinical and technical queries, preparing reports and disseminating information via a public TIAC web site, and performing technical area tasks (TATs). A baseline TAT is conducted that reviews past AMEDD funded research and development projects and evaluates their utility to programmatic development and utilization within medical specialties. Although conceived as a DoD resource, the TIAC can serve as a global resource for the telehealth scientific community by, developing technical and clinical standards, enhancing the productivity and effectiveness of researchers and clinicians, identifying best information technology applications for incorporation into main-stream medical practice and business models, and expanding the key words for telemedicine in the National Library of Medicine search engines.
DTIC
Data Bases; Information Systems

20040036171 University of Southern Illinois, Carbondale, IL
American Ginseng in the Prevention and Treatment of Human Breast Cancer
Murphy, Laura L.; Aug. 2003; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9380
Report No.(s): AD-A420190; No Copyright; Avail: CASI; A02, Hardcopy

The effect of ginseng on the prevention and treatment of breast cancer has not been studied. This research project was

designed to examine the effects of American ginseng on breast cancer using well-established in vitro and in vivo experimental models. It is our hypothesis that ginseng, and its ginsenosides, in particular, would inhibit the proliferation and growth of human breast cancer cells. Our results have shown that an extract of American ginseng (GE) in habited MCF-7 and MDA-MB-23l cell proliferation in a dose- dependent manner. Furthermore, GE in the drinking water of female nude mice significantly decreased human breast cancer tumor growth. We have identified several different ginsenosides in ginseng extract and determined that only ginsenosides Rc and Rh2 potently inhibited breast cancer cell proliferation in vitro. More recently, we have shown that a combination of Rc and Rh2 in the drinking water (5O micronm ginsenoside) of nude mice significantly reduced MCF-7 tumor growth relative to untreated controls. These findings are the first to suggest that these ginsenosides may be responsible for the anti- proliferative actions of ginseng extract on human breast cancer cell proliferation. Further data suggests that the various ginsenosides may have very different mechanisms of action to cumulatively inhibit breast cancer growth.
DTIC
Cells (Biology); Mammary Glands

20040036177 Health Research, Inc., Buffalo, NY
Antiangiogenic Gene Therapy for Breast Cancer Using Targeted Recombinant Adenovirus
Woo, Savio L.; Aug. 2003; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0336
Report No.(s): AD-A420194; No Copyright; Avail: CASI; A03, Hardcopy

We tested the expression of NC2 in HeLa cells and generated an El-expression HeLa cell line for the rescue for NG2 targeted adenovirus. Three attempts at virus rescue using NG2 targeted plasmid failed to yield targeted adenovirus. This was not due to a problem with the rescue procedure as we were able to rescue an identical virus without targeting function. We later confirmed by synthesized fluorescence labeled NG2 binding peptide that NC2 binding peptide did not bind to HeLa cells indicating the NG2 binding peptide selected by phage display is not suitable for adenovirus targeting. Therefore, we switched our project to transcription targeting through the use of tumor specific telomerase reverse transcriptase (TERT) promoter to control the replication of recombinant adenovirus- conditionally replicative adenovirus (CRAD). CRAD is an attractive anticancer agent as it can selectively replicate in tumor cells and amplify the input virus dose. CRAD adenovirus, Adv-TERTp-ElA, we constructed replicated severely attenuated in TERT-negative cells, but it replicated almost as efficiently as wild-type adenovirus in TERT-positive cells. Adv-TERTp-ElA caused TERT-positive, but not TERT-negative, cells die. This virus replicated well in tumor xenograft and caused substantial tumor necrosis without hepato- toxicity. These results indicate that Adv-TERTp-ElA can be potentially utilized as a cancer treatment agent.
DTIC
Gene Therapy; Mammary Glands

20040036181 Duke Univ., Durham, NC
Enhancement of Prostate Cancer Radiotheraphy by Immunogenetherapy
Chuan-Yuan, Li; Feb. 2003; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0052
Report No.(s): AD-A420196; No Copyright; Avail: CASI; A02, Hardcopy

The long-term goal of the proposed study is to develop a genetic immunotherapy strategy that can compliment and enhance current prostate cancer radiotherapy. The specific strategy that will be adopted in this proposal is to test the capacity of an adenovirus encoding immunostimulatory genes IL- 12 and B7 to enhance the therapeutic effects of ionizing radiation in an experimental murine prostate tumor model TrampC. A substantial progress has been made towards this goal. We have now conducted experiments where we combined radiotherapy and genetic immunotherapy in the TrampCl model. The results indicate synergistic effects in controlling subcutaneous tumor growth. We have also developed a murine prostate cancer model where tumor growth can be imaged non- invasively through a innovative bioluminescence imaging system. We anticipate this model will greatly facilitat our future studies on prostate cancer metastases.
DTIC
Prostate Gland; Radiation Therapy

20040036187 Hawaii Univ., Honolulu, HI
Genetic Polymorphisms, Estrogens, and Breast Density
Maskarinec, Gertraud; Aug. 2003; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0281
Report No.(s): AD-A420215; No Copyright; Avail: CASI; A03, Hardcopy

During this year we have completed the genotyping and urine analysis for estrogen metabolites and proceeded with the statistical analysis. We have completed two investigations that addressed the following specific aims: 1. To examine the association between polymorphism in genes coding for metabolism and biosynthesis of estrogens (COMT CYP1A1, CYP1A2, CYP1B1, and CYP17) and mammographic densities in healthy women with different ethnic backgrounds. 2. To analyze the relation of mammographic density with the urinary excretion of hormones and the urinary ratio of 2-OHE(1)/16 alpha OHE1.
DTIC
Mammary Glands

20040036189 Baylor Univ., Houston, TX
Development of a TRICARE Marketing Plan for Martin Army Community Hospital
Johnson, Keith M.; Jun. 1999; 159 pp.; In English
Report No.(s): AD-A420222; No Copyright; Avail: CASI; A08, Hardcopy

In the Military Health System, marketing and education about TRICARE for our active duty and retiree families needs a great deal of attention. This is a never- ending and frustrating battle. Most people are not interested in hearing about their medical benefits until they actually need to use them. Today, our audience is no longer captive. They now have a choice. Beneficiaries may choose to use military services or elect to obtain their health care elsewhere. If military members and families are treated poorly at the military personnel or finance office they may complain; yet, they still must use the military provided services. Customers of MACH may complain if treated poorly, but more importantly, they can take their business elsewhere. It's up to the health marketers to make sure the consumer knows about their health system (Roman, 1996). Marketing may be one of the keys to success in the future. By establishing a strong marketing department, a hospital can capitalize on trends rather than be victimized by them (Naidu, Kleimenhagen, and Pillari, 1992).
DTIC
Medical Services; Military Operations

20040036193 Baylor Univ., Houston, TX
Demand Management and Darnall Army Community Hospital - A Methodology for Implementation of Putting Prevention into Practice
Denney, David H.; Aug. 23, 1999; 41 pp.; In English
Report No.(s): AD-A420225; No Copyright; Avail: CASI; A03, Hardcopy

The Military Health System (MHS) is the largest managed care organization in the world. As such, the MHS is examining the way it provides health care to its beneficiaries with an eye towards reducing costs while at the same time improving both quality and access. One of the new ideas that resulted from this examination was the Putting Prevention into Practice (PPIP) program. The Office of the Assistant Secretary of Defense Health Affairs (OSDHA) directed all military treatment facilities would implement, in some fashion, PPIP by 1 April 1999. However, OSDHA did not make additional funding available to meet this requirement. Medical Centers and Activities were required to develop their own internal implementation plan based upon their individual capabilities. This project sets forth the implementation plan to be used for Darnall Army Community Hospital.
DTIC
Medical Services; Military Operations

20040036197 Johns Hopkins Univ., Baltimore, MD
A Study of the Impact of International Patients on the Johns Hopkins University School of Medicine
Harris, Robert A.; Feb. 2, 1999; 54 pp.; In English
Report No.(s): AD-A420232; AMEDDCS-34-99; No Copyright; Avail: CASI; A04, Hardcopy

The delivery of health care in the USA is undergoing dramatic change. This is especially true for the nation's academic health centers (AHCs) The proliferation of managed care, coupled with the decline of federal subsidies is forcing AHCs to develop new avenues in which to generate revenues. International patients represent one such opportunity because they are not typically affected by the constraints of managed care. These patients represent an opportunity for hospitals to receive full reimbursement for medical care rendered. The purpose of this research was to determine the impact of international patients on the Johns Hopkins University School of Medicine (SoM) . This was accomplished by performing a financial analysis of the Johns Hopkins Hospital International Services Department. Specifically, four areas were examined; profitability, revenues, collection rates, and the aging of accounts receivables. The results were overwhelming. The research showed that significant financial benefits are derived from international patients. In addition, the study provides recommendations concerning how the

Johns Hopkins Hospital International Services Department can further improve its management of accounts receivables.
DTIC
Cost Analysis; Cost Effectiveness

20040036205 California Univ., San Francisco, CA
Soy and Tamoxifen for Breast Cancer Prevention in High Risk Pre-Menopausal Women
Tice, Jeffrey A.; Oct. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0193
Report No.(s): AD-A420239; No Copyright; Avail: CASI; A01, Hardcopy

The current study is testing the feasibility and preliminary efficacy of soy supplementation to decrease risk of breast cancer by reducing breast density in individuals with >50% breast density on mammography and who are at elevated risk for breast cancer. One hundred women will be randomized to either 25 g/day of soy protein or placebo (milk protein). The randomized placebo controlled design will allow for comparative toxicity and efficacy determinations using patient symptom scores and validated quality of life tools. Biological endpoints, including mammographic breast density, breast cytology, urinary estrogen metabolites, and blood serum biomarkers (IGF- 1/IGF-BP 3), will be evaluated. Feasibility will be assessed by measuring the rate of recruitment, the percentage of women consuming at least 80% of the expected number of protein packets, and the dropout rate. Currently 14 women have been randomized and 7 more are scheduled to attend screening or randomization clinic visits in the next two months.
DTIC
Mammary Glands; Cancer; Cytology; Proteins; Soybeans

20040036209 Virginia Univ., Charlottesville, VA
Tumor-Secreted Autocrine Motility Factor AMF: causal Role in an Animal Model of Cachexia
Chirgwin, John M.; Aug. 2003; 26 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0586
Report No.(s): AD-A420242; No Copyright; Avail: CASI; A03, Hardcopy

Purified mouse autocrine motility factor/phosphoglucose isomerase was found to cause weight loss (cachexia) after 3 days of 3x daily intraperitoneal injection, which was accompanied by significant increases in serum concentrations of the factor. This is a simpler animal model than originally proposed structure of the protein complexed with inhibitor has been soved by x-ray crystallography and published. Mutant forms of the protein have been prepared. Experiments are underway to improve the purity of the recombinant protein and to characterize the effects of the factor on both intact animals and on a mouse muscle cell line in vitro.
DTIC
Tumors; Muscles; In Vitro Methods and Tests; Proteins

20040036211 Thomas Jefferson Univ., Philadelphia, PA
IGF-IR, Cell Adhesion and Metastasis
Surmacz, Eva; Sep. 2003; 64 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9407
Report No.(s): AD-A420246; No Copyright; Avail: CASI; A04, Hardcopy

This is a final report of the research carried out from 8/15/1999 to 8/14/ 2003. Our goal was to study the role of the insulin-like growth factor I receptor (IGF-IR) in breast cancer. IGF-IR is a multifunctional tyrosine kinase activating multiple mitogenic and survival pathways as well as non-mitogenic responses. Current evidence implicates IGF-IR in the development of primary breast tumors. However, the role of IGF-IR in breast cancer metastasis remains unknown. During the course of this work, we studied IGF-IR-dependent phenotype in ER-positive (less metastatic) and ER-negative (more metastatic) breast cancer cells. We focused on the involvement of IGF-IR in cell migration and adhesion, the processes that regulate the development of metastasis. We found that in ER- positive breast cancer cells, IGF-IR not only promotes cell growth and survival but also upregulates cell-cell adhesion by strengthening E-cadherin-dependent cell junctions. IGF-IR- increased cell-cell adhesion improved cell survival, decreased the sensitivity of cells to the antiestrogen ICI 182,780 and reduced invasiveness in organ culture. On the other hand, in ER- and E-cadherin-negative breast cancer cells, IGF-IR was not able to promote cell growth, survival, and cell-cell adhesion, but was acting as a chemoattractant stimulating cell motility. The molecular mechanisms of IGF-IR-regulated growth, survival, adhesion, and migration, and the differences in IGF- IR action

in ER-positive and ER-negative breast cancer cells have been detailed by us in several peer-reviewed publications (3 original papers and 3 reviews).
DTIC
Cells (Biology); Mammary Glands; Cancer

20040036239 Alabama Univ., Birmingham, AL
Novel Vectors for Dendritic Cell Transduction
Strong, Theresa V.; Jun. 2002; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0122
Report No.(s): AD-A420272; No Copyright; Avail: CASI; A02, Hardcopy

The development of vaccine approaches for breast cancer has the potential to provide an adjuvant therapy with low toxicity for patients at risk for disease recurrence. We are investigating novel vaccine strategies for breast cancer. The target tumor antigen is carcinoembryonic antigen (CEA), which is highly expressed in most breast tumors. Dendritic cells (DOs) show promise for cancer immunotherapy due to their critical role in mediating immune response. Development of an optimal DC transduction protocol for tumor antigen presentation would represent a significant advancement in DC- based vaccination strategies. We are investigating methods of DC transduction and antigen modification that will elicit the most potent anti-tumor immune response. Tumor challenge and tumor therapy experiments are performed using a syngeneic adenocarcinoma cell line which expresses human CEA ?MC38-CEA- 2). Because the ability to break tolerance to self antigens is critical for the success of this cancer immunotherapy approach, a CEA-transgenic mouse model will also be used.
DTIC
Mammary Glands

20040036249 Rochester Univ., NY
Post-Mastectomy and Phantom Breast Pain: Risk Factors, Natural History, and Impact on Quality of Life
Dworkin, Robert M.; Jan. 2003; 48 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8238
Report No.(s): AD-A420279; No Copyright; Avail: CASI; A03, Hardcopy

Post-mastectomy pain syndrome, post-lumpectomy pain, and phantom breast pain are poorly understood chronic pain syndromes that occur following surgical procedures for breast cancer. The primary aims of this research were to identify risk factors for these chronic pain syndromes following surgical procedures for breast cancer, characterize their natural history, and examine their irnpact on quality of life using a prospective research design. Women scheduled for mastectomy, lumpectomy, or excisional biopsy were assessed with respect to hypothesized risk factors for chronic pain and were then studied prospectively for one year. Peri%dic follow- - up assessments of pain, health-related disability and quality of life, and selected psychosocial variables allow risk factors to be identified and the impact of chronic pain on quality of life to be determined. An irn%%ortant feature of this research was its detailed assessment of pre-operative, early post-operative, and chronic pain. In these assessments, sensory and affective aspects of pain, pain quality, and non- painfill abnormal sensations are examined. By identifying risk factors for chronic pain following surgical procedures for breast cancer, the results of this research can be used to design interventions aimed at preventing the development of these chronic pain syndromes.
DTIC
Mammary Glands

20040036255 Sunnybrook and Women's Coll. Health Sciences Centre, Toronto, Ontario
Resistance to Tamoxifen: A Consequence of Altered p27Kipl Regulation During Breast Cancer
Slingerland, Joyce; Jun. 2002; 103 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8159; DAMD17-98-1-8158
Report No.(s): AD-A420283; No Copyright; Avail: CASI; A06, Hardcopy

While approximately 70% of breast cancers express the estrogen receptor (ER) at diagnosis, only two thirds of these will respond to antiestrogens such as Tamoxifen (TAM). Unfortunately, ER positive tumors that are initially responsive, invariably acquire resistance to hormonal therapies (reviewed in (1)).: TAM-resistant tumors usually show continued expression of the ER (2, 3). Estradiol regulates cell proliferation and development in the mammary gland. The elucidation of mechanisms whereby estradiol:ER influences cell cycle regulators and how these are blocked by Tamoxifen is highly relevant to the development of new treatments for steroid resistant breast cancer. Both estrogens and antiestrogens influence the cell cycle during the early Ol phase (4). The cell cycle is governed by a family of cyclin dependent kinases (cdks), whose activity is

regulated by positive effectors, the cyclins, by phosphorylation and by negative regulators, the cdk inhibitors (reviewed in (5-7)). p27 or kinase inhibitor protein 1 (KIP 1) is strongly expressed in normal mammary epfthelial cells (8). That p27 protein levels are frequently reduced in primary breast cancers and this correlates with poor prognosis, suggests that p27 is an important negative regulator of the normal breast cell cycle (8-10) . The cellular abundance of p27 is importantly regulated by ubiquitin-mediated proteolysis (11). p27 protein decreases when quiescent MCF-7 breast cancer cells are stimulated to reenter the cell cycle with estradiol treatment and p27 increases when antiestrogens induce Gi arrest ((12, 13) and PNAS manuscript appended).
DTIC
Mammary Glands

20040036257 Wisconsin Univ., Madison, WI
Pain Management Skills for Minority Breast Cancer Patients
Backonja, Miroslav; Oct. 2002; 34 pp.; In English
Contract(s)/Grant(s): DAMD17-94-J-4233
Report No.(s): AD-A420284; No Copyright; Avail: CASI; A03, Hardcopy

Improving pain control for patients with metastatic breast cancer will significantly reduce the morbidity of this disease. It is estimated that 192,200 women are newly diagnosed with breast cancer in the U.S. each year (Greenlee et al., 2001). Approximately 70% of these women are diagnosed in the early stages of the disease, due mainly to progress in screening and diagnosis. Despite improvements in cancer care for patients with early stage disease, a large number of patients will still develop metastatic disease, and mortality rates for these patients remain relatively constant. Minority women are more likely than white women to have advanced disease at diagnosis, and treatment outcomes are worse for minority women (Freeman & Wasfie, 1989; ACS, 2001). Improving the quality of life of patients who will die of their disease, especially controlling their pain, should be as much a priority for these patients as improving the therapeutic approaches for their disease.
DTIC
Mammary Glands

20040036275 Madigan Army Medical Center, Takoma, WA
Department of Defense/Veterans Affairs Sharing Initiatives at Madigan Army Medical Center
Mulalley, Kevin J.; Mar. 30, 2002; 94 pp.; In English
Report No.(s): AD-A420305; AMDCS-7-02; No Copyright; Avail: CASI; A05, Hardcopy

Madigan Army Medical Center (MAMC), TRICARE Region 11 and the VA Puget Sound Health Care System (VAPSHCS) formed a task force in September 2001 to determine ways to increase the level of sharing between the organizations. Their efforts lie in the wake of increased fiscal scrutiny the President of the USA and Congress are giving their respective parent organizations, the Military Health System and the Veterans Health Administration (VHA); the country's two largest health care systems. The U.S. General Accounting Office has reported on numerous occasions that these two health care systems are not doing enough to increase the sharing activity between them and that millions of dollars of taxpayer money could be saved if the two systems collaborated more. This critical look at DOD/VA sharing at MAMC uses retrospective descriptive analysis in an attempt to more accurately portray Fiscal Year 2001 sharing activity between MAMC and the Department of Veterans Affairs, VHA, the Veterans Benefits Administration, and the VAPSHCS. The analysis finds that MAMC' 5 level of interaction with these agencies, as measured by number of services provided and dollar amount of care provided, was significantly higher than previously reported. The project documents MAMC's and TRICARE Region 11's efforts to form new agreements and increase the overall level of sharing in the Puget Sound Area between September 2001 and March 2002. The researcher uses the USA Army's Business Case Analysis Tool, scenario analysis and breakeven analysis to analyze the financial implications, benefits and disadvantages of the two proposed new agreements and makes recommendations on their implementation.
DTIC
Defense Program; Medical Services

20040036277 Great Plains Regional Medical Command, Fort Sam Houston, TX
Predictors of Recruitment & Retention Factors to Aid in the Management of Turnover in the Army Dental Corps
McCLary, Mark E.; Jan. 1999; 174 pp.; In English
Report No.(s): AD-A420309; AMDCS-31-99; No Copyright; Avail: CASI; A08, Hardcopy

Recruitment and retention of U.S. Army Dental Corps officers continues to be of great concern. A better understanding

of the factors related to officers' intentions and feelings will assist Dental Corps strategic planning efforts. The purpose of this management project is to examine factors that influence Army Dental Corps officers' career decisions and feelings concerning their leadership. The factors of interest are those that affect officers' decisions to remain in or leave the service, those that affected officers' decisions to join the service, and factors they believe affect officers' decisions to join the service today. The goal is to evaluate and analyze the 1997 Dental Officer Recruitment and Retention Survey to ascertain the factors impacting recruitment, retention, and turnover, as well as attitudes toward Dental Corps leadership. Factors found to influence officers' decisions are related to pay, training and education, job satisfaction, quality of life, location, and years of service. Findings indicate that officers currently in dental specialty programs are more likely to stay in the Army. Special pay increases and potential future increases also influence officers to stay, where as low pay influences them to leave. Officers in their initial commitment, and those with less than six or more than 18 years of service are more likely to leave. Age, gender, rank, marital status, and type of unit did not influence officers' intentions. Immediate advanced dental educational opportunities are important for recruiting young dentists into the Army, and early opportunities for dental specialty training are important to retain them. Feelings about Dental Corps leadership generally did not influence officers' intentions, but the more senior officers, and those in administrative and special assignment positions tended to have a more positive feeling about the leadership.
DTIC
Medical Personnel

20040036279 Brooke Army Medical Center, Fort Sam Houston, TX
Report of Combat Trauma Surgical Training at Ben Taub General Hospital
Conaway, Cass W.; Campbell, Kyle D.; Jan. 1999; 192 pp.; In English
Report No.(s): AD-A420310; AMDCS-3-99; No Copyright; Avail: CASI; A09, Hardcopy

THE REPORT of COMBAT TRAUMA SURGICAL TRAINING (CTST) AT BEN TAUB GENERAL HOSPITAL (BTGH) DETAILS the BACKGROUND, CONCEPT, CONDUCT, and RESULTS of THE RECENTLY CONCLUDED (SEPTEMBER 1998) CTST ROTATION of AN ARMY FORWARD SURGICAL TEAM (FST) AT BTGH. the STATED PURPOSES of THE PILOT STUDY WERE MET IN FULL. (1) the PILOT DEMONSTRATED THAT CTST of AN ENTIRE FST WAS LEGALLY POSSIBLE. (2) the PILOT DEMONSTRATED THAT NON-GRATUITOUS CTST, WITH A MEASURE of REIMBURSEMENT FOR HEALTH CARE SERVICES RENDERED, IS CONTRACTUALLY POSSIBLE. (3) A TRAINING PLAN WAS DEVELOPED THAT MEASURED CTST BENEFIT and LINKED THAT BENEFIT to INCREASED FST SURGICAL READINESS. (4) A COST ANALYSIS of THE CTST PILOT ROTATION to INCLUDE UPFRONT and OPPORTUNITY COSTS WAS - CONDUCTED. (5) the COST and TRAINING BENEFITS of THE PILOT PROJECT WERE REPORTED to ALL APPROPRIATE JOINT MEDICAL AGENCIES and EACH of THE SERVICE SURGEONS GENERAL. BASED ON the PILOT STUDY DATA the AUTHORS FURTHER RECOMMEND the EXECUTION of A FEASIBILITY STUDY ESTABLISHING BTGH AS A JOINT TRAUMA TRAINING CENTER (JTTC) WITH PERMANENT MILITARY STAFF ASSIGNED IN OBSERVER CONTROLLER ROLES to FACILITATE the TRAINING.
DTIC
Medical Services

20040036285 Burnham Inst., La Jolla, CA
A Novel Molecular Target for Breast Cancer Prevention and Treatment
Zhang, Xiao-Kun; Jun. 2003; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0172
Report No.(s): AD-A420313; No Copyright; Avail: CASI; A03, Hardcopy

Induction of apoptosis is a plausible approach for developing new cancer therapies. A class of synthetic retinoids related to 6-3-(1-ADAMANTLYL)-4-HYDROXYPHENYL-2- naphthalene carboxylic acid (AHPN/CD437) potently induce apoptosis of both hormone-dependent and - independent breast cancers. We previously reported that apoptotic effects of AHPN/CD437 are mediated by mitochondrial targeting of orphan nuclear receptor TR3. In the past year, we have studied the mechanisms by which TR3 migrates from the nucleus to the cytoplasm and by which TR3 targets mitochondria. Our results demonstrate that the migration of TR3 from the nucleus to the cytoplasm requires retinoid X receptor (RXR) through their unique heterodimerization and is regulated by RXR ligands. We have also identified a nuclear export sequence in the RXR, which is required for its cytoplasmic localization. Furthermore, we have found that TR3 targets mitochondria through its interaction with Bcl- 2 that resides at the outer mitochondrial membrane. The interaction converts Bcl-2 from an anti-apoptotic to a pro-apoptotic molecule. Our results not only enhance our understanding of the molecular mechanism by which TR3 exerts

its apoptotic effects in breast cancer cells but also provide novel approaches to induce apoptosis ob Bcl-2- expressing breast cancer cells by using RXR ligands.
DTIC
Mammary Glands

20040036287 Pennsylvania Univ., Philadelphia, PA
PET-FDG Imaging in Metastatic Breast Cancer Treated with High Dose Chemotherapy and Stem Cell Support
Alavi, Abass; Feb. 2002; 29 pp.; In English
Contract(s)/Grant(s): DAMD17-94-V-4012
Report No.(s): AD-A420316; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of our study was to evaluate the effectiveness of PET-FDG in patients with metastatic breast cancer who were also being treated with high dose chemotherapy and stem cell rescue. The hypotheses of the study were as follow: 1) Active tumor sites shown by anatomical imaging methods will be associated with high levels of metabolic activity while inactive sites will be reflected by low levels of FDG uptake. 2) Reduction in tumor metabolic activity of tumors will be an early predictor of response to high dose chemotherapy. 3) Patients with no abnormal FDG uptake prior to high dose chemotherapy will live longer than patients with tumor that are metabolically active. The use of PET in this setting is potentially cost-saving considering the high costs of stem cell rescue. Non responders do not need to undergo further chemotherapy with consequent suffering and high costs, when palliation is more appropriate. On the other hand, the ability to predict the response to chemotherapy in responders might enable the physician to modulate the treatment for each patient. The study included a homogeneous group of patients entered on two University of Pennsylvania studies for the treatment of breast cancer with high dose chemotherapy. The chemotherapy protocols were protocol UPCC #3195 and Protocol PBT-1.
DTIC
Imaging Techniques; Mammary Glands

20040036291 Albert Einstein Coll. of Medicine, Bronx, NY
Molecular Markers of Metastasis in Ductal Mammary Carcinoma
Archary, Patnala M.; Aug. 2003; 105 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9055
Report No.(s): AD-A420319; No Copyright; Avail: CASI; A06, Hardcopy

Representational difference analysis method was used to isolate metastasis-specific genetic markers for breast cancers that are prone to develop metastasis. Of the 15 candidate MADS that have been isolated, 3 were found to be promising markers for breast metastasis. Screening of MADS-IX on a tumor cell line with homozygous loss of PTEN gene, revealed that MADS-IX is neither a part of PTEN gene nor localized in the homozygous loss region of chromosome 10q arm encompassing PTEN. Our Fluorescence in situ hybridization screening for MADS%S on primary tumor tissue touch preparation cells was successful. The results indicate that the MADS-IX could be used as a FISH probe for distinguishing the primary tumors that did and that did not develop metastasis.
DTIC
Mammary Glands

20040036295 Army Medical Dept. Center and School, Fort Sam Houston, TX
Clinical Outcomes and Resource Utilization of Well Managed Diabetics in the Military Medical Care System
Lenza, Robert; Apr. 13, 2001; 72 pp.; In English
Report No.(s): AD-A420322; AMEDDCS-07-01; No Copyright; Avail: CASI; A04, Hardcopy

Health care for patients over age of 65 is vital in today's world. Determining whether programs affect these patients' resource utilization, such as clinic visits, hospitalizations, and Emergency Room visits, will help to provide better care for them. A retrospective study of patients over 65 was conducted in two phases. Phase I examined Clinical Practice Guidelines from an administrative viewpoint for a sample of diabetics over 65. Clinical Practice Guidelines (CPGs) were developed by clinical researchers to assist disease management by using written algorithms. Phase II examined a Patient Prescription Exercise program developed by a family practice physician within Madigan Army Medical Center. Phase I outcomes showed that if a patient is well managed the number of unscheduled health care encounters is significantly reduced (p= .02). Additionally, chances of them having an unscheduled encounter at all is significantly reduced (p= .017). Phase II outcomes showed that if a patient is enrolled in a patient prescription exercise program their total number of clinic visits was reduced (p= .001). Moreover, their number of total encounters are significantly reduced (p . 002). Conclusions drawn from this study

show that implementation of Clinical Practice Guidelines, and a Patient Prescription Exercise program can significantly reduce the total resources used by participating patients.
DTIC
Clinical Medicine; Metabolic Diseases

20040036297 Naval War Coll., Newport, RI
Health Service Support to the Combatant Commander: Subtle Bridge to Improved JTF Effectiveness
Smith, Dawn M.; May 8, 2003; 28 pp.; In English
Report No.(s): AD-A420323; No Copyright; Avail: CASI; A03, Hardcopy

The new Joint Health Service Support Vision of Force Health Protection attempts to improve health service support to the Joint Force Commander by updating medical concepts to be more in line with the current operational doctrine of the warfighters. This paper asks whether the military health systems (MHS) current approach to providing health service support (HSS) for COCOM and JTF operations is an appropriate model for future operations. The evidence of recent HSS operations in support of the CENTCOM Commander indicates that current HSS doctrine is a sound approach for HSS future operations - as long as the MHS continues to review and revise the HSS principles based on continuing experience. The HSS principles improved support to the COCOM in five specific ways. First, the doctrine provided the JFC a furmidable force to engage the enemy by ensuring a healthy and fit force deployed and that force enjoyed layers of medical protection in the realm of disease and accident prevention. Second, the stationing of surgical assets far-forward with the fighting troops as well as new technology to control hemorrhaging saved lives. Third, the decreased footprint of medical forces freed up precious transportation assets for other COCOM assets and allowed the HSS to get in to the TO faster and be prepared earlier in the deployment sequence. Fourth, better trained medical personnel saved more lives. Finally, good HSS in caring for America's sons and daughters coupled with the adroit ability of the MHS to execute Humanitarian Assistance in support of the combatant commander's Theater Cooperation Plan (TCP) have proved to be especially invaluable tools in the combatant commander's toolbox.
DTIC
Medical Services

20040036301 Oklahoma Univ. Health Sciences Center, Oklahoma City, OK
Caspase Deficiency: Involvement in Breast Carcinogenesis and Resistance
Yang, Xiaohe; Jul. 2003; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9180
Report No.(s): AD-A420325; No Copyright; Avail: CASI; A03, Hardcopy

In the past year, our work focused on defining the functional impact of specific caspase deficiency as proposed in aim 3. We demonstrated that caspase-3 had feedback action on cytochrome c release in TNF-(L treated cells, as it was observed in doxorubicin treated cells. We also found that functional caspase 3 contributed to the up regulation of Fas in the cells treated with chemotherapeutic agents. To study the interactions between caspase- 3 and bcl-2, we have established bcl-2 overexpression cell lines with or without caspase-3 expression, and found that high levels of caspase-3 and bcl-2 were not compatible. To study the specific role of caspase-3 and p53 dependent apoptosis, using SiRNA technology, we have established p53 knock out cell lines form MCF-7/ pv, MCF-7/caspase 3 and MDA-MB-23l cells. We also studied the role of caspase 10 in chemotherapy responsiveness by examining the sensitivity of control and caspase-lO reconstituted MCF-7 cells to doxorubicin and etoposide. With our collaborators, we studied down regulation of caspase-3 in human breast cancers. The results and the cell lines generated in last year will facilitate the accomplishment of the proposed project.
DTIC
Mammary Glands

20040036303 Naval Hospital, Jacksonville, FL
The Impact of Maintaining a Wartime Readiness Posture
Wessel, Philip K.; Nov. 15, 2001; 64 pp.; In English
Report No.(s): AD-A420326; 32-01; No Copyright; Avail: CASI; A04, Hardcopy

Readiness is a major element in Navy Medicine with medical treatment facilities possessing unique operational missions. Naval Hospital, Jacksonville, Florida (NHJAX) recently became the 'ready Fleet Hospital' for the East Coast. Additionally, NHJAX is responsible for having a Medical Augmentation Team ready to assist the USS NASSAU (LHA-4) during operational commitments and contingencies. Assignment to these platforms, as well as other deployment requirements, have

the NHJAX staff focusing on wartime readiness and simultaneously maintaining the highest standards while carrying out the peacetime mission providing patient care. In August of 2000, the Deputy Surgeon for the USA Navy tasked many elements of the Bureau of Medicine and Surgery (BUMED) with determining the cost of readiness. According to the BUMED Readiness and Resources Divisions, it is the overall command impact of meeting readiness requirements--not simply the dollar cost that must be evaluated. Toward this end, this study evaluated the impact of readiness training on several organizational aspects to include: staff and patient satisfaction, as well as, access to care.
DTIC
Medical Personnel; Medical Services

20040036305 National Center for Toxicological Research, Jefferson, AR
Novel Recruitment Techniques for a Study of Culture-Specific Diet, Metabolic Variability and Breast Cancer Risk in African-American Women
Kadlubar, Fred F.; Ambrosone, Christine B.; Aug. 2003; 160 pp.; In English
Report No.(s): AD-A420327; No Copyright; Avail: CASI; A08, Hardcopy

There are few studies examining breast cancer risk in African Americans and fewer still in the rural south. African-American women are more frequently diagnosed with aggressive breast cancer than Caucasian women. Socioeconomic factors do not completely explain the ethnic differences in breast cancer mortality. The purpose of this pilot study was to develop a novel method of recruitment, focused primarily on minority women, and investigate previously unexplored risk factors for breast cancer. To date, interviews have been completed for 680 women, aged 29-75, 390 with breast cancer and 290 community controls. The participation rate for cases is 73% for Caucasian women, and 64% for African-American women. These rates are much improved over those using the standard methodology employed in an earlier study (37% and 30% for cases and controls, respectively). A food frequency questionnaire supplemented with foods commonly eaten by women in the rural south was developed and administered to the consenting breast cancer cases and controls. Entry of the questionnaire data into the computer database is complete and data cleaning and the transformation of the variables is underway. We phenotyped the breast cancer cases and controls for sulfotransferase and observed no association between sulfotransferase activity and odds of breast cancer. We genotyped the breast cancer cases and controls for 5 sulfotransferase polymorphisms and observed no association between any of the polymorphisms and odds of breast cancer. Work to complete the phenotyping and genotyping for NAT and CYPlA2 is underway. In conclusion, we have successfully developed infrastructure for the conduct of population based studies in this under served population in Arkansas. Work is underway to explore the reasons for the disparity breast cancer outcomes in African-American women compared to Caucasians.
DTIC
Mammary Glands

20040036309 Rochester Univ., NY
Statistical Inference for Quality-Adjusted Survival Time
Zhao, Hongwei; Oakes, David; Aug. 2003; 8 pp.; In English
Report No.(s): AD-A420329; No Copyright; Avail: CASI; A02, Hardcopy

In evaluations of breast cancer therapies, the patients' quality of life is receiving more and more attention. It is desirable that a treatment not only prolongs the overall survival life, but also improves the quality of life (QOL). Quality-adjusted lifetime (QAL) is a measure that combines both the quality and the quantity of a person's lifetime. The goal of my research is to study how to draw inference about QAL in the presence of censoring. For the past year, I have made efforts to ensure that the methodology I develop can be easily applied to clinical study of breast cancer. I have also been attacking some difficult technical problems. I am confident that the research problem I have been working on is of great importance to breast cancer studies.
DTIC
Mammary Glands

20040036313 Medical Univ. of South Carolina, Charleston, SC
The Role of Insulin-Like Growth Factor (IGF) Binding Proteins (IGFBPs) in IGF-Mediated Tumorigenicity
Harbeson, Caroline E.; Rosenzweig, Steven A.; Jul. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0392
Report No.(s): AD-A420331; No Copyright; Avail: CASI; A02, Hardcopy

The insulin-like growth factor (IGF) system has been shown to play an important role in the development and progression

of breast cancer. IGF-l binds with high affinity to a family of proteins called the IGF binding proteins (IGFBPs), which act as natural inhibitors of IGF-l through sequestration from the IGF-l receptor. The purpose of this proposal is the development of IGF antagonists based on the structure of the TGFBPs. Knowledge of the mechanism of IGFBP action is currently unclear, therefore we have taken a photoaffinity labeling approach to identify the IGF binding domains on the IGFBPs. Previous data collected in the lab indicate that the carboxy terminus of IGFBP-2 is involved in high affinity binding to IGF-l; these experiments are being repeated with TGFBP-3 to extend these findings. Current photoaffinity labeling data indicate that the carboxy terminus of the IGFBP-3 protein may be involved in IGF-l binding. This information will be used in the rational design of therapeutic IGF antagonists for use in the treatment of breast and other cancers.
DTIC
Mammary Glands; Cancer; Insulin

20040036315 Wisconsin Univ., Madison, WI
The Role of Amplified Wild-Type Neu in the Etiology of Breast Cancer
Gould, Michael N.; Jul. 2003; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0459
Report No.(s): AD-A420332; No Copyright; Avail: CASI; A03, Hardcopy

Many human breast cancers have amplified wild-type Neu (Her2) protooncogenes. It is still not known from either human or rodent models if amplified wild-type Neu is involved in the etiology of breast cancer. We have begun to develop rat transgenic models. Under the first aim we will construct additional Neu transgenic rat lines. Aim 2 will endocrinologically manipulate female Neu-transgenic rats in a way that models high androgen postmenopausal women. Aim 3 will explore alternative reasons of why these female transgenics do not develop breast cancer. The role of genetic background as it relates to female breast cancer development in this model will be explored. We have produced two independent strains of Neu-transgenic rats that spontaneously develop mammary carcinomas in males. Females supplemented with androgens develop mammary carcinomas. These carcinomas activated Neu by amplification and%not by mutagenesis. We have thus developed a useful model of Neu associated mammary carcinogenesis. This answers a key question of whether the amplification of wild- type Neu is only associated with tumor progression or is it also possibly involved in breast cancer etiology. These data presented is the first model to clearly demonstrate that the amplification of wild type Neu can induce mammary cancer.
DTIC
Mammary Glands; Cancer; Tumors

20040036317 Northwestern Univ., Chicago, IL
An Embryonic Growth Pathway is Reactivated in Human Prostate Cancer
Bushman, Wade; Feb. 2003; 69 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0040
Report No.(s): AD-A420333; No Copyright; Avail: CASI; A04, Hardcopy

Epithelial-mesenchymal interactions in prostate cancer represent a promising target for drug therapies to arrest or slow tumor growth. For this potential to be realized, it is necessary to identify one specific epithelial- mesenchymal -interaction which is critical for tumor growth. We have shown that Sonic hedgehog (SHH) signaling pathway is absolutely required for normal prostate development. Our preliminary studies show this pathway is expressed at very low levels in the normal adult prostate but reactivated in human prostate cancer. This research postulates that prostate cancer cells commandeer this normal epithelial-mesenchymal signaling pathway to recruit stromal cells to support abnormal tumor growth and tests the hypothesis that SHH signaling promotes prostate tumor growth. The primary goal of the study is to establish the concept that prostate tumor growth is promoted by re-activation of the SHH-Gli pathway and identify this as a novel target for drug treatment to slow or arrest prostate cancer growth.
DTIC
Prostate Gland

20040036319 Fordham Univ., New York, NY
Involvement of a Novel Rho GTPase Activating Protein in Breast Tumorigenesis
Kandpal, Rajendra P.; Aug. 2003; 24 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9394
Report No.(s): AD-A420334; No Copyright; Avail: CASI; A03, Hardcopy

We had previously shown that expression of a novel transcript that had sequence similarity to rat Rho GAP sequence was altered in breast carcinoma cell lines. We believed that the putative Rho GAP is functionally active. Rho family of proteins shares homology with the Ras super family. Our working hypothesis was that breast carcinoma where Ras mutations have not been detected could still arise from aberrant Ras signaling by virtue of loss of activity of members of Rho family or factors/proteins that affect the activity of Rho proteins. We have bacterially expressed the putative Rho GAP and shown it to have specificity toward RhoA. To further associate the biochemical activity with its well- established physiological role we have demonstrated that transfected Rho GAP can alter actin organization of fibroblast cell lines. We have transfected breast cancer cells with RhoGAP expression construct and shown it to suppress cell growth. This growth suppression pathway is mediated via p2 1. To better characterize the physiological significance of RhoGAP we have used the yeast two-hybrid system to isolate interacting proteins. The protein was shown to interact with alpha tubulin, TAX1 binding protein, SWI/SNF and HMG CoA reductase. These interactions provide a mechanism for statin induced inhibition of breast carcinoma cells and indicate as yet uncharacterized involvement of RhoGAP in other processes.
DTIC
Cells (Biology); Mammary Glands

20040036321 Smithsonian Institution, Washington, DC
Biodiversity Inventorying and Monitoring, Conservation and Training
Losos, Elizabeth C.; Sep. 2003; 25 pp.; In English
Contract(s)/Grant(s): DAMD17-99-2-9024
Report No.(s): AD-A420335; No Copyright; Avail: CASI; A03, Hardcopy

The ICBG Associate Program for Biodiversity Inventory and Monitoring, Conservation and Training (APi) is composed of three organizations: Smithsonian Institution's Monitoring and Assessing Biodiversity Program (SI/NAB), Center for Tropical Forest Science (CTFS) and the Bioresources Development and Conservation Programme. Through APi - SI/NAB proposed to accomplish the following long-term objectives: I) building in-country capacity through a series of training courses, 2) expanding the network of biodiversity plots in Cameroon and Nigeria, and 3) collecting temporal data from previously established NAG sites. CTFS concurrently proposed to build upon the work, which has been accomplished and initiated at the Korup Forest Dynamic Plot (KFDP). Over the past five years of funding CTFS accomplished the following tasks: 1) establishment of the 50-Heactare Korup Forest Dynamics Plot in the Korup National Park, 2) complete enumeration, identification, and measurement of approximately 500 species, over 320,000 individual trees, 3) completion of a liana census including over 7,000 individuals (286 species) with 10-ha of the KFDP, and 4) conducted phenology and seeding studies. Both SI/NAB and CTFS enhanced the infrastructure of local organizations by providing funds to local scientists so that they may participate in various training courses. Our specific aims were to continue inventory and forest dynamics research at the large-scale (50-ha.) permanent forest plot in Korup National Park of Cameroon as well as expand the network of 1-ha. Biodiversity plots established in Nigeria and Cameroon. The large-scale plot data effectively addresses the basic biological questions as well as biodiversity monitoring, biomass monitoring, conservation, silviculture, reforestation, ethnobotany, carbon sequestration, climate change, fragmentation, and disturbance by human populations. The 1-ha. Biodiversity plots provide data for mapping regional species distributions and beta diversity. 7
DTIC
Biological Diversity; Culture Techniques; Medical Science

20040036323 Ohio State Univ., Columbus, OH
A Novel Phosphatase Gene on 10q23, MINPP, in Hereditary and Sporadic Breast Cancer
Eng, Charis; Aug. 2003; 49 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0390
Report No.(s): AD-A420336; No Copyright; Avail: CASI; A03, Hardcopy

PTEN is a tumor suppressor gene on 10q23 and encodes a dual specificity phosphatase. One of the major substrates for PTEN is phosphotidylinositol (3,4, 5) triphosphate in the P13 kinase pathway. When PTEN is dysfunctional or absent, P-Akt is high and hence, anti- apoptotic. PTEN is a major susceptibility gene for Cowden syndrome (CS), a hereditary disorder with a high risk of breast and thyroid cancer, and appears to be involved in a broad range of tumors. In addition, germline PTENmutations have been found in a developmental disorder, Bannayan-Riley- Ruvalcaba syndrome (ERR) as well. Previously not thought to be associated with cancer risk, ERR families and cases with germline PTEN mutations have recently been shown to be at risk for cancers and especially breast tumors. Between 10-80% (mean 60%) of CS families and 60% of ERR individuals have germline PTENmutations. Families that do not have germline PTEN mutations are not inconsistent with linkage to the l0q22-23 region. Thus, genes with related function to PTEN in the lOq2l- q25 region are good candidates genes

for PTENmutation negative CS, ERR and related sporadic tumors, eg, those of the breast and thyroid. MINPP1 lies no more than 1 Mb upstream of PTEN and encodes an inositol polyphosphate phosphatase. while we have found no intragenic germline MINPPl mutation in CS and ERR, MINPPl has been found to be co-deleted with PTEN in one case of ERR with prominent GI features. MINPPl also appears to act as a low penetrance susceptibility gene for sporadic follicular thyroid neoplasia but not breast cancer. While no somatic intragenic MINPP1 mutations were found in whole breast cancers, co-deletion of PTEN and MINPPl occur in 3040% of sporadic breast carcinomas. More interestingly, these codeletions have been shown to occur in the stroma. Therefore, MINPPl plays a comodulatory (non-traditional) role in hereditary and sporadic breast cancer.
DTIC
Mammary Glands

20040036329 Georgetown Univ. Hospital, Washington, DC
High-Resolution Speckle-Free Ultrasound Imaging System-A Potential Solution for Detecting Missed Breast Cancer
Freedman, Matthew T.; Oct. 2003; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0599
Report No.(s): AD-A420340; No Copyright; Avail: CASI; A03, Hardcopy

The Imperium Inc. transmission ultrasound system is a highly promising novel method for imaging the breast. In this pilot project, we are to work with Imperium to advise and help them modify their existing system for non-destructive testing into one suitable for breast imaging, perform a physics evaluation and perform a small clinical pilot feasibility trial. The initiation of this project was delayed by non-approval of the human use portion of the project. We have received US Army Human Use approval for study of tissue samples. During this past year, we provided technical advice to Imperium, and have performed physics tests and in imaging of pieces of animal tissue obtained in a supermarket. Imperium has improved the machine during this past year and we will be starting human tissue tests shortly. They have created a prototype of a dry system and have designed a potential system for clinical use that is yet to be constructed. We will describe some of these improvements in this annual report.
DTIC
High Resolution; Imaging Techniques; Mammary Glands

20040036333 Baylor Coll. of Medicine, Houston, TX
The Role of Ckh2 in Breast Cancer
Elledge, Stephen J.; Apr. 2003; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0280
Report No.(s): AD-A420342; No Copyright; Avail: CASI; A03, Hardcopy

Breast cancer is a very heterogeneous disease. Many pathological alterations contribute to breast cancer development. Some initiate the cancer formation or accelerate its progression. Our bodies counter DNA damaging stressed form the environment, such as g-irradiation, UV, carcinogens or even from metabolic processes. If DNA damage occurs without being repaired n the genes controlling cell growth or morality, cells will acquire altered growth properties and become transformed and cancer will eventually develop. Fortunately, our bodies have natural defense mechanisms called checkpoints to keep the damaged cells in check so that the damaged genes can be repaired. In this proposal, we plan to study Chk2, one of the central components of the machinery, for its role in managing our defensive system to repair damaged DNA and to suppress cellular transformation. In our studies, we will first generate cells or animals which have no Chk2 expression for use as a model. By studying the responses to DNA damaging agents and the transformation potential, we can determine the significance of Chk2 functions in managing checkpoints and in suppressing transformation. Next, we plan to systematically identify Chk2 substrates and its associated proteins so that we can discover the entire network connecting to Chk2.
DTIC
Mammary Glands

20040036335 California Univ., Berkeley, CA
The Functions of BRCA2 in Homologous Recombinational Repair
Chen, David J.; Jul. 2003; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0439
Report No.(s): AD-A420343; No Copyright; Avail: CASI; A03, Hardcopy

The BRCA2 breast cancer gene is a major contributor to a dominantly inherited predisposition to the disease. Recent evidence has indicated that the critical functions of BRCA2 associate with chromosome stability and with DNA repair

medicated by homologous recombination. Using homologous recombination assay, we have demonstrated that disruption of the BRCA2- Rad51 interaction inhibits the HRR frequency in vivo. The results indicate that the interactions between Rad5l and BRCA2 are important for regulating HRR. The 6xHis-tagged baculoviral construct of BRC1-4, BRC5-8 and BRC1- 8 fragments of bRCA2 have been made and individually expressed in insect cells. Each protein was purified using a Ni-NTA column and the identity of each protein was confirmed by Western analysis. We have used three assay systems to determine the activity of Rad5lB and Rad5lC proteins, including DNA binding, ATPase and DNA strand transfer.
DTIC
Mammary Glands

20040036337 Kimmel (Sidney) Cancer Center, San Diego, CA
Tumor Specific Gene Expression and Tumor Specific Vector Replication for Systematic Chemotherapy Sensitization Treatment of Breast Cancer
Deisseroth, Albert B.; Jul. 2003; 79 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9457
Report No.(s): AD-A420344; No Copyright; Avail: CASI; A05, Hardcopy

We have developed a safety modified adenoviral vector in which the tumor specific L-plastin promoter can be used to control the expression of therapeutic genes such as cytosine deaminase (CD). The CD gene product catalyzes the conversion of a non-toxic precursor, 5-Fluorocytosine (5FC) into a drug, 5-Fluorocytosine (5FC), thereby sensitizing the cells in which it is produced to 5FC induced toxicity. We have also generated vectors in which the adenovirus needs to replicate within mammalian cells. The replication of a virus within a mammalian cell takes over all of the metabolic and cell proliferative machinery of%the cells and thereby kills it. Our data shows that the adenoviral vector which carries the L- plastin-ElA transcription unit can replicate within breast cancer cells and other estrogen dependent carcinomas, such as ovarian cancer, while not being able to replicate in normal cells. This L-plastin-ElA vector can suppress the growth of human breast cancer cell lines in immunosuppressed mice. We have recently isolated a vector in which both the CD ElA genes are under the control of the L-plastin promoter, which is currently under study.
DTIC
Gene Expression; Mammary Glands

20040036339 Winston-Salem State Univ., Winston-Salem, NC
A Potential Therapeutic Role of J Series Prostaglandins in PPAR-gamma Mediated Treatment of Breast Cancer
Monjazeb, Arta M.; Chilton, Floyd H.; High, Kevin P.; Jun. 2003; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0489
Report No.(s): AD-A420345; No Copyright; Avail: CASI; A03, Hardcopy

Naturally occurring derivatives of arachidonic acid metabolism are potent and effective activators of PPAR- gamma. The most potent of these derivatives is 15deoxy- delta(12,14)PGJ2 (15dPGJ2), the dehydration and isomerization product of prostaglandin D2 (PGD2). 15dPGJ2 induces PPAR-gamma mediated transcriptional activation leading to the synthesis of critical gene products involved in cell cycle arrest and apoptosis. of these gene products, expression of the cyclin dependent kinase inhibitors, p21 and p27, is associated with marked cell cycle arrest with subsequent apoptosis involving caspase-3. However, apoptosis induced by 15dPGJ2 is unlikely to be PPAR-gamma mediated as demonstrated by studies with dominant negative forms of this receptor. To further elucidate how AA derivatives such as 15dPGJ2 induce apoptosis in breast cancer cells investigations into AA metabolic pathways were undertaken. We demonstrate that intracellular accumulation of AA induces apoptosis in cancer cells by activating the AP-1 family of nuclear transcription factors. Given the anti-cancer efficacy of therapies which alter AA metabolism, such as NSAIDs, further investigation into 15dPGJ2 and other facets of the AA metabolic pathway are warranted.
DTIC
Mammary Glands

20040036341 Johns Hopkins Univ., Baltimore, MD
Therapeutic and Chemopreventive Actions of a Novel Polyamine Analog Against Breast Cancer
Davidson, Nancy E.; Sep. 2003; 43 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9231
Report No.(s): AD-A420346; No Copyright; Avail: CASI; A03, Hardcopy

The intracellular polyamines, spermidine, spermine, and putrescine, play an important role in the proliferation and death

of normal and malignant cells. As a consequence, our work has focused on development of inhibitors of this metabolic pathway. A phase II trial of diethylnorspermine (DENSpm) for women with advanced breast cancer was completed. No major toxicity was observed but clinical activity was not sufficient to warrant further testing of DENSpm at the dose and schedule used. Analysis of DENSpm- and control-treated breast cancer tumors derived form discarded mastectomy tissue showed that DENSpm can modulate expression of the SSAT enzyme on some specimens. This could potentially serve as a biomarker of effect the efficacy of several new polyamine ananogs as treatment for established breast cancer in a nude mouse model zenograft has been demonstrated. Future studies will focus on these agents.
DTIC
Mammary Glands

20040036343 Minnesota Univ., Minneapolis, MN
Insulin-Like Growth Factor Binding Protein-1 Interacts with Integrins to Inhibit Insulin-Like Growth Factor- Induced Breast Cancer Growth and Migration
Gross, Jennifer M.; Jul. 2003; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0329
Report No.(s): AD-A420347; No Copyright; Avail: CASI; A03, Hardcopy

The insulin-like growth factor (IGF) system and extracellular matrix proteins are key regulators of the malignant breast cancer phenotype. Both IGFs and extracellular matrix proteins communicate wit epithelial cells by ligating cell surface receptors. Therefore, ligand-receptor interactions of the two systems are relevant treatment targets in breast cancer cell growth. Studies have shown that IGFBP-l can bind to IGF and prevent IGF from interacting with its receptor and inhibit breast cancer cell growth. IGFBP-1 has also been shown to interact with extracellular matrix protein receptors, integrins, on the cell surface through an Arg-Cly- Asp (RGD) integrin recognition sequence. This proposal will test the hypothesis that IGFBP-1 interrupts ligand-receptor interactions between extracellular matrix proteins and integrins. The key research accomplishment is the conclusion that expression of a mutant form of IGFBP-l that cannot bind integrins at reasonable levels is not technically achievable using the Pichia pastoris yeast expression system. An alternative approach will be used to express mutant IGFBP-1. The successful expression and purification of mutant IGFBP-1 protein is needed to test whether IGFBP-1 can be used as a strategy to neutralize integrin function in an RGD-dependent manner.
DTIC
Mammary Glands

20040036349 Temple Univ., Philadelphia, PA
Novel COX-2 Inhibitor for Breast Cancer Therapy
Reddy, E. P.; Jul. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0579
Report No.(s): AD-A420352; No Copyright; Avail: CASI; A02, Hardcopy

Recent studies have shown that NSAIDS such as aspirin reduce the incidence of human cancers by inhibiting the enzyme Cyclooxygenase (COX), which plays a key role in arachidonic acid metabolism. It is now known that COX exists in at leas two isoforms, term COX-l and COX-2. Of these, COX-2 has also been found to be constitutively expressed in a number of tumor tissues, including breast. The purpose of out study to develop new COX-2 inhibitors that can be sued in breast cancer therapy. We have exploited the structural differences between the two COX enzymes to develop specific inhibitors of COX-2 and have identified three classes of novel COX-2 inhibitors that possess tumor growth inhibitory activity. Some of these compounds inhibit growth of both COX-2 positive as well as COX-2 negative tumor cell lines, suggesting that these compounds might target another protein that plays an important role n the growth of tumor cells. These studies suggest that these compounds may play an important role as an anti-cancer and chemopreventive agents.
DTIC
Mammary Glands

20040036359 Beth Israel Deaconess Medical Center, Boston, MA
Lymphatic Regeneration Within Porous VEGF-C Hydrogels for Secondary Lymphedema
Contreras, Mauricio A.; Jul. 2003; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0152
Report No.(s): AD-A420366; No Copyright; Avail: CASI; A03, Hardcopy

Lymphedema is an abnormal swelling, in which lymph production exceeds drainage capabilities. This occurs as a result

of lymphatic vessel destruction during the removal of lymph nodes or subsequent radiation therapy in breast cancer treatment. Management of lymphedema remains a clinical problem. In adult lymphangiogenesis, VEGF-C has been shown to be a specific mitogen for lymphatic endothelial cells (LEC) via the VEGF-3 receptor. Ang-2 has recently been shown to be required for proper lymphatic development via the Tie 2 receptor.
DTIC
Lymphatic System; Mammary Glands

20040036361 Utah Univ., Salt Lake City, UT
Randomized Trial of Interleukin-2 (IL-2) as Early Consolidation Following Marrow Ablative Therapy with Stem Cell Rescue for Metastatic Breast Cancer
Samlowski, Wolfram E.; Oct. 2003; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9417
Report No.(s): AD-A420367; No Copyright; Avail: CASI; A03, Hardcopy

Interleukin-2 (IL-2) has the capacity to activate lymphocytes to kill multidrug resistant cancer cells. Our phase I data established the feasibility of administering a single course of low-dose IL-2 (1.6 million IU/m2/day as a continuous i.v. infusion for 18 days) as consolidation treatment to patients with metastatic breast cancer early after intensive chemotherapy. Seven patients (60%) remained in complete remission at a median of >435 days post stem cell transplantation. We are therefore performing a phase II trial of AC+T chemotherapy followed by IL-2 consolidation (1 cycle as described above) in high risk stage II and III breast cancer patients. The goal is to kill residual chemotherapy- resistant cancer cells. Disease free survival and toxicity assessment represent major clinical aims (Specific aim 1). Immunologic effector mechanisms induced following MAT/SR by IL- 2 infusion will be evaluated using phenotypic and functional assays for LAK cell induction (Specific Aim 2). Accrual to this study has been delayed due to a change from a randomized trial to a single arm phase II study. After overcoming regulatory and legal issues, the study finally opened 6/11/03. Three patients been have accrued (about 1 per month). Toxicity has been minimal to none. Two additional patients are being screened for enrollment. Our plan is complete accrual within 2 years, carrying over funds from ear 1-3.
DTIC
Bone Marrow; Immune Systems; Mammary Glands; Rescue Operations

20040036363 Children's Hospital, Boston, MA
Transcriptional Regulation of the Neurofibromatosis Type 1 Gene
Chong, Jayhong A.; Moran, Magdalene M.; Teichmann, Martin; Kaczmarek, J. S.; Roeder, Robert; May 2003; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0640
Report No.(s): AD-A420369; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this project was to understand the transcriptional regulation of the NFl gene. Specifically to further characterize TLF-mediated regulation and identify new factors that participate in the control of NFl regulation. In addition, an attempt was made to determine signaling pathways that affect NFl levels. We found that TLF(TRF2) activates a number of different genes that include the Neurofibromatosis I (NFl)gene. Overexpression of TLF increases the amount of NFl mRNA in cells. In vivo, TLF binds and up regulates transcription from a fragment of the NFl promoter. In vitro, purified TLF-TFIIA binds directly to the same NFl promoter fragment that is required for TLF-responsiveness in cells. In contrast, TLF inhibits transcription driven by a fragment of the TATA-containing c-fos promoter by sequestering TFIIA. TBP affects the NFl and c-fos promoters in a reciprocal manner to TLF, stimulating the c-fos promoter and inhibiting NFl transcription. Thus, it appears that TLF is a functional regulator of transcription with targets distinct from those of TBP.
DTIC
Gene Expression; Gene Regulation; Transcription (Genetics)

20040036367 Academy of Health Sciences (Army), Fort Sam Houston, TX
Physician Provider Profiling in Brooke Army Medical Center's Internal Medicine Clinic: A Multiple Regression and Process Control Model
Wegner, Michael D.; Dec. 1999; 166 pp.; In English
Report No.(s): AD-A420371; HCA-3-99; No Copyright; Avail: CASI; A08, Hardcopy

The purpose of this project is to develop a model and tool that utilizes data currently capture by existing information systems to apply objective metrics for physician provider practice profiling. The model examines utilization expense for lab,

x-ray and pharmacy services ordered for outpatients in Brooke Army Medical Center's Internal Medicine Clinic during the 3rd & 4th quarter of FY 1998. Data regarding 26,502 individual patient-provider encounters were extracted from both the Composite Health Care System (CHCS) and Ambulatory Data System (ADS) computer databases. Data extracts were then loaded into a PC database management system for subsequent relational integration, organization and statistical analysis. Case-mix adjustment was accomplished by selecting internists and internal medicine residents and a single primary diagnosis. Second level case mix adjustment accounted for other quantifiable variables using a multiple regression model identify% variables having a statistically significant relationship with the total ancillary expense. Variables accounted for diversity among patients, providers, and individual encounter acuity. Profiling was accomplished showing dispersion of lab, x-ray and pharmacy expense for each provider as predicted by the multiple regression model. Significant variables were patient beneficiary category, number of comorbid diagnoses, and the consistency of seeing the same provider; significant provider variables were professional status and experience. A surprising finding was that neither patient age, sex, or RVU intensity were significant determinants of expense.
DTIC
Mathematical Models; Regression Analysis

20040036371 California Univ., Berkeley, CA
Basis of Persistant Microenvironment Perturbation in Irradiated Human Mammary Epithelial Cells
Barcellos-Hoff, Mary H.; Jul. 2003; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0437
Report No.(s): AD-A420373; No Copyright; Avail: CASI; A02, Hardcopy

Our hypothesis is that the disruption of morphogenesis releases constraints on genomic integrity in preneoplastic cells. Thus we predict that colonies arising from irradiated cells will show increased genomic instability due to the lack of microenvironment control rather than as a direct result of DNA damage. In the current IDEA grant, we seek to determine whether such a correlation exists. In addition, to be in a position to manipulate the phenotype in future studies, we wish to determine the underlying basis for the irradiated phenotype. In aim 2, we will determine whether irradiated cells can communicate their phenotype in a fashion similar to the bystander effect' that occurs when unirradiated cells respond as if they were irradiated under conditions of heterogeneous radiation exposure. In aim 3, we will begin studies to test an alternative%or additional mechanism in which the phenotype is perpetuated by epigenetic modifications leading to altered gene expression. Together these studies will test whether the irradiated HMEC phenotype contributes to radiation-induced genomic instability that is observed in cells generations after radiation exposure.
DTIC
Mammary Glands

20040036373 Arizona Univ., Tucson, AZ
Relationship Between Mammographic Density and IGF Levels Among Hispanic and Non-Hispanic White Women
Arendell, Leslie A.; Chen, Zhao; Aug. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-02-0-0272
Report No.(s): AD-A420374; No Copyright; Avail: CASI; A01, Hardcopy

The purpose of this study is to investigate the relationship between breast density and IGF levels in pre and postmenopausal Hispanic and non-Hispanic White women. This study will use data collected from the parent study, the Women's Breast and Bone Density (WBBD) Study, in combination with the results from laboratory analyses to test this association. The parent study was completed on May 31, 2003. Recruitment was lower than expected for the Hispanic women, but recruitment goals were met or exceeded for the non- Hispanic White women. The total numbers are: 60 premenopausal Hispanic women, %5 premenopausal non-Hispanic White women, 28 postmenopausal Hispanic women, and %8 postmenopausal White women. The serum and plasma samples have been collected for the Insulin-like Growth Factors (IGFs) and their binding proteins (IGFBPs) assays used in this study (including TGF-1, IGFBP-3, and Free IGF-1), however, the assays will be completed in Fall 2003. The mammographic density measurements are currently being finalized and will be merged with the data collected from questionnaires, physical measurements, and dual energy x-ray absorptiometry (DXA) scans. When the laboratory analyses are complete, the results of those tests will be merged with the WBBD data so the analysis can be completed and results disseminated.
DTIC
Mammary Glands

20040036375 Pittsburgh Univ., Pittsburgh, PA
Novel Thioredoxin Inhibitors for Breast Cancer Therapy
Laso, John S.; Jul. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0412
Report No.(s): AD-A420376; No Copyright; Avail: CASI; A03, Hardcopy

The hypothesis tested was that the thioredoxin redox signaling system is essential for the growth of some human breast caners and that drugs inhibiting this system will block oncogenesis and cause selective growth inhibition and/or apoptosis. The specific objectives of the IDEA proposal are to generate and identify selective inhibitors of thioredoxin using target-array chemistry methodologies, in vitro assays and cell-based screening approaches. The scope of the research activity demanded that we develop semi-automated synthetic methodology. We selected lead compounds that could be optimized as candidates for clinical development, which would encompass a Clinical Translational Research (CTR) proposal. We performed preclinical pharmacokinetics and formulation studies on interested candidates.
DTIC
Mammary Glands

20040036377 Nebraska Univ., Omaha, NE
Magnetic Resonance Studies of Photosensitizers and Their Effect in Tumors
Ramaprasad, Subbaraya; Aug. 2003; 82 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9065
Report No.(s): AD-A420378; No Copyright; Avail: CASI; A05, Hardcopy

In this project, we use specifically fluorine labeled photosensitizers which will be of utility in the treatment of breast cancer via photodynamic therapy (PDT). The accumulation of the photosensitizer in the tumor and the muscle are evaluated using noninvasive 19F spectroscopic modality in mice bearing RIF tumor. By determining the relative disposition of the sensitizer, we can determine the best time to irradiate the tumor causing minimal damage to nearby healthy cells around the tumor. The absorption, distribution and elimination of the labeled sensitizer is achieved by 19F spectroscopy of tumor models after administering a single dose of the sensitizer. The tumor destruction is achieved by irradiating the tumor with an appropriate wavelength laser light. The process of tumor destruction and the accompanying changes in the high energy phosphates and diffusion process are monitored by 31P and 1H MR studies. The 31P MR studies performed before and after the use of 19F labeled PS(DoD2) does not show any appreciable changes in the spectra but tumor regression was observed after PDT studies under fractionated laser doses. The corresponding nonlabeled compound did not show 31P spectra changes or tumor regression following PDT.
DTIC
Magnetic Resonance; Mammary Glands

20040036379 Wayne State Univ., Detroit, MI
Role of RAD6 a DNA Repair Gene in Tumor Progression and Drug Resistance
Shekhar, Malathy P.; Aug. 2003; 81 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9443
Report No.(s): AD-A420380; No Copyright; Avail: CASI; A05, Hardcopy

The goal of this IDEA award was t9 understand the role of Rad6B, a key mediator of postreplication DNA repair (PRR), in breast tumor progression and drug resistance. Results of our study demonstrated that Rad6B plays a critical role in maintenance of genomic integrity of human breast cells, as imbalances in Rad6B levels induced by experimental manipulation (and observed in human breast tumors) cause loss of cell polarity and genomic instability which correlate with alterations in chemosensitivity and PRR capacities. Rad6B forms supramolecular complexes with p53, pl4ARF and Mdm2, and inclusion of pl4ARF and M%m2 into Rad6-p53 complexes is dependent upon exposure to DNA damaging agent. Recombinant Rad6B mediates monoubiquitination of p53. That monoubiquitinated p53 functions in DNA damage-induced response is evident as G2/M arrest and p53 response observed in normal MCFlOA breast cells following DNA damage is associated with parallel increases in monoubiquitinated p53. Loss of cell polarity induced by Rad6B overexpression appears to be a result of dysregulation in Wnt and Rho signaling pathways. Samples accrued from patients post-chemotherapy shows differential distribution of Rad6 in cytoplasmic versus nuclear compartments, and our preliminary data suggest that recruitment of Rad6 into nucleus following chemotherapy may predict favorable treatment outcome.
DTIC
Deoxyribonucleic Acid

20040036381 Thomas Jefferson Univ., Philadelphia, PA
X-Ray Polarization Imaging
Maidment, Andrew D.; Jul. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0593
Report No.(s): AD-A420381; No Copyright; Avail: CASI; A03, Hardcopy

Conventional mammography only evaluates the spatial arrangement of tissue in the breast, as it depends upon the fact that some materials absorb x-rays more than other materials (the x-ray energy must be deposited in the body to produce an image). We propose to investigate the potential of x-ray polarization imaging, by building an x-ray polarimeter (a device designed to measure polarization) and determine the factors that affect polarimeter design. Polarization radiography has the potential to supplement mammographic images with information about the function, composition, and metabolism of the breast. We plan to perform fundamental experiments regarding x-ray polarization to determine whether the effect is sufficiently large to allow it to be used to produce images. We also wish to measure the ability of key biological materials, including breast tissue, to alter the polarization of x-rays, and determine the accuracy with which we can measure this effect. This research is quite clearly, speculative, but the program described in the grant would give the experimental data necessary to clearly understand the benefits and limitations of attempting to image tissue using polarized x-rays. This annual report presents our research to date.
DTIC
Mammary Glands; X Ray Imagery

20040036387 Texas Univ., Houston, TX
Breast Reconstruction Using Tissue Engineering
Patrick, Charles W., Jr; Sep. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9268
Report No.(s): AD-A420386; No Copyright; Avail: CASI; A02, Hardcopy

This is the final addendum report for a 6 month no- cost extension (9/l/02-2/28/03) of the original 3-year grant awarded to investigate the initial development of tissue engineering strategies for breast reconstruction following tumor resection.
DTIC
Mammary Glands; Tissue Engineering

20040036389 Johns Hopkins Univ., Baltimore, MD
Dissecting the Mechanisms of T Cell Tolerance for More Effective Breast Cancer Vaccine Development
Ladle, Brian H.; Jaffee, Elizabeth M.; Aug. 2003; 17 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0282
Report No.(s): AD-A420387; No Copyright; Avail: CASI; A03, Hardcopy

T cell tolerance to tumor-associated antigens is a significant barrier to immune based treatments of human cancers. One such tumor-associated antigen is the proto- oncogene HER-2/neu (neu) which is overexpressed in 35-40% of all human breast cancers. Although patients with neu expressing tumors develop antibody and T cell responses to this antigen, these responses are weak and unable to hinder tumor growth. Our work has focused on understanding these mechanisms of T cell tolerance using the neu-N transgenic mice that express the wild type rat neu cDNA under control of the MMTV promoter. Since neu is an endogenously expressed antigen, profound neu-specific immune tolerance exists in the neu-N mice. We previously reported the immunodominant T cell epitope of neu recognized by parental FVB/N mice, RNEU420-429. We have investigated whether altering RNEU420-429 can generate a more immunogenic peptide that will result in better protection from a HER-2/neu expressing tumor in the neu-N mice. Also, using GFP-expressing RNEU420-429-specific T cells, we demonstrate that high avidity CTL cannot persist in the periphery of neu-N mice but do persist in the periphery of parental mice. Further studies are underway to understand the role other immune cells (such as CD4(+)CD25(+) regulatory T cells) play in CD8(+) T cell tolerance. This work to further understand the mechanisms of T cell tolerance in this cancer model should lead to even further improvements in vaccination strategy for cancer immunotherapies.
DTIC
Mammary Glands; Tolerances (Physiology)

20040036393 Madigan Army Medical Center, Takoma, WA
Tricare Senior Prime Demonstration Project at Madigan Army Medical Center: Is Cost Neutrality Achievable?
Millar, William H.; Apr. 1999; 161 pp.; In English
Report No.(s): AD-A420390; AMDCS-7-99; No Copyright; Avail: CASI; A08, Hardcopy

Delivery of care under the Medicare Subvention Demonstration began 1 September 1998, at Madigan Army Medical Center (MAMC). The goal of the demonstration is to implement a cost-neutral alternative to delivering health care to Medicare- eligible military beneficiaries, while increasing the total federal cost to neither the Department of Defense (DOD) nor Department of Health and Human Services. The purpose of this research effort is to determine if MAMC can achieve cost-neutrality and contribute to the achievement of the DOD Level of Ef fort (LOE). Two supporting objectives are examined in this research effort. The first seeks to determine if the cost of treating Medicare dual-eligible beneficiaries is significantly greater than the cost of treating all other beneficiaries. The second examines whether MAMC will meet its assigned LOR based on accrued costs for care rendered to dual- eligible beneficiaries. Cost-neutrality is achieved if the LOR is met but not exceeded. Results indicate MAMC will meet and exceed its assigned LOE, but will not achieve cost-neutrality. Results also revealed that costs for Medicare patients are greater (significantly) . Information and methods presented in this study may assist health care decision-makers in innovating methods for controlling the associated costs.
DTIC
Medical Services

20040036399 North Carolina Univ., Chapel Hill, NC
Growth-Promoting and Angiogenic Functions in Adenosine in Breast Cancer
Spychala, Jozef; Aug. 2003; 54 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0351
Report No.(s): AD-A420393; No Copyright; Avail: CASI; A04, Hardcopy

Adenosine has angiogenic, growth-stimulatory and immunosuppressive properties that may be relevant for breast cancer progression. The second period of the funding term (12 months, Aug 1, 2002 to Jul 31, 2003) has been used to characterize in detail breast cancer cell lines developed in the first period. The in-depth characterization of eN-1 GFP-, and ADA overexpressing clones of MDA-MV-231 cells included their expression profiling and adhesion properties in vitro assays. The expression profiling of the panel of breast cancer cells established that the high capacity to generate adenosine correlates with mesenchymal phenotype that is characteristic for invasive and metastatic breast cancer cells. Several membrane proteins that are characteristic for this phenotype, such as CD44, integrins alpha5 and beta1 and EGFR were not altered in GFP and ADA overexpressing and in eN-suppressed MDA- MB-231 cells, suggesting that engineerd alterations were confined to the capacity to produce adenosine and express eN. Characterization of eN and ADA+ cells led to discovery that eN is a receptor for Tenascin C and downregulation of eN caused decreased adhesion on this ECM. Finally, we have performed preliminary inoculations of developed cells in nude mice to test the relationship of growth of grafts to the expression of ADA and eN. Our results so far fully support the important role of adenosine and eN in breast cancer.
DTIC
Mammary Glands

20040036401 Strang Cancer Prevention Center, New York, NY
Restoring BRCA1 Function With Antibiotics
Monteiro, Alvaro N.; Sep. 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0636
Report No.(s): AD-A420394; No Copyright; Avail: CASI; A03, Hardcopy

BRCA2 mutations leading to premature termination of the protein confer high cancer risk. Currently very few clinical options are possible for women carrying predisposing mutations. So far, the only one to provide a significant reduction in risk is prophylactic mastectomy and oopherectomy. Restoring BRCAl function in these patients might result in a significant decrease in cancer risk. We proposed to restore BRCAl function using antibiotics. In eukaryotic cells, aminoglycosides interact with ribosomal RNA and relaxes codon recognition allowing normal tRNAs to insert an amino acid at a codon specifying a stop. As a result, the ribosome will read through the mutation and produce a full-length protein that can potentially restore the protein's original function. We focused on the following aims: Screen aminoglycosides in yeast to determine if they could suppress a nonsense mutation in BRCAl; Determine the ability of selected antibiotics in human cells to suppress different types of mutations and on the wild type BRCAl. We show that gentamicin suppresses BRCAl nonsense mutations is able to restore some of the wildtype protein levels and may provide a preventive strategy for individuals carrying these mutations. Given the dearth of alternatives for these individuals and the results obtained in our studies the use of antibiotics merits further investigation.
DTIC
Mammary Glands

20040036403 Academy of Health Sciences (Army), Fort Sam Houston, TX

An Analysis of Saturday Family Practice Clinic Utilization at Reynolds Army Community Hospital, Fort Sill, Oklahoma

Roberts, Paul L.; Mar. 16, 1999; 96 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420396; HCA-24-99; No Copyright; Avail: CASI; A05, Hardcopy

The objective of this study was to establish a patient profile using descriptive statistics that reflects the type of patient who uses the Saturday Family Practice Clinic, and to determine if this profile differs from those who use the Monday-Friday FPC. The study revealed that users of the Saturday FPC were predominantly female active duty dependents age 17-50 (40.4%) and children between the ages of one and ten (27.3%).

DTIC

Medical Services

20040036407 Meharry Medical Coll., Nashville, TN

Institutional Training Program in Breast Cancer

Levine, Robert S.; Sep. 2003; 9 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9289

Report No.(s): AD-A420398; No Copyright; Avail: CASI; A02, Hardcopy

This report is submitted in compliance with contractual reporting requirements for Award Number DAMDl7 -99- 1-9289, Institutional Training Program in Breast Cancer. The program is a collaborative effort that includes Meharry Medical College and Vanderbilt University Medical Center. The program's tasks are to: (1) Recruit Trainees; (2) Recruit Visiting Professors; (3) Enroll additional t rainees; and (4) successfully complete the education of at least three trainees as evidenced by publications and secured appointments in the field of breast cancer.

DTIC

Mammary Glands; Medical Science

20040036409 Academy of Health Sciences (Army), Fort Sam Houston, TX

Can TRICARE Senior Prime Remain Budget Neutral for the Department of Defense and Department of Health and Human Services?

Stilley, Jim L.; Jun. 26, 1999; 40 pp.; In English

Report No.(s): AD-A420400; HCA-34-99; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this retrospective study is to determine the financial neutrality of the TRICARE Senior Prime program. TRICARE Senior Prime was created under the provisions of the 1997 Balanced Budget Amendments for Medicare Subvention Demonstration projects. TRICARE Senior Prime is a demonstration of the Military Health System's ability to conduct a Medicare+Choice style benefit for dual- eligible beneficiaries. Under the provisions of the program the goal of the TRICARE Senior Prime program is, through a joint effort by the Department of Health and Human Services and the Department of Defense's Military Health System, to implement a cost effective alternative for delivering accessible and quality care to dual-eligible beneficiaries while ensuring that the demonstration does not increase the total federal cost for either agency. The analysis provides insight to how the program was created and areas that will provide a financial challenge for the Military Health System. The study found that the Military Health System has a disproportionately larger risk share in this program than the Department of Health and Human Services and can not remain budget neutral as the program is currently structured.

DTIC

Defense Program; Medical Services; Military Operations

20040036417 Colorado Univ., Aurora, CO

The Role of Claudin-7 in Mouse Mammary Gland and Tumorigenesis

Neville, Margaret C.; Jul. 2003; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0211

Report No.(s): AD-A420404; No Copyright; Avail: CASI; A03, Hardcopy

We have fully characterized the expression and localization of claudin 7 in the mammary epithelium, finding that it is not associated with tight junctions but is constitutively present in punctate structures, presumably vesicles, at the basal and lateral borders of cells. We find the same to be true of mouse mammary tumors. We find claudins 1, 3, 4, 5 and 8 to be present in at least one of our mouse mammary cell lines, where they are localized to the tight junction. Only claudin 1 has been found to be consistently present in mammary epithelial tight junctions. Claudin 3 is localized to the basal and lateral borders of the

cells in the virgin and pregnant animals, but not observed in lactation. Claudin 8 is prominent at the tight junctions in the mammary epithelium from the lactating animal. In the next year we will complete these analyses and apply them to mouse mammary tumors. In addition we plan to use our adenoviral technology to overexpress claudin 8 during pregnancy to determine whether it can contribute to closure of the tight junctions under conditions where the junctions are normally open.
DTIC
Mammary Glands

20040036427 Walter Reed Army Medical Center, Washington, DC
Transitioning to Itemized Billing in the Military Healthcare System: Are We Ready? Evaluating Outpatient Coding Accuracy in the Walter Reed Army Medical Center General Internal Medicine Clinic
Poulsen, Eric E.; Apr. 19, 2002; 55 pp.; In English
Report No.(s): AD-A420414; AMDCS-9-02; No Copyright; Avail: CASI; A04, Hardcopy

In a major step towards meeting Health Insurance Potability and Accountability Act (HIPAA) standards, the Military Healthcare System (MHS)plans to implement an outpatient itemized billing system by October 2002. Over the last four years, there have been many different methods and systems used to collect and code outpatient encounter data. The purpose of this project is to evaluate and assess various methods of performing coding in the Walter Reed Army Medical Center (WRAMC) General Internal Medicine Clinic (GIMC)and determine whether current outpatient coding practice and data quality is sufficient for supporting itemized billing. The first part of this study involved a comparison on coding accuracy between providers in 1998 using a bubble sheet to code diagnoses and procedures (Gall, 1998), and the current study using an automated coding system. The results showed a decrease in International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnosis coding correctness from 66% to 51% and a decrease in the average number of diagnoses recorded per encounter from 2.24 to 1.81. Evaluation and management (E&M) complexity coding accuracy worsened, showing a higher propensity towards over coding, increasing from 37% to 83% over coded. The second part of this study evaluated coding accuracy of a clinic initiative using medical clerks to code directly from provider written documentation. Evaluating and comparing the results using these and other methods of coding is essential to developing the best practices for accurate coding in the MHS. This study provides suggested interventions and process improvements to assist the organization in improving coding accuracy and overall data quality. More importantly, these interventions will help leadership reduce billing risk and remain focused on the core mission of providing quality care to military beneficiaries.
DTIC
Clinical Medicine; Medical Services; Military Operations

20040036429 Northwestern Univ., Evanston, IL
Optimization of Technique Factors for Full-Field Digital Mammography and Comparison of Optimized Techniques to Screen-Film Mammography
Berns, Eric A.; Hendrick, Edward; Sep. 2003; 71 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9144
Report No.(s): AD-A420415; No Copyright; Avail: CASI; A04, Hardcopy

This final report presents progress achieved during a four year pre-doctoral traineeship project to determine the optimum techniques for a flat-panel Cesium- iodide silicon-diode full-field digital mammography system and to compare those optimized techniques to screen-film mammography at equal breast doses. This project work has analyzed the effect of technique factor selection (target- filtration, kvp, and mAs) on image contrast and low- contrast lesion detection under the conditions of matched average glandular dose to an optimized film-screen mammography system. Results indicate that low-contrast lesion detection was optimized for full-field digital mammography by using a softer x-ray beam for thin breasts and a harder x-ray beam for thick breasts. Under the constraint of matched average glandular dose between digital and screen-film mammography systems, optimum low-contrast lesion detection with full-field digital mammography was superior to that. for screen-film mammography for all but the thinnest breasts. The results of this project have been published in two journal articles with another manuscript in preparation for submission and five abstracts have been published and presented at scientific meetings.
DTIC
Mammary Glands

20040036431 Academy of Health Sciences (Army), Fort Sam Houston, TX
An Error Reduction Initiative
Underwood, Paula K.; Apr. 6, 2001; 76 pp.; In English
Report No.(s): AD-A420418; HCA-25-01; No Copyright; Avail: CASI; A05, Hardcopy

Medical errors kill many Americans each year. Information on sentinel events gathered at military hospitals is typically presented as numerator data without much analysis. Fearing litigation and blame, health care providers appear to be reluctant to report on 'near misses' where errors have occurred, but not resulted in actual harm. Using a non- punitive approach, anesthesiologists championed a method to learn from errors in order to improve patient outcomes. This graduate management project involves analysis of trends and error rates in the risk management database of Winn Army Community Hospital. Numbers of incident reports were compared before and after educational interventions to increase voluntary reporting. Numbers of prescription edits were quantified and compared before and after default prescriptions were introduced to decrease errors. Recommendations were made about efforts which may best serve an effective error reduction initiative.
DTIC
Medical Services; Military Operations

20040036433 Texas Univ., Houston, TX
Integration of Pathologic Findings With Clinical- Radiologic Tumor Measurements to Quantify Response to Neoadjuvant Chemotherapy
Symmans, William F.; Jun. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0458
Report No.(s): AD-A420419; No Copyright; Avail: CASI; A03, Hardcopy

The aim of the first year of this project was to develop a new method to quantify the proportion (percent) of cancer that is residual after neoadjuvant chemotherapy using standard radiologic and/or clinical measures of tumor size integrated with pathologic information about the amount of cancer within each tumor. We tested tumor cellularity and combined that information with tumor size. We have determined that tumor cellularity significantly decreases as a result of neoadjuvant (pre-operative) chemotherapy compared to control untreated breast cancers managed by surgery alone. However, the extent and variability of reduction of cellularity is considerable, particularly in the partial and minimal clinically responsive groups. When cellularity is combined with actual tumor size, there is a shift in the distribution of this measure of residual cancer in the tumor bed, suggesting that most breast cancers are more responsive to neoadjuvant chemotherapy that measurement of tumor diameter alone would indicate. Therefore, size alone is not sufficient measure of the tumor response to treatment. We are now working to incorporate our measure of cancer cellularity to combine with the radiological tumor measurements for these patients during the course of their therapy to test the product of tumor size and cellularity as a measure of actual breast cancer response.
DTIC
Clinical Medicine; Mammary Glands

20040036435 Tripler Army Medical Center, Honolulu, HI
Business Case Analysis for a Gastroenterology Ambulatory Procedure Center
Deak, James C.; Apr. 12, 2002; 115 pp.; In English
Report No.(s): AD-A420421; AMDCS-8-02; No Copyright; Avail: CASI; A06, Hardcopy

Tripler Army Medical Center has been experiencing the loss of GI workload to its civilian contracted network of providers for years. Its inability to meet demand is based on lack of space and staff in its current location. In addition, the VA clinic at Tripler has also been experiencing the same problem. The VA asked if research could be conducted for the development of an Ambulatory Surgery/GI facility on Tripler grounds with the purpose of a sharing resources between the VA and Tripler. A Process Action Team was developed and research was conducted. It was found that potentially, workload for both organization could be recaptured via several proposed options. Construction conversion costs, existing space, staff, equipment, cost sharing,and future projected workload were factored into these options.
DTIC
Clinical Medicine; Gastrointestinal System; Medical Services

20040036437 JAYCOR, San Diego, CA
Modeling for Military Operational Medicine Scientific and Technical Objectives
Stuhmiller, James H.; Shen, Weixin; Niu, Eugene; Sep. 2003; 61 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-C-0031
Report No.(s): AD-A420424; No Copyright; Avail: CASI; A04, Hardcopy

This report describes progress toward scientific and technical objectives of the Military Operational Medicine Research Program. The second year's work on developing a biomechanically-based assessment of behind body armor blunt trauma is

described, including measurements of actual loads and estimated response.
DTIC
Medical Services; Military Operations

20040036441 Chicago Univ., Chicago, IL
Molecular Markers in Hereditary Breast Cancer
Olopade, Olufunmilayo I.; Oct. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9123
Report No.(s): AD-A420426; No Copyright; Avail: CASI; A02, Hardcopy

We are entering a new era of medicine where genetic markers are going to be used to make clinical management decisions. My long term career goal is to further our understanding of the genetic alterations which characterize human breast cancer in a way that will eventually lead to early diagnosis, more effective treatment or prevention of the disease. The promise of research into breast cancer genetics is that it will provide us with new insight into the etiology of breast cancer that can be translated to strategies for early diagnosis and treatment for the larger population of women who develop breast cancer without having a genetic predisposition.
DTIC
Mammary Glands

20040036457 Naval War Coll., Newport, RI
Operation Nigerian Angel: Fighting Aids To Fight Terrorism
Kendall, Julie A.; May 29, 2003; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420439; No Copyright; Avail: CASI; A03, Hardcopy

Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) continues to ravage the African continent, threatening already fragile states by creating chaos and disorder. Some states risk losing more than a third of their populations while having to provide for millions of orphans left behind. The resulting instability creates opportunities for terrorist recruitment and refuge. The US has significant national interest in Nigeria for its vast natural resources and its position as a regional anchor in West Africa. In the coming years, as the pandemic overwhelms countries' abilities to function effectively, the US may likely be called upon to respond to the crisis. OPERATION NIGERIAN ANGEL provides a model for a multinational force to address key issues and provides the COCOM a means to restore regional stability and order.
DTIC
Acquired Immunodeficiency Syndrome

20040036473 Mount Sinai School of Medicine, New York, NY
Psychological Distress, Cognitive Bias, and Breast Cancer Surveillance Behavior in Women Tested for BRCA 1/2 Mutation
Erblich, Joel; Bovbjerg, Dana; Aug. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9305
Report No.(s): AD-A420452; No Copyright; Avail: CASI; A02, Hardcopy

This research project examined psychological distress and processing of information associated with breast cancer risk. Understanding the types and magnitude of women's distress and impaired processing of cancer-related information is critical because cancer-related distress has been associated with poorer compliance with screening behaviors, and impaired processing of cancer information may decrease women's knowledge and understanding of (and hence, compliance with) recommended screening guidelines. These concerns may be particularly salient among women who attend genetic counseling, as they receive complex, and oftentimes-distressing information about their risk for the disease. To. date, our findings indicate that women with family histories of breast cancer may be so preoccupied with their risks for developing% breast cancer that they exhibit impaired processing of cancer- related information, which may lead to poorer informed choices about their health care. We also found that these women underestimate their risks of developing other more common diseases, such as cardiovascular disease, and this may be exacerbated by biased media coverage of breast cancer. Our research has also demonstrated that distress about breast cancer is related to significantly poorer knowledge of information presented during genetic counseling. Results of this project strongly suggest that women at increased risk for breast cancer may not be adequately processing information critical to their health care, in Spite of the fact that they may stand to gain the most from counseling.
DTIC
Mammary Glands; Stress (Psychology)

20040036509 Meharry Medical Coll., Nashville, TN

Mechanisms of Transforming Growth Factor Beta- Receptor II Loss in Breast Neoplasia

Forbes, Digna S.; Jensen, Roby A.; Dec. 2002; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0322

Report No.(s): AD-A420478; No Copyright; Avail: CASI; A03, Hardcopy

Epidemiologic studies show that most human invasive breast carcinomas arise from preexisting benign lesions. Usual hyperplasia without atypia has a two fold elevation in risk for subsequent invasive breast cancer compared with women without proliferative disease. In order to identify the women at high risk, knowledge of molecular markers of breast neoplastic progression is needed Transforming growth factor-betas are important growth suppressing factors in normal breast epithelium. and their activity is mediated by specific receptors, including transforming growth factor beta receptor II (TGFbRII). Most normal breast epithelium express high levels TGFbR II. Loss of expression of TGFbR II is related to cell proliferation and tumor progression. A recent study showed that reduced levels of TGFbR II in epithelial hyperplasia lacking atypia added an additional risk of invasive breast cancer. The molecular alterations responsible for the development and progression of proliferative breast diseases without atypia are not understood. We hypothesized that loss of TGFbR II expression in usual hyperplasia identifies a subset of women at increased risk of breast cancer. To test this hypothesis we have established a repository of African American breast biopsies from Meharry Medical College and Metropolitan Nashville General Hospital from 1960-1995 (2.255 cases). Histologically confirmed cases of usual hyperplasia without atypia lesions in African American women are selected and immunohistochemically stained for TGFbR II and Ki-67(M1B4) to determine the loss of expression and proliferation. The percentage of positive cells in hyperplastic lesions are assessed as less than 25%, 25%-75 %, and greater than 75% for TGFbR II. A cell is considered positive if there is any nuclear staining for MlB4. In usual hyperplasia cases from the Nashville Breast Study Cohort and African American repository.

DTIC

Mammary Glands; Receptors (Physiology)

20040036511 Rochester Univ., NY

Acustimulation for the Control of Chemotherapy- Induced Nausea in Breast Cancer Patients

Roscoe, Joseph A.; Marrow, Gary R.; Bushunow, Peter; Aug. 2003; 17 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0424

Report No.(s): AD-A420482; No Copyright; Avail: CASI; A03, Hardcopy

The current experiment examined the efficacy of acustimulation (mild electrical stimulation to an acupuncture point) to the Neiguan (P6) acupuncture point (located on the ventral surface of the wrist) in controlling chemotherapy- induced nausea and vomiting (NV). In traditional Chinese medicine, this acupuncture point is associated with NV relief. It was a randomized three-arm clinical trial testing the usefulness of an acustimulation wrist band for the relief of chemotherapy- induced nausea and vomiting as an adjunct to standard 5-HT3 antiemetics. Patients who experienced nausea at their first treatment were eligible to participate. Patients in the two treatment groups (i.e., correct location: band worn on the inside of the wrist and sham location: band worn on the outside of the wrist) put on the acustimulation wrist band prior to the administration of chemotherapy and wore it for up to five days. The use of an active acustimulation band in the sham condition was intended to control for both the placebo effect and for any effect due to the release of endorphins, thereby allowing for a direct examination of the efficacy of stimulation to the (P6) acupuncture point. In addition, the experiment had a 'no band' condition for additional comparisons.

DTIC

Mammary Glands; Medical Science

20040036513 Michigan Univ., Ann Arbor, MI

Computer-Aided Interval Change Analysis of Microcalcifications on Mammograms for Breast Cancer Detection

Hadjiiski, Lubomir; Jul. 2003; 20 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0489

Report No.(s): AD-A420484; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this project is to develop a computer- aided diagnosis (CAD) system for interval change analysis of lesions on mammograms. An important component of the CAD system is the multistage regional registration technique for identifying corresponding microcalcification clusters on temporal pairs of mammograms. In the first stage, an initial search region was estimated on the prior mammogram based on the lesion location on the current mammogram. In the second stage the search region was refined. In the third stage the lesion was detected within the search region. In the first stage we compared the regional registration method (RRM) to the use of linear and nonlinear warping techniques for the initial estimation of the

lesion location. 390 temporal pairs of mammograms were used for evaluation. The average distance between the estimated and the true lesion centroids on the previous mammogram after the initial stage was 8.5%+/- 6.2mm. 2mm for RRM and 9.0 +/- 6.7mm for the best of the warping techniques. The RRM method outperformed the warping techniques. In the second step, automated detection of microcalcification cluster within the search region is performed. Using our current cluster detection program with standard thresholds, 69. 4% (50/72)TP with 0.21 false positives (FP) were detected within the search region. Using a high-sensitivity threshold, 84.7% (61/72) TP with 0. 75 FP were detected.
DTIC
Computer Techniques; Mammary Glands

20040036515 Colorado Univ., Boulder, CO
Breast Cancer Therapeutics, Environmental Estrogens, and the Estrogen Receptor (ER); Characterization of the Diverse Ligand Binding Properties of the ER
Wuttke, Deborah S.; Jul. 2003; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9148
Report No.(s): AD-A420485; No Copyright; Avail: CASI; A03, Hardcopy

The estrogen receptor (ER) is found in the nucleus of several tissues, including breast, bone, liver, the organs of the reproductive system, and the cardiovascular system. The ER binds several types of compounds, including compounds that are quite distinct form its natural ligand. Estrogens bind to and activate the ER, which leads to the stimulation of transcription of genes containing an estrogen responsive element (ERE). Antiestrogens and partial antiestrogens bind tightly to the ER but fail to activate transcription; these compounds are currently in widespread use for the treatment of breast cancer. In addition, a variety of compounds introduced into the environment by human activity have also been found to act as estrogen mimics and alter reproductive function and development. The goals of this project are to understand, on a molecular level, how the ER binds estrogens, anti- estrogens, and estrogen mimics present in the environment, how this binding triggers activity, and how mutations in the ER discovered in breast cancer patients affect ER activity. Towards this end, we have expressed and purified the ligand binding domain of the estrogen receptor, and studied complexes with estradiol, the natural ligand, and tamoxifen, a partial antiestrogen in use as a breast cancer therapeutic using high- resolution heteronuclear NMR spectroscopy.
DTIC
Mammary Glands

20040036521 Indiana Univ., Indianapolis, IN
Role of the Neddylation Enzyme Uba3, a New Estrogen Receptor Corepressor, in Breast Cancer
Nephew, Kenneth P.; Sep. 2003; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-92-1-0418
Report No.(s): AD-A420492; No Copyright; Avail: CASI; A03, Hardcopy

Estrogen are well known to play an important role in both the onset and malignant progression of breast cancer. The content of estrogen receptors in breast tumors is a valuable predictor of whether a patient will respond to therapy with antiestrogens, such as tamoxifen and fulvestrant (ICI 182,780). Expression and activity of ER can be lost or impaired in antiestrogen- resistant breast cancer. The proposed studies are designed to test the overall hypothesis that the ubiguitin-like NEDD8 protein modification pathway represses estrogen action by facilitating degradation of ER protein. Perturbation of this pathway may prove instrumental in breast tumor progression; alternatively, activation of this pathway may prove to be a valid target for novel therapeutics. This study on mechanisms that regulate ER levels and activity are highly relevant to the development and progression breast cancer, including tumor progression to states of hormone independence and antiestrogen resistance. Receptor coregulators, such as Uba3, may represent a crucial point of control of estrogen action. Thus, understanding how coregulators influence the estrogen receptor is an area of research critical to understanding the tissue selective pharmacology of estorgens, tamoxifen and other SERMS and of the utmost relevance to therapies that target ER and other nuclear receptors.
DTIC
Mammary Glands

20040036533 Naval Health Research Center, San Diego, CA
Risk Factors for HIV Infection in the U.S. Military: A Cross-Service Comparison
Thomas, Ann; Brodine, Stephanie; Starkey, Monica; Ito, Stan; Seib, Sabrina; Nov. 13, 2002; 58 pp.; In English
Contract(s)/Grant(s): DAMD17-93-V-3004
Report No.(s): AD-A420502; NHRC-02-31; No Copyright; Avail: CASI; A04, Hardcopy

Background: U.S. military personnel face HIV infection risks both at home and while in foreign lands. It is of paramount importance to quantify and understand the multi- faceted risk factors for HIV infection in this population in order to develop effective interventions. Mandatory, periodic HIV testing of U.S. military personnel has led to a uniquely well-characterized cohort of HIV-seropositive persons. This study capitalized on having a known seroconversion window, and it assessed HIV infection risks during that time period.
DTIC
Infectious Diseases; Medical Services; Military Operations

20040036541 Naval Health Research Center, San Diego, CA
Low-Level Laser Therapy: A New Treatment Alternative Effective for Acute Exercise-Related Tendinitis
Almeida, Sandra; Leichliter, Sandra G.; Hervig, Linda K.; Streeter, Jackson; Maxwell-Williams, Karen; Jul. 7, 2002; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420506; NHRC-02-13; No Copyright; Avail: CASI; A03, Hardcopy
The efficacy of low-level laser therapy for the treatment of acute iliotibial band syndrome was evaluated in a sample of Marine Corps recruits. A randomized, placebo- controlled, double-blind trial was conducted with 22 recruits receiving an active laser treatment, and 20 recruits receiving a placebo/sham treatment. In addition to the laser/placebo treatment, all recruits received standard medical therapy consisting of naproxen, icing, stretching, and rest. The laser treatment consisted 6 laser/placebo treatments, 3 per week for 2 weeks.
DTIC
Physical Exercise

20040036543 Texas A&M Univ., College Station, TX
Disaster Relief and Emergency Medical Services Project (DREAMS): Digital Emergency Medical Services and the Detection and Remediation of Chemical Threat Agents
Ewing, Richard E.; Oct. 2003; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-2-0010
Report No.(s): AD-A420509; No Copyright; Avail: CASI; A03, Hardcopy
The Disaster Relief and Emergency Medical Services (DREAMS(Trademark)) project is a consortium of scientists; medical professionals, and engineers from The Texas A&M University System and the University of Texas Health Science Center at Houston. The goal of DREAMS is to improve the diagnosis and treatment of critically ill or injured soldiers in the field by expediting their access to medical experts at trauma centers of field hospitals.
DTIC
Medical Services

20040036557 Air Univ., Maxwell AFB, AL
An Examination of the Role of Communication Problems in Preventable Medical Adverse Events
Stone, Fred P.; Apr. 2002; 50 pp.; In English
Report No.(s): AD-A420531; AU/ACSC/110/2002-04; No Copyright; Avail: CASI; A03, Hardcopy
This exploratory, descriptive study examined 30 medical malpractice case files and 30 medical incident investigations to identify the prevalence of three barriers to effective communication among healthcare professionals. These cases were randomly selected from the files of the Office of the Air Force Surgeon General. Barriers included problems with encoding and decoding information, hierarchical structure of teams, and time pressures and workload. The results of this study indicated that communication errors were present in 76 percent of the cases examined. A total of 92 communication problems were noted. Verbal and written communication problems were equally distributed. Nurse and physician miscommunication was as common as physician-to-physic ian miscommunication. Eleven cases were noted as having hostile work environments. Only two cases involved problems with communication as the result of time pressures or workload. The study concludes a broad-based progmm that facilitates communication throughout healthcare facilities may help decrease medical errors. Suggestions for further research are given.
DTIC
Medical Services; Military Operations

20040036561 McDonald Army Community Hospital, Fort Eustis, VA

A Comparison of Urgent Care Center Access for TRICARE Prime Enrollees Before and After Implementation of a Re-Engineering Initiative

Rustan, Bradley S.; Jun. 14, 1999; 95 pp.; In English

Report No.(s): AD-A420542; No Copyright; Avail: CASI; A05, Hardcopy

This study looked at a comparison of access in the McDonald Army Community Hospital (MACH) Urgent Care Center (UCC) before and after the implementation of a Re-engineering Initiative. The purpose was to implement and examine a re-engineering process to increase access for beneficiaries enrolled in TRICARE prime, better utilize primary care providers and resources, and reduce overall costs of providing primary care. The Re-engineering Initiative used a process action team to develop a course of action that would best conform to the overall goals of the organization and the purpose of the Initiative. The courses of action were briefed to the hospital's Executive Committee, where the decision was made to operate the UCC at night, Sundays and major holidays. Additionally, the clinic would be available for the treatment of patients, as an extension of the General Outpatient Clinic (GOPC), during the day and on Saturdays. Raw data was collected from the Composite Health Care System for the period of one year, exported into spreadsheet and database programs and thoroughly analyzed. The Re-engineering Initiative plan of action was then developed based on the data analysis and expertise of the health care providers and ancillary staff. The plan was implemented April 1, 1999. Overall, the enrolled population of MACH reduced UCC utilization by 352 visits or 34. 3 percent over the mean of the year studied. Additionally, the number of non-urgent patients was reduced by 746 visits or 48. 3 percent.

DTIC

Insurance (Contracts); Medical Services; Military Operations

20040036563 Baylor Coll. of Medicine, Houston, TX

Identification of New Genes that Regulate Telomerase and Telomere Length in Budding Yeast

Otero, Joel; Jun. 2003; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0143

Report No.(s): AD-A420543; No Copyright; Avail: CASI; A03, Hardcopy

In budding yeast, Cdc13 has both an essential function in chromosome end protection as well as a non- essential role in telomere replication, by mediating recruitment of telomerase to the chromosome end. Using fusion protein techniques, we have determined that the essential function of Cdc13 is to deliver an Stnl-containing end protection complex to the telomere. This delivery is sufficient to protect the chromosome, but is unable to provide telomere replication. However, delivery of a small region of Cdc13 is capable of restoring telomerase recruitment in the absence of intact Cdc13 protein. In addition, we performed a genetic screen designed to identify hypothesized processing activities at telomeres. Several interesting mutants that were uncovered have been classified and their role in telomere maintenance is being analyzed. I am presently working in the biochemical characterization of the proteins involved in end protection, and in the identification of metazoan homologs of these proteins. It is our belief that the information derived from the experiments detailed in this proposal may be extrapolated to the corresponding biological situation in humans, where protection of chromosome ends is critical for maintaining genomic integrity and preventing genomic instability.

DTIC

Genes; Enzyme Activity; Yeast

20040036591 Indiana Univ., Indianapolis, IN

Nanoparticle: Monoclonal Antibody Conjugates: A Novel Drug Delivery System in Human Breast Cancer

Sledge, George W.; May 2002; 33 pp.; In English

Contract(s)/Grant(s): DAM17-98-1-8111

Report No.(s): AD-A420569; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this research project was to develop a novel targeted drug delivery system which would allow delivery of drugs directly to cancerous breast tissue without delivering significant amounts of drug to other parts of the body. The systems described in this research proposal utilize biodegradable nanoparticles based on poly(lactic-co- glycolic) acid (PLAGA) containing paclitaxel (Taxol) or doxorubicin (adriamycin). The nanoparticles were prepared according to a novel technique which incorporates poly(ethylene glycol) (PEG) into the nanoparticles. Addition of PEG alone reduces the uptake of the nanoparticles by the reticuloendothelial system and increases their circulation time. In addition, the PEG arms of the nanoparticles were to be conjugated to monoclonal antibody (MAb) to HER-2/neu, which would selectively bind to breast cancer cells expressing the HER-2 extracellular domain, thereby allowing the nanoparticles to be delivered and targeted directly to cancerous breast tissue. Some nanoparticles are also prepared using polymers that are graft copolymers of PEG and

PLA/PGA. All formulations of nanoparticles were to be prepared in order to be of a size less than 750 nm in diameter, preferably less than 300 nm.
DTIC
Mammary Glands

20040036611 Naval Postgraduate School, Monterey, CA
Return on Capital Employed at Naval Dental Center Gulf Coast
Yonkers, Michael A.; Flis, Marek; Dec. 2003; 51 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420591; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this MBA Project is to provide a Return% on Capital Employed model for Naval Dental Center Gulf Coast (NDCGC) resource managers. The model will enable the resource managers to evaluate financial and personnel assets appropriate for each dental clinic and to allocate assets as deemed necessary based on those results. NDCGC is required to report the report on Investment (ROI) of each branch dental clinic (BDC) to the Bureau of Medicine and Surgery on a quarterly basis. NDCGC has made an effort to calculate return on assets, but there has been little understanding of the source of the income cost and assets validation data using in the equation. N DCCC has recognized over the past fiscal year that using the measure of Return on Capital Employed (ROCE) vice ROI will give them assessment of alternatives to optimize the of resources. NDCGC has requested that a model be developed to analyze ROCE at each BDC. A breakdown and analysis of the ROCE equation will enable NDCGC to provide all BDCs with proper recommendations based on the outcomes of the study on ROCE's effectiveness. This project was conducted with the sponsorship and assistance of Naval Dental Center Gulf Coast.
DTIC
Resources Management

20040036615 Academy of Health Sciences (Army), Fort Sam Houston, TX
An Analysis of Medication Errors at the Military Medical Center: Implications for a Systems Approach for Error Reduction
Scheirman, Katherine; Apr. 2, 2001; 88 pp.; In English
Report No.(s): AD-A420601; HCA-33-01; No Copyright; Avail: CASI; A05, Hardcopy

An analysis was accomplished of all inpatient medication errors at a military academic medical center during the year 2000, based on the causes of medication errors as described by current research in the field. The results of this analysis, which showed errors most often associated with information systems deficits and with the ordering process, were used as a framework for prioritizing elements of the current system which offer opportunities for significant error reduction. This framework, when combined with a detailed examination of the current inpatient medication processes, a review of recommendations on error reduction from the literature, and an investigation into the currently available information technologies, was used to develop a prioritized plan of action to address the root causes of reported inpatient medication errors at this medical center. The results of the analysis and the recommended actions to address systemic causes of errors were presented to the executive leadership for conceptual validation and future resource allocation decisions.
DTIC
Error Analysis; Medical Services; Military Operations

20040040339 Institute of Space Medico, Beijing, China
Space Medicine and Medical Engineering, Volume 16, No. 5
Wei, Jin-He, Editor; Su, Shuang-Ning, Editor; Jiang, Shi-Zhong, Editor; Wang, Xian-Min, Editor; Liu, Xin-Min, Editor; Su, Hong-Yu, Editor; Bai, Jing, Editor; Sun, Xi-Qing, Editor; Xiao, Zhi-Jun, Editor; Liu, Yong, Editor, et al.; October 2003; ISSN 1002-0837; 84 pp.; In English; In Chinese; See also 20040040340 - 20040040359
Report No.(s): CN-11-2774/R; Copyright; Avail: Other Sources

The following report were processed for inclusion into the NA&SD database:Endocardial Boundary Detection in Echocardiographic Images with an Improved Fast Marching Method; An Improved Portable Fiber Optic Sensor for Continuous Clinical Monitoring of Entero-gastric Reflux;WMN: A Negative ERPs Component Related to Working Memory during Non-target Visual Stimuli processing; Effects of Repeated Body Position Change Training for Human Orthostatic Tolerance; Effects of Short-action Hypnotics Triazolam and Zopiclone on Simulated Flight Performance; Circadian Rhythms of DNA Synthesis and Telomerase Expression in Hepatic Cancer Transplanted in Nude Mice; Analysis of Heat Transfer in Tissues during Percutaneous Hot Saline Injection Therapy; Numerical Analysis of Finger Temperature Distribution in a Cold

Environment; Aerodynamic Characteristics of Crewman's Arms During Windblast; Principles and Experimental Analysis of a Measuring System for Measuring Spacesuit Joint's; Damping Parameters Decomposition of EMG Signals Based on Combination of Information Diffusion Theory and Fuzzy Neural Network; Studies on a Non-invasive System for Estimation of the Resistance of Children's Pulmonary Vessels Measurement and Statistical Analysis of the Vertical Force in Normal Young People's Gait; A New Membrane-permeable Peptide from Human Measurement of Cerebral Blood Oxygen Saturation with Near Infrared Spectroscopy and Its Application in Hyper-Gravity Effect of Space Flight on Yield of Monascus purpureus; Effects of Enriched Oxygen on Human Free Radical Metabolism during Exercise at 5 380 m; Plateau Effects of Simulated Weightlessness on Reproduction in Male Rats; Study on Space Motion Sickness before , during and after Spaceflight;and sEMG Time-frequency Analysis Techniques for Evaluation of Muscle Fatigue and It's Application.
Derived from text
Aerospace Medicine; Weightlessness Simulation; Space Suits; Cancer

20040040340 China Scientific and Technical Univ., Anhui, China
Decomposition of EMG Signals Based on Combination of Information Diffusion Theory and Fuzzy Neural Network
Qian, Xiao-Jin; Yang, Ji-Hai; Liang, Zheng; Chen, Xiang; Zhou, Ping; Feng, Huan-Qing; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 354-359; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to solve the problem of large samples and contradictory samples in EMG during high level muscle contraction. By means of recording EMG during muscle contraction with linearly increasing force instead of constant force, basic MUAP templates were obtained with the combination of information diffusion theory and fuzzy neural network. Samples were compressed and contradictory samples were eliminated. The method was tested by simulated and real EMG data and the results were satisfactory. This method is meaningful for decomposing NEMG at high level muscle contraction.
Author
Electromyography; Signal Processing; Muscles

20040040341 Zhejiang Univ., China
sEMG Time-frequency Analysis Techniques for Evaluation of Muscle Fatigue and It's Application in Ergonomic Studies
Wang, Du-Ming; Wang, Jian; Ge, Lie-Zhong; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 387-390; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

As a non-invasive on-line measurement, sEMG can reflect the status of muscle activity and muscle function accurately and objectively. Some sEMG Time-frequency analysis techniques, especially the JASA (joint analysis of EMG spectrum and amplitude) analysis ,for evaluation of muscle fatigue in ergonomics and occupational field studies are introduced and evaluated in this paper. The sEMG signal analysis and the necessity for developing sEMG analysis techniques for field use in ergonomics are also briefly discussed.
Author
Muscular Function; Human Factors Engineering

20040040342 Shanghai Jiao Tong Univ., China
Endocardial Boundary Detection in Echocardiographic Images with an Improved Fast Marching Method
Yan, Jia-Yong; Zhuang, Tian-Ge; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 313-316; In English; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to study a new computerized automatic method for endocardial boundary estimation and tracking in sequential echocardiographic images. Through analyzing the existing problems of the traditional fast marching method, the contour energy conception of the active contour model was introduced to improve the traditional fast marching mathematical model. The improved mathematical model was applied to sequential echocardiographic images and the experimental results showed that endocardial boundary can be accurately detected. The introduction of contour energy conception enhances the stability and effectiveness while keeping the convergence velocity of the fast marching algorithm.
Author
Echocardiography; Edge Detection

20040040343 Institute of Space Medico-Engineering, Beijing, China

Effects of Repeated Body Position Change Training for Human Orthostatic Tolerance

Wu, Bin; You, Guang-Xing; Wu, Ping; Liu, Xing-Hua; Xue, Yue-Ying; Su, Shunag-Ning; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 326-328; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to develop a method for on-line continuous monitoring of entero-gastric reflux in clinical diagnosis. Development of a fiber optic sensor for clinical monitoring of entero-gastric reflux based on characteristic absorption of bilirubin at analytical wavelength was reported in detail. The whole measuring system was composed of two LEDs as light sources, a bifurcated optic bundle and a detection circuit. A wonderful dynamic response with a linear range of up to 10 mg/dl was achieved. The pH effect on sample analysis was investigated and the in-vitro test demonstrated that the sensor worked preferably in acid environment. In vitro analyses of bile sample were carried out using the sensor. The sensor shows good accuracy and sensitivity. With further development, the sensor can be made easily transportable, compact and inexpensive for biomedical analysis.

Author

Bioinstrumentation; Fiber Optics

20040040351 Sichuan Univ., Chengdu, China

Circadian Rhythms of DNA Synthesis and Telomerase Expression in Hepatic Cancer Transplanted in Nude Mice

Qu, Yi; Wang, Zheng-Rong; Huang, Xiang; Yang, Chun-Lei; Liu, Bai-Lin; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 332-335; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to study the circadian rhythms of DNA synthesis and telomerase expression in hepatic cancer transplanted in nude mice. Sixteen BALB/C mice were synchronized with an alternative lighting regimen with 12 h for light and 12 h for darkness (12:12 LD) for 4 weeks. Hepatic cancer cells (SMMC-7721) were implanted into both flanks of each mouse. One week after transplantation, sampling from the tumor was conducted at 3, 9, 15 and 21 h after light onset (HALO). Single cell suspension was obtained and stained with propidium iodide. The cellular DNA content was measured by flow cytometry. Telomerase activity was measured by PCR-ELISA assay. Data were documented by ANOVA and Cosinor analysis. The proportion of tumor cells in phase G1, S, G2/M and telomerase activity varied according to circadian time with statistical significance, and the telomerase activity showed a synchronized variation. The distribution curves of both phase S and the expression level of telomerase were fit for Cosinor changes. DNA synthesis and telomerase expression of SMMC-7721 cells transplanted into the nude mice varies according to the circadian rhythm. The results provide a guidance for laying down the chemotherapy protocol for human tumors, especially when the telomerase inhibitor was used as the anti-cancer agent.

Author

Circadian Rhythms; Deoxyribonucleic Acid; Cancer; Synthesis (Chemistry)

20040040352 Tsinghua Univ., Bejing, China

Measurement and Statistical Analysis of the Vertical Force in Normal Young People's Gait

Geng, Chun-Ya; Ma, Jun; Guo, Zhong-Wu; Ding, Hui; Ding, Hai-Shu; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 364-367; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

Objective. To find a method for evaluating the relationship between mechanical data and gait efficiently. Method. Gait mechanical data of 27 young men (20 approx. 22 years) without history of the kinetic diseases were collected using a force-measuring system. The data were transformed into characteristic two-peak curves in vertical direction (z-axis). Seven characteristic parameters were distilled. The coefficient of variation (CV) and the absolute symmetry index (ASI) of the parameters between left foot and right foot were analyzed. Result. It was found that CV of the first temporal parameter of gait (T(sub z1)) is equal to 14.49%, which corresponds to larger dispersion. The values of AS1 are all lower than 12.5%, which means the symmetry between left and right feet meets general requirement. But the P value (result of t-test) of F(sub z2) is 0.0368(lower than 0.05), which means that there is obvious difference between F(sub z2) of left and right feet, while no such different were found for the other six characteristic parameters. t-test was also used to analyze the different between the gait of male and female. It is still found that p value of F(sub z2) is lower than 0.01, which corresponds to a great different on F(sub z2) between male and female. Conclusion. Some significant conclusions of the repetition, dispersion, symmetry and different of gait data have been obtained by the analysis. Key words : force platform ; gait analysis ;ground reaction forces ;temporal parameters Address reprint requests to : MA Jun. Department of Material Science & Engineering, Tsinghua University,

Author

Statistical Analysis; Males; Diseases; Females; Gait; Human Beings

20040040354 Technical Inst. of Physics and Chemistry, Beijing, China

Analysis of Heat Transfer in Tissues during Percutaneous Hot Saline Injection Therapy

Gui, Lin; Liu, Jing; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 336-339; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to establish a mathematical model for heat and fluid transport in living tissues and perform preliminary study on a new hyperthermia approach based on percutaneous injection of boiled hot saline water. The problem was simplified as heat and flow transfer in one-dimension spherical coordinate system. Heat and mass transfer between hot saline and tumor tissue was simulated basing on Pennes bio-heat equation for porous medium. Transient moving front of the hot saline, transient moving front of the heat and the temperature distribution, as well as influences of injection velocity on the above fronts were obtained through theoretical prediction. It is concluded that when well controlled, the hot saline injected percutaneously can readily raise the temperature of the target site in the tumor. This is of importance for clinical treatment of tumors.

Author (revised)

Fluid Injection; Tumors; Heat Transfer; Tissues (Biology); Water; Salts

20040040357 Beijing Agricultural Univ., China

Effects of Simulated Weightlessness on Reproduction in Male Rats

Zheng, Xing; Zhang, Xiao-Ping; Wan, Yu-Min; Qin, Yi; Wang, Jian-Jin; Li, Ying-Hui; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 379-381; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

To study the effects of tail-suspension on gonad and spermatic hormone in male rats. Method After tail-suspension and reambulation some times in male rats, weight of testis was measured, sperm of epididymis was inspected, morphology of testicular cell was compared, and antent of testosterone assay by radioimmunoassay ratio of LH-p positive cell in pituitary was measured by immunohistochemic. Result After tail-suspension, weight of testis in male rats decreased significantly. Shape of the convoluted tubules and number of all levels of the spermatocyte in testis atrophied markedly. No sperm was found in the epididymis. Content of testosterone decreased markedly. Number of positive cell of p-subunit of LH in the pituitary increased markedly . Conclusion Tail-suspension has negative effect on sex gland and reproduction function of male rats.

Author

Weightlessness Simulation; Rats; Pituitary Gland; Morphology; Males

20040040358 Fudan Univ., Shanghai, China

Studies on a Non-invasive System for Estimation of the Resistance of Children's Pulmonary Vessels

Cai, Xiao-Dong; Wang, Yuan-Yuan; Wang, Wei-Qi; Zhang, Yu-Qi; Chen, Shu-Bao; Luo, Zhong-Chi; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 360-363; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to study and develop a non-invasive system for estimation of children's pulmonary vessel resistance (PVR). ECG signals and blood flow ultrasound Doppler signals were sampled. Then the spectrogram of the signals were analyzed. By extracting the envelop and its feature points from the spectrogram, hemodynamic parameters of the pulmonary circulation, including pulmonary vessel resistance, were finally calculated. The hemodynamic parameters of pulmonary circulation estimated using this system were well related to the clinical statistical data. It showed that the estimated PVR is an useful index for clinic diagnosis. The system proposed in this paper can be used to estimate the PVR.

Author

Nonintrusive Measurement; Children; Hemodynamic Responses; Pulmonary Circulation

20040040359 Beijing Univ. of Aeronautics and Astronautics, Beijing, China

Numerical Analysis of Finger Temperature Distribution in a Cold Environment

Sang, Min-Jing; Yuan, Xiu-Gan; Qiu, Yi-Fen; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 340-343; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective for this research is to discuss temperature distribution over the finger, so as to provide reference for thermal protection of the hand. A mathematical model for thermoregulation of trunk including hands was established. In the model, the trunk was divided into 15 segments and the hand was divided into palm and 5 fingers. The model was presented as a consistent set of bio-heat equations and was solved by a finite element method. The effect of wind speed on the finger temperature is so evident, while the effect of artery blood temperature on the finger temperature is so little. Through the

comparison with the result of literature the establishment of the model was proved to be reasonable and the method feasible. Author (revised)
Fingers; Temperature Distribution; Thermoregulation

20040041354 NASA Glenn Research Center, Cleveland, OH, USA
Generational Analysis Reveals that TGF-Beta1 Inhibits the Rate of Angiogenesis in Vivo by Selective Decrease in the Number of New Vessels
Parsons-Wingerter, Patricia; Elliott, Katherine E.; Farr, Andrew G.; Radhakrishnan, Krishnan; Clark, John I.; Sage, E. Helene; Microvascular Research; 2000; ISSN 0026-2862; Volume 59, pp. 221-232; In English
Contract(s)/Grant(s): NCC3-782; NSF EEC-95-29161; NIH-EY-04542; NIH-GM-40711; Copyright; Avail: Other Sources

Quantitative analysis of vascular generational branching demonstrated that transforming growth factor-beta1 (TGF-beta1), a multifunctional cytokine and angiogenic regulator, strongly inhibited angiogenesis in the arterial tree of the developing quail chorioallantoic membrane (CAM) by inhibition of the normal increase in the number of new, small vessels. The cytokine was applied uniformly in solution at embryonic day 7 (E7) to the CAMs of quail embryos cultured in petri dishes. After 24 h the rate of arterial growth was inhibited by as much as 105% as a function of increasing TGF-beta1 concentration. Inhibition of the rate of angiogenesis in the arterial tree by TGF-beta1 relative to controls was measured in digital images by three well-correlated, computerized methods. The first computerized method, direct measurement by the computer code VESGEN of vascular morphological parameters according to branching generations G(sub 1) through G(sub greater than or equal to 5), revealed that TGF-beta1 selectively inhibited the increase in the number density of small vessels, N(sub v greater than or equal to 5), (382 plus or minus 85 per square centimeter) for specimens treated with 1 microgram TGF-beta1/CAM for 24 h, compared to 583 plus or minus 99 per square centimeter for controls), but did not significantly affect other parameters such as average vessel length or vessel diameter. The second and third methods, the fractal dimension (D(sub f)) and grid intersection (rho (sub v)), are statistical descriptors of spatial pattern and density. According to D(sub f) and rho(sub v), arterial density increased in control specimens from 1.382 plus or minus 0.007 and 662 plus or minus 52 per square centimeters at E7 (0 h) to 1.439 plus or minus 0.013 and 884 plus or minus 55 per square centimeters at E8 (24 h), compared to 1.379 plus or minus 0.039 and 650 plus or minus 111 per square centimeter for specimens treated with 1 microgram TGF-beta1/CAM for 24 h. TGF-beta1 therefore regulates vascular pattern and the rate of angiogenesis in a unique fingerprint manner, as do other major angiogenic regulators that include VEGF, FGF-2 (bFGF), and angiostatin. TGF-beta1 did not stimulate angiogenesis significantly at low cytokine concentrations, which suggests that this quail CAM model of angiogenesis is not associated with an inflammatory response.
Author
In Vivo Methods and Tests; Quantitative Analysis; Regulatory Mechanisms (Biology); Cytology

20040043711 Arizona State Univ., Tempe, AZ, USA
The Protective Roles of the Antioxidant Enzymes Superoxide Dismutase and Catalase in the Green Photosynthetic Bacterium Chloroflexus Aurantiacus
Blankenship, Robert E.; Rothschild, Lynn, Technical Monitor; [2004]; 7 pp.; In English
Contract(s)/Grant(s): NGT2-52284; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of this study was to examine the biochemical response of the green thermophilic photosynthetic bacterium Chloroflexus aurantiacus to oxidative stress. Lab experiments focused primarily on characterizing the antioxidant enzyme superoxide dismutase and the response of this organism to oxidative stress. Experiments in the field at the hotsprings in Yellowstone National Park focused on the changes in the level of these enzymes during the day in response to oxidants and to the different types of ultraviolet radiation.
Author
Antioxidants; Enzymes; Catalase; Thermophiles; Yellowstone National Park (ID-MT-WY)

20040043746 Academy of Health Sciences (Army), Fort Sam Houston, TX
Initiative to Recapture Orthopedics Workload Using Business Case Analysis at Evans Army Community Hospital
Pace, Noel C.; Aug. 2001; 126 pp.; In English
Report No.(s): AD-A420395; HCA-13-01; No Copyright; Avail: CASI; A07, Hardcopy

Currently the civilian Managed Care Support Contractors (MCSC) that provide healthcare services to the military health system (MHS) are costing the government too much money. In October of 2000, the Surgeon General of the USA Army, Lieutenant General James Peake, mandated that all Army healthcare facilities 'must increase their productivity and utilize a

business case analysis (BCA) process to determine how to best recapture workload from the MCSC's,' in order to save the government money. This study is an initiative that uses the BCA process in an effort to recapture orthopedics workload at Evans Army Community Hospital, Fort Carson, Colorado. This study demonstrates that by using the sound business practices of the BCA process, an initial investment of approximately $295,000 in personnel and resources to recapture orthopedics workload from the MCSC can save the government approximately $330,000 net in healthcare costs. LTG Peake used the results of this study in his testimony to members of the USA Senate on February 28, 2001. He said this study 'is as an example of how to optimize the productivity and utilization of military hospitals and clinics consistent with sound business practices.' DTIC

Budgeting; Commerce; Hospitals; Medical Services; Military Operations; Orthopedics; Workloads (Psychophysiology)

20040043747 Academy of Health Sciences (Army), Fort Sam Houston, TX

A Study to Determine the Tripler Army Medical Center Urology Clinic's FY 2001 Outpatient Service Charges to the Veterans Administration

Sander, Paul M.; Apr. 13, 2001; 64 pp.; In English

Report No.(s): AD-A420409; HCA-8-01; No Copyright; Avail: CASI; A04, Hardcopy

The objective of this study was to determine the Tripler Army Medical Center (TAMC) Urology clinic's outpatient service charges to the Veterans Administration (VA) for fiscal year 2001. A sensitivity analysis was conducted using a six- month sample of TAMC Urology clinic VA beneficiary (VAB) encounters (509 clinic and ambulatory procedure visits) and six federal and civilian outpatient billing methodologies in order to determine fair and reasonable TAMC Urology clinic outpatient charges to the VA. The six outpatient billing rates used in this study were the full and relevant Medical Expense and Performance Reporting System (MEPRS), full federal third- party and Interagency, local Hawaiian usual, customary, and reasonable (UCR), and Medicare's Outpatient Prospective Payment System (OPPS). The Medicare OPPS, though projected to initially reimburse 40 percent less than the current TAMC outpatient billing methodology (relevant MEPRS), adheres to current joint VA/DoD outpatient billing guidelines, is competitive with local healthcare market rates, and it satisfies the 2000 National Defense Authorization Act directive to implement an itemized CPT outpatient billing methodology (by 2002) similar to civilian industry standards. Based on the results of this study, a recommendation was made to implement Medicare OPPS billing rates for the TAMC Urology clinic for FY2001.
DTIC

Clinical Medicine; Health; Medical Services; Urology

20040043749 Air Command and Staff Coll., Maxwell AFB, AL

America's Food: Does Anthrax Pose A Threat?

Perkowski, Stefanie C.; Apr. 2002; 57 pp.; In English

Report No.(s): AD-A420514; AU/ACSC/092/2002-04; No Copyright; Avail: CASI; A04, Hardcopy

The project addresses the pathogen B. anthracis and its potential use to maliciously contaminate America's food supply. The potential social, political and economic ramifications of such an agro-terrorism attack are addressed at length. The preparedness of the USA to stave off such an act of aggression is also evaluated. Lastly, the paper's emphasis is the threat of anthrax to America's food and livestock, and its potential to cause fatal food poisoning. The methodology used is an extensive review of open-source literature, including medical and scientific journals, general publications and current news items. There is much emphasis on food security as an issue of national security. Conclusions are that the USA has one of the safest food supplies in the world; however nothing is entirely secure. The use of anthrax against USA food supplies would unlikely cause high numbers of deaths, but could instead incite social, political and economic instability through frank terrorism. The paper recommends a closer look at the anthrax vaccination program for animals, but agrees with the CDC that the vaccine is not indicated for first responders and medical personnel, based on the intelligence available regarding the threat. The paper emphasizes food security as an integral part of national security and recommends additional research in this area as part of Homeland Defense.
DTIC

Infectious Diseases

20040043766

Analysis of the MEDCOM Patient Safety Climate Survey: Implications for Implementation of the AMEDD Patient Safety Program

Doleman, JoAnn S.; Apr. 14, 2002; 118 pp.; In English

Report No.(s): AD-A420627; AMDCS-40-02; No Copyright; Avail: CASI; A06, Hardcopy

In response to emphasis on patient safety following publication, in November 1999, of the Institute of Medicine's report 'To Err Is Human, U.S. Army Medical Command (MEDCOM) established a Patient Safety Program for the Army Medical Department (AMEDD). MEDCOM Regulation 40-41 directs each Medical Treatment Facility to implement a Patient Safety Program dedicated to avoiding harm and enhancing patient safety. As part of a comprehensive strategy to improve safety by first assessing the magnitude of the problem, MEDCOM administered a 'Patient Safety Climate Survey' to staff of all U.S. Army Military Treatment Facilities (MTFs) in August/September 2001. Nineteen Likert scale items and one open-ended question assessed perceptions about three conceptual components of an effective patient safety program: willinguess to report errors, organizational problem-solving process, and perceptions about leadership concern for patient safety. The purpose of this study was to analyze the 10,768 responses to assess the corporate climate, identify respondents' perceptions of barriers to reporting errors, prioritize safety issues identified, and make recommendations for improving patient safety throughout the AMEDD. Although a 'culture of blame' exists in Army MTFs, respondents perceive that leadership is concerned about patient safety and that problem solving processes to reduce medical error are being implemented.
DTIC
Climate; Clinical Medicine; Health; Leadership; Medical Services; Military Operations; Patients; Safety

20040043767 Central Texas Veterans Health Care System, Austin, TX
A Forecast of Competencies Required for Management of Multiple Site Healthcare Services: A Delphi Study of Managers in a Veterans Health Administration Integrated System
Welch, Andrew M.; Jun. 21, 2001; 58 pp.; In English
Report No.(s): AD-A420628; AMDCS-38-01; No Copyright; Avail: CASI; A04, Hardcopy

Management, both at mid-level and top-level, is interested in discovering the factors that might improve the likelihood of effective multisite management. This research provides a scientifically derived and prioritized list of important competencies for success as a manager of multisite healthcare services. The subjects of this study are 61 managers of services in an integrated Veterans Health Administration healthcare system. These managers responded, to two separate rounds of questionnaires using the Delphi method. The first round resulted in 45 respondents who supplied a total of 216 competency phrases and 528 SKA phrases. Listed in order of frequency of competency phrase within each group, these domains were: management communication, interpersonal effectiveness, leadership, professional competence resource management, personal qualities, personal mastery, and systems thinking. A total of 36 subdomains were grouped and named by an expert panel. The second Delphi iteration included a structured questionnaire that consolidated the SKAs down to 230 and enabled each to be rated using a seven-point relative importance scale. According to the results of this iteration, the most important SKAs for successful multisite management of services are based on individual attributes at the interpersonal level while attributes in the area of technical competence were less important.
DTIC
Delphi Method (Forecasting); Forecasting; Health; Human Relations; Medical Services; Project Management

20040043768 TRICARE Southwest, San Antonio, TX
Changes in Patient Satisfaction Staff Satisfaction and Efficiency Following the Implementation of the Air Force Primary Care Optimization Program
Johnson, George P.; May 2001; 409 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420629; AMDCS-33-01; No Copyright; Avail: CASI; A18, Hardcopy

Efficiency staff satisfaction and, possibly, patient satisfaction increased following implementation primary care optimization' (PCO). support staffing increased 62%, but was still below Air Force goals. Only 33% of'optimized' providers had a full complement of support staff. Enrollment increased 32% while daily productivity increased 21 to 35% depending on the calculation method utilized. Two areas of staff satisfaction: workload, and compensation, decreased following PCO. Five areas of staff satisfaction: treatment team, patient relationships, facility Support, efficiency, and quality, increased following PCO. The number of hours worked per week, nursing support, and the staff position were key variables affecting staff satisfaction. Other important variables included age, gender, and type of employee. Administrative activities were related to lower satisfaction. Efficiency gains have been impressive, but 18% more efficiency will be needed to meet the Surgeon General? 5 goal of an average enrollment of 1500 patients per provider. As primary care optimization matures and the leadership continues to press for more productivity, PCO staff satisfaction may decline because of longer hours' and a more hectic work pace. Staff satisfaction and patient satisfaction should be monitored closely to ensure that further increasing productivity does not have an adverse effect on these important factors.
DTIC
Health; Medical Services; Patients; Tasks

20040043796 Johns Hopkins Univ., Baltimore, MD

A Cost Benefit Analysis for Justification of Additional Funding to Support the Listening Center Cochlear Implant Services at a Large Tertiary Care Teaching Institution

Doucette, Sandra L.; Mar. 31, 1999; 40 pp.; In English

Report No.(s): AD-A420673; AMDCS-34-99; No Copyright; Avail: CASI; A03, Hardcopy

In May 1998 the TCTI Listening Center Cochlear Implant administrative team presented a business plan to the institutional business review group. All rehabilitation and audiology service volumes for this program are primarily directly related to surgical implantation volumes. FY 97 records showed 63 surgeries budgeted and 43 actually performed. FY 98 data budgeted for 19 and actually performed 60. Consequently, the funds requested were approved minus $88,000 needed to fund additional clinical and administrative support staff Retrospective review of first quarter fiscal year 1999 data indicated 27 surgical implantations performed against 15 budgeted. A review of a sample of first quarter patient surgery charges revealed several charge system errors that were subsequently corrected. Combining increased patient volume with charge system corrections that result in an increase in per implantation allowable charges resulted in a substantial increase in institutional revenue. Updated surgical volume and revenue information was presented to institutional finance and management personnel. Subsequently, funding was allocated to support additional staff requirements. Recommendations were made to provide further accurate and detailed data that will assist in performing another cost benefit analysis when current staff is not able to support patient volumes.

DTIC

Clinical Medicine; Cochlea; Cost Analysis; Cost Effectiveness; Education; Implantation; Medical Services

20040043797 Naval Health Research Center, San Diego, CA

Fluorometric Detection of B. pertussis by Polymerse Chain Reaction (PCR) and Molecular Beacon Probe

Poddar, Saibol K.; Le, Charles T.; Gray, Gregory C.; Nov. 27, 2000; 7 pp.; In English

Report No.(s): AD-A420674; NHRC-00-46; No Copyright; Avail: CASI; A02, Hardcopy

Bordetella pertussis was detected by spectrofluorometry following PCR incorporating a molecular beacon probe in the reaction. A DNA fragment from the tandem repeat sequence region (1S481) of the genome of B. pertussis was amplified in presence of the probe. The probe sequence was complementary to an internal segment of the amplified DNA fragment. Fluorescein (FAM) and DABCYL were used as the fluorophore and quencher in the probe. The probe was characterized for its signal to noise ratio by homogeneous solution hybridization with a complementary oligonucleotide. Measurement of fluorescent signal at the emission maxima of FAM, immediately after a PCR allowed the detection of a B. pertussis target, requiring no additional steps. Presence of B. pertussis in a sample was also examined by agarose gel electrophoresis following PCR. A serial diluted stock of ATCC strain #9797 of B. pertussis and fourteen clinical isolates of B. pertussis were examined. The sensitivity of detection by fluorescent measurement was found to be at least in the range of 0. 0 1- 0.1 CFU in the tested volume of the sample and it was equal to or better than that detected by agarose gel analysis.

DTIC

Bacteria; Beacons; Detection; Fluorescence; Nucleotides; Optical Measuring Instruments

20040043799 Baylor Coll. of Medicine, Houston, TX

Research Training Program in Breast Cancer

Medina, Daniel; Jul. 2003; 38 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9073

Report No.(s): AD-A420678; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this research training program is to produce highly qualified scientists for careers as independent investigators in the field of breast cancer. During the last 25 years, there has been a fundamental revolution in the understanding of molecular and cell biological concepts related to cell growth, function and tumorigenesis. To utilize what has been learned and to continue future progress in the area of breast cancer requires the continued availability of well-trained, innovative and committed scientists. This program represents an interdepartmental training program involving 15 investigators form seven departments. Trainees are predoctoral and postdoctoral fellows with backgrounds in biochemistry, cell and molecular biology, molecular genetics and molecular virology. The training program provided trainees with additional foundation in carcinogenesis and breast cancer. In addition to the core curriculum taken by the predoctoral fellow in their respective academic departments, program enhancement is provided through trainees' participation in a graduate course on 'Molecular Carcinogenesis' (predoctoral fellows), a Breast Disease Research Seminar (all trainees) and participation at national meetings

and local seminars. Predoctoral and postdoctoral trainees are enrolled in the program.
DTIC
Cancer; Education; Mammary Glands

20040043801 Naval Health Research Center, San Diego, CA
Summary of Findings for Initial Task Identification for Military Operations in Urban Terrain (MOUT)
Vickers Jr, Ross R.; Hodgdon, James A.; Nov. 17, 1999; 24 pp.; In English
Report No.(s): AD-A420682; MHRC-00-04; No Copyright; Avail: CASI; A03, Hardcopy

Demographic and geopolitical trends make it certain that urban settings will be the sites of military conflicts more often in the future than in the past. Sixteen subject matter experts (SMEs) identified 46 physically demanding tasks for military operations in urban terrain (MOUT). Tasks were rated for level of physical demand, importance, and frequency of performance. Cluster analysis of the average SME ratings identified three clusters. One cluster consisted of tasks with high ratings on all three scales. A second cluster consisted of tasks with high physical demand ratings, but moderate frequency and importance ratings. The third cluster consisted of tasks with low importance and low frequency ratings. Tasks in the first cluster were used to describe physical ability requirements in MOUT because these tasks appeared the most likely to be points of performance failures. These tasks primarily involve the movement of personnel and supplies through windows and up and down stairs. MOUT physical conditioning programs should focus on upper and lower body muscle strength and endurance, particularly bursts of power lasting I 0-20 seconds. Normal preparations for the Physical Fitness Test should provide adequate aerobic capacity. Training on obstacle courses may be useful for developing the required strength and muscle endurance.
DTIC
Intelligence; Military Operations; Physical Fitness; Terrain

20040043813 Leonard Wood Army Community Hospital, Fort Leonard Wood, MO
Determining Personnel Staffing Levels for General Leonard Wood Army Community Hospital Using the Automated Staffing Assessment Model (ASAM)
Letizio, Robert A.; Apr. 1999; 59 pp.; In English
Report No.(s): AD-A420711; No Copyright; Avail: CASI; A04, Hardcopy

Fort Leonard Wood is expecting approximately 7,537 additional personnel as a result of the Base Realignment and Closure (BRAC) process. The increase is approximately 23% above the current population of 33,116 personnel. The Automated Staffing Assessment Model (ASAM) was used to forecast additional personnel requirements for General Leonard Wood Army Community Hospital (GLWACH) in response to the BRAC increase. A 23% increase was applied to the current Medical Expense and Performance Reporting System (MEPRS) workload levels within each hospital service and specialty. The results showed an increase in staffing requirements of eighty-three personnel (from 901 to 984), an increase of approximately 9.2%. Ten of the eighteen major functions within the hospital realized an increase. The largest percentage increase was realized in the Pathology Division (26%); the largest raw increase was realized in the Division of Primary Care and Community Medicine (28 personnel). Although the ASAM yielded useful information, additional data must be gathered before the validity of the ASAM as a forecasting tool can be assessed.
DTIC
Hospitals; Medical Personnel; Medical Services; Military Operations; Personnel; Wood

20040043819 Michigan Univ., Ann Arbor, MI
Suppression of KFkB by Tetrathiomolybdate Inhibits Tumor Angiogenesis and Enhances Apoptosis in Human Breast Cancers
Pan, Quintin; May 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0492
Report No.(s): AD-A420719; No Copyright; Avail: CASI; A02, Hardcopy

Angiogenesis, the formation of capillaries from pre-existing blood vessels, is essential for sustained growth of solid tumors. Numerous studies have shown that copper is required to modulate several pro-angiogenic factors. However, the specific effects of copper homeostasis on tumor angiogenesis have not been extensively studied. Our preliminary studies demonstrated that tetrathiomolybdate, a potent and novel copper chelator, blocks tumor growth and angiogenesis. We hypothesize that TM is inhibiting tumor angiogenesis by decreasing levels of VEGF, bFGF, IL-6, and IL- 8 through interference with the NFkB signaling cascade. In this proposal, the molecular mechanism whereby TM regulates NFkB expression and activity will be investigated. We will establish if the NFkB transcription factor complexes, p50, p52, RelA, and

RelB, are regulated by TM using Western blot analysis and gel shift assays. Furthermore, using a reporter gene system, we will ascertain if TM regulation of VEGF, bFGF, IL-6, and IL-8 is a direct consequence of NFkB signal inhibition. The studies as outlined will help us better understand the role of copper deficiency in tumor angiogenesis and may lead to a more specific and potent global anti- angiogenic approach to treat breast cancer.
DTIC
Apoptosis; Cancer; Mammary Glands; Tumors

20040043828 Mitre Corp., McLean, VA
The Computational Challenges of Medical Imaging
Stubbs, Christopher; Brenner, Michael; Despain, Alvin; Henderson, Robert; Long, Darrell; Feb. 2004; 53 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 13039021-DC
Report No.(s): AD-A420728; JSR-03-300; No Copyright; Avail: CASI; A04, Hardcopy

JASON will undertake a study for the DOE and the NIH National Institute for Bio-medical Imaging and Bio- engineering on the role of computation (broadly defined to include raw computational capabilities, mass storage needs, and connectivity) for medical imaging. This study will address the computational requirements in three general areas: * The fusion of image data of varying modalities, over differing spatial and temporal scales and resolutions. * The extraction and display of quantitative information, with associated uncertainties. 0 Data archiving: raw vs. extracted parameters, metadata standards.
DTIC
Imaging Techniques; Medical Services; Radiography

20040043835
Proceedings of EUROTOX 2002, Congress of the European Societies of Toxicology (40th)
Apr. 11, 2003; 472 pp.; In English
Contract(s)/Grant(s): F61775-02-WF-043
Report No.(s): AD-A420737; EOARD-CSP-02-5043; No Copyright; Avail: CASI; A20, Hardcopy

The Final Proceedings for 40th Congress of the European Societies of Toxicology (EUROTOX 2002), 15 September 2002 - 18 September 2002 This is an interdisciplinary conference. Topics include mechanisms of exposure, biomedical issues (neurotoxicity, genotoxicity, immunotoxicity, etc), exposure modeling, environmental monitoring, and risk assessment.
DTIC
Conferences; Toxicology

20040043843 Army Soldier Systems Command, Natick, MA
Waterproof, Breathable Fabrics for Military Clothing Systems: An Innovative Approach to Acquisition
Smedstad, Neil E.; Apr. 1995; 32 pp.; In English
Report No.(s): AD-A420748; NATICK/TP-9/3504; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Army Natick Research, Development and Engineering Center (Natick) is charged with the mission to continually improve the protective clothing systems and individual equipment for soldiers and marines in the field. For the past 10 years, we have relied on the use of state-of- the-art materials that resist penetration of water, while allowing moisture vapor to pass out through the garments. The use of such materials minimizes condensation of moisture that could create a conductive cold layer next to the skin, keeps the wearer dry, and reduces the potential for cold injuries.
DTIC
Clothing; Fabrics; Injuries; Personnel; Protective Clothing; Waterproofing

20040043844 Tripler Army Medical Center, Honolulu, HI
Computer Simulation of an Anesthesia Service at a U.S. Army Medical Treatment Facility
Cook, Jerry A.; Aug. 1999; 36 pp.; In English
Report No.(s): AD-A420750; 8-99; No Copyright; Avail: CASI; A03, Hardcopy

With the emphasis on cost-saving continuously growing within the Military Health System, the leadership of Tripler Army Medical Center (TAMC) has responded by implementinga corporate style of practice and a business philosophy that prescribes more efficient use of assets. Increased business case analyses and increased cooperation with Queens Health Plans,the local TRICARE sub-contractor, evidence this. One particularly successful example of this cooperation is the use of Resource Sharing Agreements (RSA) a mutually beneficial arrangement where the contractor alleviates an identified specific personnel

shortage by providing a health professional to fill that specified position within the hospital. However, TAMC departments often perceive the personnel gained through these RSAs as free labor. This misperception has contributed to an increase in the number of requests within the command as well as the resulting need to further scrutinize the requests. One such request from the hospitals anesthesia service prompted the command to commission this study to analyze empirical data to substantiate the workload and staffing levels within the service. The study was accomplished using a simulation modeling software program and existing as well as gathered data on all the anesthesia service at TAMC. The purpose was to compare not only the overall workload vs. staffing levels, but also the ratio of Certified Registered Nurse Anesthetists (CRNA) to Anesthesiologist Consultants. Three models were built with all factors identical except the number and assignment of the Anesthesiologist Consultants. Analysis of the simulation results indicates that the current workload could still be done after reducing the number of Anesthesiologists.
DTIC
Anesthesia; Computerized Simulation; Cost Analysis; Health; Medical Services

20040043846 Academy of Health Sciences (Army), Fort Sam Houston, TX
Selection of Equipment Service Option, Estimation of Equipment Maintenance Costs, and Comparative Costs Analysis, Brooke Army Medical Center, Fort Sam Houston, Texas
Olaiya, Samuel T.; Mar. 1999; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420753; HCA-3-99; No Copyright; Avail: CASI; A04, Hardcopy

Due to the increasing cost of health care, it behooves health care administrators to continue to look for ways of doing business cost-effectively without jeopardizing quality of care or limiting access to care. The purpose of this study was to: 1. Develop a decision making model that could be easily used by managers to evaluate and select appropriate service options. 2. Develop a maintenance cost estimation model. 3. Evaluate the efficiency of Brooke Army Medical Centers (BAMC) equipment management program. To address the first concern, the JUDGE model was used to breakdown decision into a list of attributes that influence what action would be ultimately taken. With regard to maintenance costs estimation, a retrospective study, based on a sample of 119 observations from Brooke Army Medical Center s (BAMC) property accounting system, was done to determine if there was a statistically significant difference in maintenance costs based on service option, equipment age, acquisition cost, equipment type and usage rate. As for the comparative costs analysis, performance ratios were utilized to evaluate the efficiency of BAMC in comparison to two other medical centers. Overall, this study showed that cost- effective equipment management techniques could be employed to monitor maintenance costs.
DTIC
Costs; Houston (Tx); Maintenance; Total Quality Management

20040043851 California Univ., Berkeley, CA
Reconstruction of Mammary Gland Structure Using Three-Dimensional Computer-Based Microscopy
DE Solorzano, Carlos O.; Aug. 2003; 58 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0306
Report No.(s): AD-A420761; No Copyright; Avail: CASI; A04, Hardcopy

During the administrative funding period of this grant we have developed a system that permits three- dimensional reconstruction of entire the entire murine ductal epithelium from physical tissue sections. The system reduces the interaction required for low- resolution imaging of H&E stained sections, registration of images of consecutive sections and annotation of tissue structures -i.e. morphologically normal ducts and intraductal tumors- in the images. In addition, we have developed fully automatic tools for image registration and annotation that are now being integrated in our system and used in the reconstruction of the latest tissue specimens. Complementing morphological H&E based reconstruction, our system can be used for morphologically driven acquisition of high- resolution images form immunostained intermediate sections, both using fluorescence and bright field microscopy. To show the use of our system, we are using our it to compare the whole-gland distribution of hormone receptors (ER and PR) in the development of the mouse mammary gland. Under the one year, no cost extension requested, we will complete imaging and quantifying the whole-gland cell- by-cell ER and PR status of the mammary gland as it evolves through puberty into maturity.
DTIC
Cancer; Computer Techniques; Mammary Glands; Microscopy

20040043853 American Red Cross, Rockville, MD

The Role of Actin Polymerization in Tumor Metastasis

Zhan, Xi; Aug. 2003; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0125

Report No.(s): AD-A420763; No Copyright; Avail: CASI; A03, Hardcopy

Breast cancer is frequently associate with gene amplification of EMS1 or cortactin, a protein that regulates the assembly of filamentous actin (F-actin). Previous studies have demonstrated that overexpression of cortactin results in increase in metastases and invasion of breast tumor cells. The goal of this project is to reveal the biological significance of the interaction of cortactin with phospholipids, which are known to play a critical role in the modulation of cell migration in response to extracellular stimuli. Cortactin binds to a subset of phosphatidylinositides, including phosphatidylinositol 5- phosphoate (PI(5)P) , phosphatidylinoistol 4,5 biophosphoate (PI(4,5)P2) and phosphatidylinositol 4-phosphoate (PI(4)P). Interestingly, not all those phospholipids show a similar effect on%the activity of cortactin. While PI(5)P increases the activity of cortactin for actin assembly, PI(4)P inhibits the cortactin mediated actin branching. This data indicates that the activity of cortactin is regulated by different types of membrane phospholipids. In addition, we also utilized small interference RNA to inhibit the expression of cortactin in breast cancer cells. These RNAs inhibit the cortactin expression by more than 80%, impair the actin assembly and reduce the formation of invadopodia. Thus, cortactin is essential for the actin-based invasiveness of tumor cells and modulates actin assembly that is subject to regulation by specific phospholipids.

DTIC

Cancer; Mammary Glands; Metastasis; Polymerization; Tumors

20040043855 Walter Reed Army Medical Center, Washington, DC

A Proposal for the Consolidation of Dermatology Services of Walter Reed Army Medical Center and the National Naval Medical Center

Brant, David A.; Aug. 1999; 55 pp.; In English

Report No.(s): AD-A420765; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this project is to determine if consolidating dermatology services of Walter Reed Army Medical Center (WRAMC) and the National Naval Medical Center (NNMC)at one location will lead to increased efficiency for those beneficiaries seeking dermatological care. Visits to WRAMC for the 12 month period ending June 30th, 1998 totaled 18,937 with anaverage cost per visit of $138.55. Patient visits for the same period totaled 15,108 at NNMC and averaged $238.05 per visit. Though both clinics are cost-effective, more can be done to improve efficiency. Performing a cost-effectiveness analysis allowed other factors such as staffing requirements, Graduate Medical Education, and access to care to be considered in the examination. The studys recommendation is to merge WRAMC and NNMC clinics at NNMC to form one department solely responsible for providing dermatological care to military beneficiaries. Despite the studys overall recommendation, a successful consolidation will be difficult to achieve without major changes to intangible factors that currently exist within the two separate services. For consolidation to succeed, the rigid, service focused cultures must be replaced by philosophies that value flexibility, forward thinking, and the processes for delivering high- quality, cost-effective patient care. All stakeholders in this effort must be susceptible to change and the higher authorities must be willing to accept a level of risk and change the ways of the past. Consolidation efforts are doomed to fail if those entering the mergers lack a clear understanding of why they are doing it. Armed with a willingness to compromise and share accountability, consolidating dermatology services in the National Capital Area is attainable.

DTIC

Clinical Medicine; Consolidation; Cost Effectiveness; Dermatology; Medical Services

20040043856 Georgetown Univ. Hospital, Washington, DC

Gene Regulation and Expression Pattern of the Growth Factor Pleiotrophin in Breast Cancer

Stoica, Gerald E.; Sep. 2003; 16 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9204

Report No.(s): AD-A420767; No Copyright; Avail: CASI; A03, Hardcopy

Pleiotrophin is growth factor that has mitogenic and anti-apoptotic effects in a variety of cell lines. It is also a positive regulator of tumor angiogenesis. PTN is expressed in breast cancer cell line and in primary tumor specimens as well as in fibroblasts and endothelial cell. In order to understand the biological and biochemical effects of PTN, we uncovered the PTN receptor anaplastic lymphoma kinase (ALK). Our goal was to study the signal transduction pathways for ALK/PTN axis and the modulation of ALK in stromal cells. ALK is activated by PTN and, sequentially, activates an array of second messengers in various cell lines. We identified some of the interaction partners of ALK that participate in signal transduction. In stromal

cells, ALK could be upregulated by growth factors and conditioned media from an array of cancer cells. Upregulated levels of ALK in HUVEC render these cells more susceptible to PTN and promote angiogenesis. Moreover, we tested the functional consequences of downregulation of ALK by si RNA. This approach, coupled with designing small molecule inhibitors for ALK would contribute to blocking of the activation of ALK in stromal cells and promotion of tumor growth in response to PTN secreted from human mammary cancer cells.
DTIC
Cancer; Gene Expression; Mammary Glands

20040043857 Northern California Inst. for Research and Education, San Francisco, CA
A Novel Signaling Perturbation and Ribozyme Gene Therapy Procedure to Block Rho-Kinase (ROK) Activation and Breast Tumor Metastasis
Bourguignon, Lilly Y.; Sep. 2003; 49 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9291
Report No.(s): AD-A420768; No Copyright; Avail: CASI; A03, Hardcopy

In this study we have examined CD44 AN HYALURONAN (HA) receptor interaction with a RhoA-specific guanine nucleotide exchange factor (p11 5RhoGEF) in human metastatic breast tumor cells (MDA-MB-23 1 cell line). Immunoprecipitation and immunoblot analyses indicate that both CD44 and p115RhoGEF are expressed in MDA-MB-231 cells, and that these two proteins are physically associated as a complex in vivo. The binding of HA to MDA-MB-231 cells stimulates p115RhoGEF-mediated RhoA signaling and Rho-Kinase (ROK) activity which, in turn, increases serine/ threonine phosphorylation of the adaptor protein, Gab-1 (Grb2-associated binder-1). Phosphorylated Gab-1 promotes PI3 kinase recruitment to CD44v3.
DTIC
Cancer; Enzyme Activity; Gene Therapy; Mammary Glands; Metastasis; Perturbation; Tumors

20040043858 Baylor Coll. of Medicine, Houston, TX
Gene Targets of C/EBPB Involved in Mammary Gland Development and Breast Cancer
Grimm, Sandra L.; Rosen, Jeffrey; Aug. 2003; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0138
Report No.(s): AD-A420769; No Copyright; Avail: CASI; A03, Hardcopy

Targeted deletion of the bZIP transcription factor, C/EBPbeta, was shown previously to result in aberrant ductal morphogenesis and decreased lobuloalveolar development, accompanied by an altered pattern of progesterone receptor (PR) expression. Similar changes in the level and pattern of prolactin receptor (PrIR) and estrogen receptor alpha (ERa) expression were also observed in C/EBPbeta KO mice. PR patterning was also altered in PrIR KO mice, and in mammary tissue transplants from both PrIR KO and Stat5a/b-deficient mice, with concomitant defects in hormone-induced proliferation. Along with decreased BrdU-Incorporation and decreased expression of K167 were increases in the cyclin- dependent kinase inhibitors p21 and p27. lGFBP-5, lGF-ll, and IRS-1 all displayed altered patterns and levels of expression in C/EBPbeta KO mice, suggestive of a change in the lGF signaling axis. Increased expression of markers of ductal epithelium, such as NKCC1, aquaporin 5 and keratin 8, were observed in C/EBPbeta KO glands. In addition, SPRR2A, a marker of epidermal differentiation, and keratin 6 were misexpressed in the mammary epithelium of C/ EBPbeta KO mice. Together, these data suggest that C/EBPbeta is a master regulator of mammary epithelial cell fate and that the correct spatial pattern of PR and PrlR expression is a critical determinant of hormone-regulated cell proliferation.
DTIC
Cancer; Genes; Mammary Glands; Targets

20040043859 Minnesota Univ., Minneapolis, MN
A Novel Approach to Increase Breast Cancer Chemosensitivity: Disruption of the Anti-Apoptotic Function of Translation Factor eIF4E
Polunovsky, Vitaly A.; Oct. 2003; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9298
Report No.(s): AD-A420770; No Copyright; Avail: CASI; A03, Hardcopy

The objective of the project was to experimentally test the idea that targeted disruption of the anti-apoptotic function of the translational complex eIF4F can sensitize breast carcinoma cells to therapeutic doses of a non-genotoxic cytostatic agents and/or to low concentrations of genotoxic agents. We demonstrated that enhanced integrity of the cap- dependent translational

complex eIF4F cells breast carcinoma lines harboring diverse oncogenic alteration is associated with increased resistance of cancer cells to drug-induced apoptosis. Enforced activation of eIF4F in mammary epithelial cells increases their resistance to apoptosis and results in cells that are able to form transformed foci in vitro. Accordingly, targeted disruption of the cap-dependent translational complex by ectopic overexpression of the translational repressor 4E-BP1 stimulates apoptosis, abrogates chemoresistance and in vivo tumorigenicity in breast carcinoma cells in a manner dependent on a phosphorylation status of 4E- BP 1. These data show that both genesis and maintenance of a drug resistant neoplastic phenotype in mammary epithelial cells are strictly dependent upon the activation status of the eIF4F-mediated translational apparatus. They provide the conceptual basis for a new approach to anticancer therapy: correcting aberrant translation as a complement to strategies that target_malignant cells by activating apoptosis.
DTIC
Apoptosis; Cancer; Mammary Glands; Translating

20040043860 California Univ., Berkeley, CA
Mechanisms of Intraductal Tumor Spread
DE Solorzano, Carlos O.; Aug. 2003; 64 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0227
Report No.(s): AD-A420771; No Copyright; Avail: CASI; A04, Hardcopy

During the administrative funding period of this grant, we have developed a system that permits three- dimensional reconstruction of intraductal tumors (DCIS) from physical tissue sections. The system reduces the interaction required for low-resolution imaging of H&E stained sections, registration of images of consecutive sections and annotation of tissue structures -i.e. morphologically normal ducts and intraductal tumors-in the images. In addition, we have developed fully automatic tools for image registration and annotation that are now being integrated in our system and used in the reconstruction of the latest tissue specimens. Complementing morphological H&E based reconstructon, our system can be used for morphologically driven acquisition of high-resolution images from immunostained intermediate sections, both using fluorescence and brightfield microscopy. We are using our system to characterize the cellular differences between malignant transformed cells and morphologically normal cells of ducts either in continuum or in the proximity of DCIS tumors. Under the no-cost extension requested, we expect to complete the characterization, which includes the following markers: Her2, ER and PR status Ki67 (proliferation), Caspase 3 (apoptosis) and a marker of dedifferentiation of stemness, CD49f.
DTIC
Cancer; Mammary Glands; Tumors

20040043861 Texas Univ., Houston, TX
Therapy of Breast Tumor Cells Overexpressing c- cerbB-2/neu
Siddik, Zahid H.; Apr. 2003; 187 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9269
Report No.(s): AD-A420773; No Copyright; Avail: CASI; A09, Hardcopy

Two of the major barriers against the successful therapy of breast cancer are mutation of the tumor suppressor p53 gene and overexpression of the c-erbB-2/neu (HER-2/neu) gene. These conclusions have been drawn from many studies reported over the last decade for each of these two genetic defects. However, the possibility of interactions between these two genes in the treatment outcome with therapeutic antitumor agents are limited, and have led to conclusions that are inconsistent. The end result is that treatment decisions are made in absence of any objective information to guide the design of the regimen. Of further concern is the absence of any therapeutic agents that could be used under such circumstances. The present research project was proposed to address these limitations.
DTIC
Cancer; Cells (Biology); Mammary Glands; Neoplasms; Therapy; Tumors

20040043862 Manitoba Univ., Winnipeg, Manitoba
Mammaglobin and Lipophilin Related Molecules in Normal and Tumor Human Breast Tissue: Expression, Hormone Regulation and Functional Analysis
Leygue, Etienne R.; Aug. 2003; 65 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0308
Report No.(s): AD-A420774; No Copyright; Avail: CASI; A04, Hardcopy

Genes, expression of which is breast specific or is altered during breast tumorigenesis, represent potential targets for new

preventive and curative strategies. Such genes, Mammaglobin (MGBl), hSBEM (Human Small Breast Epithelial Mucin), Psoriasin, Estrogen receptor beta (hERB) and SEA (Steroid receptor RNA activator), are currently studied in our group. We found that: MGBl expression correlates with ER (an established breast cancer prognostic and predictive factor), but is not modified by hormone treatments, suggesting it might be a new independent breast cancer prognostic marker. hSBEM, which represents an attractive candidate for a new breast tumor marker with obvious potential for cancer diagnostics can now be detected using specific antibodies. SEA, previously believed to believed to belong to the family of non-coding RNA and able to activate steroid receptor activity, is translated into a protein which function remains to be determined. Psoriansin, highly expressed in high risk DCIS, can contributes to breast tumor progression through modulation of Jabl activity. hERB isoforms have promoter-specific differential activities suggesting that they may have a role in differentially modulating estrogen action during breast tumor progression.
DTIC
Cancer; Functional Analysis; Hormones; Mammary Glands; Molecules; Tumors

20040043863 Manitoba Univ., Winnipeg, Manitoba
Isolation of Estrogen-Responsive Genes in Human Breast Cancer Cells
Davis, James R.; Oct. 2003; 95 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0319
Report No.(s): AD-A420776; No Copyright; Avail: CASI; A05, Hardcopy

The goal of this research is to isolate and identi% the estrogen receptor (ER) associated genes in human breast cancer cells. Approximately 60% of ER positive human breast tumors need estrogen to grow, and the need for estrogen corresponds to the presence of the estrogen receptor in the tumor. ER is a transcription factor that binds directly or indirectly to regulatory regions of estrogen responsive genes. In the presence of estradiol (E2), ER dimerizes and binds to estrogen response elements (ERE) to turn on or turn off the expression of the genes, which are required in order for breast cancer cells to proliferate (Luqmani et al., 1989; Berry et al., 1989). A number of estrogen-inducible genes, such as cathepsin D and c-fos genes, have ER binding to DNA with help from another transcription factor Spi (Krishnan et al., 1994; Safe, 2001; Duan et al., 1998). In some cases, ER operates through Spi without binding to DNA (xie et al., 1999; Duan et al., 1998; Dubik and Shiu, 1992).
DTIC
Cancer; Estrogens; Genes; Isolation; Mammary Glands

20040043865 Virginia Commonwealth Univ., Richmond, VA
Consequences of Prolonged Hemorrhage on Oxygen Delivery to Skeletal Muscle Microcirculation
Pittman, Roland N.; Oct. 2003; 58 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0692
Report No.(s): AD-A420778; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of the proposal is to characterize global hemodynamics and microcirculatory oxygen transport in skeletal muscle in an animal model of severe (40 mm Hg), prolonged (4 hours) hemorrhagic hypotesion (HH) . The target pressure and length of hemorrhage were set in the Army's original request for proposals. Arterial and venous blood pressures, gases, acid-based status, glucose, lactate, electrolytes, hemoglobin, 02 delivery and consumption were measured before and up to 4 h after HH (mean arterial pressure, MAP = 40 mm Hg.) Ringer's lactate (RL) was used to maintain MAP. Fifty-three percent of rats survived greater than or equal to 3 h (survivors, S); others were considered non- survivors (NS) . Following HH, all rats required Rb infusion for greater than or equal to h. NS showed a significantly greater degree of metabolic acidosis that S. Respiratory rate, arterial PO2, O2Sat, O2 content, glucose and pH were significantly higher in S. Rate of Rb infusion, arterial K+ and PCO2 were lower in S. Arterial K+ and RR were the only parameters significantly different between S and NS at all time points during HH. The data suggest that early oxygenation and metabolic compensation are essential for survival of prolonged HH.
DTIC
Blood Circulation; Hemorrhages; Muscles; Musculoskeletal System; Oxygen; Shock (Physiology)

20040043866 Tulane Univ., New Orleans, LA
Regulation of Multidrug Resistance Phenotype and P- Glycoprotein Activity in MCF-7 Cells by the Epthelial Na+ Channel
Awayda, Mouhamed S.; Aug. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0431
Report No.(s): AD-A420779; No Copyright; Avail: CASI; A02, Hardcopy

Drug resistance is a process that occurs in a variety of carcinomas and especially in epithelial breast carcinomas. These carcinomas represent 80% of all breast cancer types and are the subject of intense study. The origins of drug resistance in these cells are poorly determined. This proposal deals with examining the roles of the cell membrane and the properties of ion channels within this membrane in drug resistance. It is well known that the plasma membrane, through its role as a permeability barrier that defines and differentiates the intracellular from the extracellular one, plays a vital role in cell viability and survival to various noxious agents. However, the transport properties of breast epithelial cells and certainly those of cancerous origins are essentially undetermined. We propose to define these properties and to test the effects of transport alterations on cell viability and resistance to anthracycline antibiotics, agents which are widely used to combat breast cancer. Moreover, the routes of drug entry and exist across polarized cells (with apical and basolateral membranes) will be determined.
DTIC
Cancer; Mammary Glands

20040043867 Texas Univ., Houston, TX
The Clinical Development of Thalidomide as an Angiogenesis Inhibitor Therapy for Prostate Cancer
Daliani, Danai D.; Oct. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0069
Report No.(s): AD-A420780; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this award id to evaluate the: 1) Safety and toxicity of neo-adjuvant thalidomide therapy prior to radical prostatectomy in patients with locally advanced prostate carcinoma (PCa); 2) Efficacy of neo-adjuvant thalidomide treatment, as measured by the rate of tumor reduction/ PSA decline; 3) Qualitative measurements of the in vivo effect of thalidomide therapy on the Endothelial and Epithelial compartment. Significance: The ability to assess in vivo the effects of thalidomide as well as identify surrogate markers of anti-angiogenic activity is in valuable to the design of new effective therapies. Prior to the DOD's final decision (April 2002) to sponsor the correlative studies proposed in the grant 18 patients had been entered in this study. Their clinical information is attached. Pending some additional HSRRB required amendments, the patients' research tissue was stored but the funds awarded were not used to perform any of the studies until we obtained the final DOD approval. After April 2002 (when DOD was cited as a partial sponsor) and until we solved all the remaining issues and obtained DOD clearance to proceed (9/2003) we held accrual in this trial. We have re-activated the study and are confident that we will complete patient accrual within 1 year. We are requesting a no-cost extension of 1 year to allow completion of the planned studies.
DTIC
Cancer; Inhibitors; Prostate Gland; Therapy

20040043869 Pennsylvania Univ., Philadelphia, PA
Identification of Alternative Splicing Factors Involved in Prostate Cancer Progression
Carstens, Russ P.; Oct. 2003; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0532
Report No.(s): AD-A420782; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this project is to identify and characterize proteins factors that regulate splicing of fibroblast growth factor 2 (FGFR2) in prostate cancer cells. A change in the splicing of this transcript has been shown to accompany the transition of model prostate cancers form an androgen dependent to androgen independent phenotype. It is hypothesized that the factor that control this splicing 'switch' may be involved in the acquisition of androgen independent growth. To accomplish these goals, we have established a genetic screening strategy to identify splicing factors that regulate FGFR2 splicing though activation of exon IIIb and repression of splicing of exon IIIc. This switch form exon IIIb to exon Ilic splicing has been shown to occur during the transition to androgen independent cancers. We have established robust splicing reporter constructs in which splicing regulation that yields exon Ilib splicing and IIIc repression can be determined by EGFP or mRFP fluorescence. We have established stable cell lines expressing these reporter and are carrying out genetic screens to identify splicing regulatory proteins. We have set up a retroviral cDNA library screening system in order to carry out his screen. Using dual fluorescence to enhance the efficacy of the system, we expect this strategy to be highly effective as a means to identify functionally relevant proteins.
DTIC
Cancer; Prostate Gland; Splicing

20040043870 Thomas Jefferson Univ., Philadelphia, PA
Quantification of the Benefits of Pendant Mammography
Piccoli, Catherine W.; Oct. 2003; 36 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0650
Report No.(s): AD-A420784; No Copyright; Avail: CASI; A03, Hardcopy

High quality mammographic images enhance the radiologist's ability to interpret mammograms. Image quality is dependent upon adequate visualization and inclusion of tissue, adequate exposure, contrast and resolution; and proper compression. Meeting these criteria is essential to detection of cancer, since 73% of cancers are located in the peripheral or retroglandular fat. Pendant mammography, is a procedure whereby the patient leans forward 15 to 25 degrees during mammography, pulling the breast away from the body, and thereby increasing the amount of retroglandular breast tissue evident on a mammogram. We propose to test the benefits of pendent mammography by imaging 250 women by acquiring both conventional and pendent mammograms. We will then perform a quantitative analysis of the mammograms, to determine the effect of leaning on the amount of breast tissue imaged, the compression obtained, and the dose to the breast. There was a change of Principal Investigator when Dr. Andrew Maidment left Thomas Jefferson University Hospital for the University of Pennsylvania. After receiving IRB approval for the project, we began patient recruitment in August 2003 . As of September 19, 2003 we have recruited 18 patients.
DTIC
Cancer; Mammary Glands

20040043873 Nebraska Univ., Omaha, NE
Biomarker Based Individual Risk Assessment for Prostate Cancer
Hemstreet, George P., III; Sep. 2003; 66 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0121
Report No.(s): AD-A420787; No Copyright; Avail: CASI; A04, Hardcopy

The goal of this work is to develop a biomarker profile of prostate cancer risk, based on cell signaling proteins that serve as high-level biomarkers of cellular subsystems; e.g., tissue transglutaminase (TTGase), cadherins or catenins, and gelsolin, G-actin or thymosin-beta. TTGase, cadherins, and G-actin are strong biomarkers of prostate cancer and may be strong biomarkers of field disease and premalignancy. The biomarker profile will identity individuals for prostate cancer prevention and rebiopsy, with high sensitivity and specificity, complementing serum PSA screening that captures 95% of prostate cancer cases with only 20% specificity. Protein biomarkers are quantified in single cells by Quantitative Fluorescence Imaging Analysis (QFlA), which requires stoichiometric labeling of high-quality tissue specimens. A complex and highly integrated configuration of standard operating procedures, tissue culture models, and optimal tissue specimens has been developed and recent implementation supports down regulation of TTGase as a biomarker for prostate premalignancy. Fluorescence signals are currently generated with organic fluorophores but we are now investigating inorganic nanocrystals for biomarker labeling and expect, during the next year of this award, to apply nanocrystal-antibody conjugates to analysis of multiplexed signals from single cells as part of our development of an extensive QFlA data set with prostate specimens.
DTIC
Assessments; Biomarkers; Cancer; Prostate Gland; Risk

20040043874 Academy of Health Sciences (Army), Fort Sam Houston, TX
A Commander's Guide for Conducting Integration Operations in the San Antonio Military Health System
Bewley, Lee W.; Feb. 1999; 34 pp.; In English
Report No.(s): AD-A420788; HCA-3-99; No Copyright; Avail: CASI; A03, Hardcopy

Commanders preparing for integration operations in the San Antonio Military Health System (SA-MHS) should be cognizant of three important considerations: the majority of all mergers, acquisitions, collaborations, and consolidations fail to achieve pre-integration goals; the military is not well-trained in conducting these type of operations; and the track record for collaborations and consolidations in the SA- MHS is not good. Despite these daunting caveats, conducting successful integration operations is not mission impossible. A dedicated, well-educated staff, a relatively secure beneficiary population, and currently, significant protection from competitors provide considerable organizational strengths that can be employed to overcome the numerous obstacles for successful integration operations. The most prevalent factor in Integration Operations that has yielded less-than-optimum operational efficiencies is the failure of organizations to create and implement an effective integration plan. Organizations that are able to clearly articulate achievable goals, develop a comprehensive plan to conduct integrations, and flexibly execute both current operations and integration operations generally achieve success. This study was

undertaken in order to produce a commander's guide that may enhance the propensity for success in the event of any future integration operations in the SA-MHS.
DTIC
Health; Management Planning

20040043875 Academy of Health Sciences (Army), Fort Sam Houston, TX
Evaluation of a New Hospitalist Service at an Academic Medical Center
DaCorta, Joseph A.; Aug. 1999; 39 pp.; In English
Report No.(s): AD-A420790; HCA-34-99; No Copyright; Avail: CASI; A03, Hardcopy

Hospitalists, physicians, and physician extenders who specialize in the care of inpatients, are a new and growing trend in the American health system. There are about 3000 hospitalists practicing in 10 percent of hospitals. They are predominately young, male, general internal medicine specialists earning an average of $143,000 per year. The experience with a trial hospitalist initiative at a large academic medical center mirrored the findings in the management literature, achieving reductions of 8 percent in length-of-stay (LOS) and 17 percent incost-per-case, with lower mortality, unchanged readmission rates and no appreciable effect on patient or staff satisfaction, when compared to the rotating call system in place prior to the initiative. Further research is indicated regarding the use of physician extenders in hospitalist practice and the role of hospitalists in disease management and discharge planning.
DTIC
Health; Management Planning

20040043876 International Agency for Research on Cancer, Lyon
Breast Cancer Risk in Relation to Urinary Estrogen Metabolites and Their Genetic Determinants: A Study Within the Dutch 'DOM' Cohort
Kaaks, Rudolf J.; Sep. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0422
Report No.(s): AD-A420792; No Copyright; Avail: CASI; A02, Hardcopy

We are conducting a large case-control study, nested within a prospective cohort, to estimate relative risk of breast cancer in post-menopausal women by levels of urinary estrogens and estrogen metabolites, and to examine the association between the concentrations of these hormones and breast cancer risk with polymorphic variations of a series of candidate genes, known to be implicated in the regulation of estrogen metabolites synthesis. In this first year of the project, cases and matched control subjects were identified, and their urinary samples retrieved from the biorepository in Utrecht (the Netherlands). After centrifugation of the urine samples to prepare the pellets for DNA analysis, cases and matched controls were sent to Dr. Kurzer's laboratory (University of Minnesota, USA) for hormonal analyses by gas chromatography/mass-spectrometry. The laboratory of Dr. Kurzer had been prepared, and her personnel hired for running these analyses. Our study started without problems, and is mostly on schedule. Urinary DNA has been extracted and prepared for genotyping of polymorphic variants in CYP1A1, CYP1B1, CYP3A4 and COMT genes, which will be measured in year 3 of the project. Measurements of estrogen metabolites will start in September/October 2003.
DTIC
Cancer; Estrogens; Genetics; Mammary Glands; Metabolites; Risk; Urology

20040043877 Academy of Health Sciences (Army), Fort Sam Houston, TX
Variation in Civilian Healthcare Utilization Amoung Active Duty Army Service Members in Germany
Doyle, Dennid D.; Feb. 1999; 23 pp.; In English
Report No.(s): AD-A420793; HCA-28-99; No Copyright; Avail: CASI; A03, Hardcopy

A review of the literature indicated that both military and civilian medical systems struggle to provide the greatest health benefit at the lowest cost. This struggle is particularly challenging as a result of the military drawdown in Europe since medical resources have been reduced faster than the decrease in the beneficiary population. As a result of this imbalance between resources and customers, many beneficiaries may seek their care outside the military system. A first step toward managing access and health care cost is an analysis of the historical utilization rates. This study examined the variation of civilian health care usage among the eleven health clinics within one medical facility's geographic area in Europe. The data consisted of a two-year (Fiscal Year(FY) 97 - 98)retrospective review of the number of Army active duty claims and associated cost for civilian health care. An analysis of proportions from unordered categories yielded significant (a =0.01) variation in both years for both health care cost and claims. A paired sample t-test yielded significant (a = 0.05)differences in the means of both the

claims and cost between FY97 and FY 98. Possible sources of this variance may be the wide dispersion of the clinics, deployment induced access difficulty and distance to tertiary care.
DTIC
Germany; Health; Management Planning

20040043878 Academy of Health Sciences (Army), Fort Sam Houston, TX
OptiFill II Automated Prescription Bottle Filler System Post-Implementation Analysis
Flores, Daniel R.; Jul. 26, 1999; 28 pp.; In English
Report No.(s): AD-A420795; HCA-32-99; No Copyright; Avail: CASI; A03, Hardcopy

Since 1995, the Naval Hospital Pensacola has been experiencing a decline in its number of pharmacists and pharmacy technicians. Along with this decline in pharmacy personnel, Naval Hospital Pensacola has seen an increase in its pharmacy workload. In an attempt to accommodate this increase in work, three processes were implemented. These processes have alleviated some of the wait times experienced by patients, but have not reduced the increased burden placed upon pharmacy personnel. In an attempt to remedy this, the Naval Hospital Pensacola decided, in 1998, to lease the OptiFill II automated prescription bottle filler system. This project evaluated the impact on the quality of care delivered by the OptiFill II system. This was done by measuring the pharmacy dispensing error rate for a three month period before and after implementation of the system. The decrease in the pharmacy dispensing error rate was found to be highly significant ($p < .01$, $df = 1$). This project also performed a cost benefit analysis of the system. While there was no cost benefit found, the author does recommend continuing use of the OptiFill II system based upon a significant increase in the quality of care delivered.
DTIC
Bottles; Fillers; Health; Management Planning; Systems Analysis

20040043879 Academy of Health Sciences (Army), Fort Sam Houston, TX
Reasons for Utilization of the Emergency Room at Irwin Army Community Hospital by Patients Classified as Non-Urgent
Hillard, Jeffery S.; Aug. 1998; 48 pp.; In English
Report No.(s): AD-A420796; HCA-23-99; No Copyright; Avail: CASI; A03, Hardcopy

The primary objective for conducting this study was to identify the reasons patients categorized as having non- urgent conditions utilized the emergency room (ER) at Irwin Army Community Hospital, Fort Riley, Kansas, a 44-bed facility that serves a user population of approximately 30,000 people. The research method for this study was a descriptive, cross- sectional design and utilized a questionnaire to obtain patient responses. Patients who presented to the ER between 16 February 1999 and 14 March 1999, and who were assessed as having a non-urgent medical condition were eligible to participate in this study. A total of 2,333 patients (93.0% of all patients) who presented to the ER were eligible for study. Of the 380 questionnaires that were distributed, 296 patients (12.7% of the total number of patients who presented) returned completed questionnaires. Of that total, 142 patients(48.0%) utilized the ER because they believed they had an emergent or urgent medical condition that required attention within two to four hours and 16 patients (5.4%) stated that they were too sick to go anywhere else. One hundred nine patients (36.8%) indicated that their use of the ER related to issues regarding access to primary care sources, which included 54 patients (49. 5% of access reasons) who reported that their primary care clinics were not operational during convenient times and 36 patients (33.0% of access reasons) who utilized the ER because no primary care appointments were available when they tried to schedule them. Sixty-three (21. 3%) respondents stated that they were referred to the ER by a health care provider or telephone advice nurse. A total of 41 patients (13.9%) cited dissatisfaction with their current sources of primary care and/or had opinions that the ER staff provided better care than that given by their respective primary care managers. Perception
DTIC
Emergencies; Health; Hospitals; Management Planning; Patients

20040043880 Academy of Health Sciences (Army), Fort Sam Houston, TX
Ambulatory Data System: A Case Study in the Compliance, Utilization and Data Accuracy of the Ambulatory Data System at Naval Hospital, Camp Lejeune, North Carolina
Irwin, Christopher J.; Jun. 7, 1999; 87 pp.; In English
Report No.(s): AD-A420797; HCA-32-99; No Copyright; Avail: CASI; A05, Hardcopy

The recent shift toward managed care, coupled with the increase in the requirement for detailed health care information has made the requirement for the capture of relevant health care data a high priority. The Navy Ambulatory Data System

(ADS), was deigned to provide quality, real-time ambulatory data that would be useful for commanders to make resources decisions. Unfortunately, Naval Hospital Camp Lejeune has had many difficulties with ADS and the data compliance rate is well below the Surgeon Generals benchmarks. This case study reviews the hospitals ADS process and identifies the problems associated with ADS compliance. Finally, based on the results, recommendations have been made for compliance resolution.
DTIC
Data Systems; Health; Hospitals; Management Planning; Medical Services

20040043881 Academy of Health Sciences (Army), Fort Sam Houston, TX
A Descriptive Analysis of Nonurgent Emergency Room Utilization at William Beaumont Army Medical Center
Kuntz, Patrick A.; Apr. 28, 1999; 55 pp.; In English
Report No.(s): AD-A420798; HCA-1-99; No Copyright; Avail: CASI; A04, Hardcopy

The object of this study was to determine the percentage of patients seen in the WBAMCER for conditions triaged as nonurgent during a seven-month period from June to December in 1998. Additionally, the study, utilizing pre- recorded data, desired to determine if 12 independent variables were associated with nonurgent utilization of the ER. The registered nurses on duty triaged a total of 2,173 patients that met inclusion criteria. A large number (n=1260, 58% of sample) were triage to level 4 (nonurgent). Patients triaged to level 3 (treat within 24 hours) accounted for 37.8% (n=821). The remaining level two (urgent) and level one (emergent) accounted for nearly equal percentages of the population at 2.3% (n=49) and 2.0% (n=43) respectively. The typical profile of ER utilization by frequency showed the greatest usage by female active duty dependents between the ages of 18-35 who are CHAMPUS eligible and enrolled in TRICARE Prime. This profile also depicts the typical user as someone who presents with a sprain or strain on a weekday during the hours of 0700-1500. This profile is further typified by a person or sponsor between the rank of E5 and E9 with no third party insurance, lived in zip code 79924 (6 miles from WBAMC) and released without limitation after being treated in the ER. This study strengthens and quantifies the long-standing belief among practitioners and administrators regarding the prevalence of nonurgent use in the ER at WBAMC. These nonurgent patients may be candidates for referral to a more appropriate level of care, typically primary care, without a significant risk for deterioration of their condition. Identifying and quantifying this population is the first step in shaping important organizational initiative aimed at self- care education, utilization of telephone advice and triage, and other out patient medical management programs.
DTIC
Emergencies; Health; Management Planning

20040043884 Academy of Health Sciences (Army), Fort Sam Houston, TX
The Healthcare Administrator's Desk Reference: A Managed Care and Health Care Contracting Dictionary for the Military Health System
Korody-Colwell, Carol A.; Jul. 1998; 197 pp.; In English
Report No.(s): AD-A420803; HCA-9-99; No Copyright; Avail: CASI; A09, Hardcopy

A strong working knowledge of managed care and health care contracting is the key to success for today's health care administrator. Specifically, a thorough knowledge of the language, terminology, and acronyms is fundamental to understanding today s health care delivery processes both in the civilian sector and the military health system. One consolidated desk reference was developed to improve communication and increase comprehension among and between providers and administrators across all services. The goal is to promote understanding and diminish confusion, thereby, albeit indirectly, improving the delivery of health care services.
DTIC
Dictionaries; Health; Management Planning

20040043886 Academy of Health Sciences (Army), Fort Sam Houston, TX
Provider Profiling: A Population Health Improvement Tool for the Southeast Military Health System
Pemberton, Phillip D.; Jun. 1999; 58 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420806; HCA-35-99; No Copyright; Avail: CASI; A04, Hardcopy

Appropriate utilization of health care is the crux of managed care. It is also a key to success for the Southeast Military Health System (SEMHS). Profiling with Provider Perspectives, a Primary Care Management Tool, provides the SEMHS with a standardized performance measurement system that offers feedback in a user friendly and non-threatening format. This is accomplished without undue hindrance on patient care, through the maximization of automation, and requires minimal management overhead by the military treatment facility (MTF). The tool graphically displays opportunities to achieve

efficiencies at the provider decision node: the point in the health care delivery continuum that has the greatest impact on where limited resources should be allocated to provide the most benefit. Profiling Primary Care providers at Martin Army Community Hospital (MACH) at Fort Benning, Georgia, effectively addressed the three essential components required to modify provider decision making and utilization management behavior: motivation, information, and a structured process. MACH, by empanelling beneficiary populations to individual Primary Care providers, is placing the onus on these providers to ensure more appropriate utilization of services such as emergency room visits and inpatient admissions, while maximizing preventive services, such as mammography screening and immunizations. The initial results indicate providers have enthusiastically embraced the population health/disease management profiling and the educational aspects of the tool. Additionally, analysis of selected preventive and efficiency performance measures suggests significant variation in the practice behavior between groupings of providers.
DTIC
Health; Medical Services; Military Operations; Populations

20040043887 Finch Univ. of Health Sciences/Chicago Medical School, Chicago, IL
Improving Quality of Life in Ovarian Cancer Patients: A Brief Intervention for Patients and Their Partners
Zakowski, Sandra G.; Sep. 2003; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0722
Report No.(s): AD-A420807; No Copyright; Avail: CASI; A02, Hardcopy

The current study examines the effects of a psychological intervention that encourages emotional expression in ovarian cancer patients and their partners. Ovarian cancer patients (n=130) and their partners are randomly assigned to an intervention or a control group. Following Pennebaker's model, subjects in the intervention group are asked to write about their deepest thoughts and feelings regarding their cancer experience for 20 minutes each day for three consecutive days. The control group is asked to write about trivial non-emotional topics. Outcome variables including psychological distress, quality of life, and physical symptoms is assessed at baseline and over a period of nine months after the intervention (one week, three, six, and nine months) In accordance with our approved Statement of Work data collection is currently underway. To date 52 subjects have been enrolled and are at various stages of the data collection process. Data processing is continuing as planned, including data entry and verification, which has been completed for all subjects currently enrolled in the project. Preliminary data analyses are being conducted.
DTIC
Cancer; Patients

20040043889 Academy of Health Sciences (Army), Fort Sam Houston, TX
TRICAREs Impact on Emergency Department Use at the National Naval Medical Center
Prior II, Richard J.; Dec. 1999; 38 pp.; In English
Report No.(s): AD-A420809; HCA-32-99; No Copyright; Avail: CASI; A03, Hardcopy

The author performed a retrospective, comparative analysis of the impact of a wide-scale managed care program (TRICARE) on Emergency Department use at the Nation Naval Medical Center. Patients included in the study presented to the ED during either or both of two six-month study periods, before and after TRICARE. Patients were compared by demographics, urgency of visits, number of visits, and principle diagnosis. Although ED use decreased in the comparision period, more patients presented with greater frequency and with case-manageable diseases. Several recommendations are offered to reduce the number of unecessary ED visits. They are; improve access to Primary Care, implement ED case management, triage more patients out of the ED, implement co-pats, and improve education and training.
DTIC
Emergencies; Medical Services

20040043892 Wisconsin Univ., Madison, WI
Diagnosis of Breast Cancer Using Fluorescence and Reflectance Spectroscopy
Palmer, Gregory M.; Ramanujam, Nirmala; Sep. 2003; 26 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0628
Report No.(s): AD-A420812; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this grant is to characterize the fluorescence and diffuse reflectance properties of breast tissue, and identify features in the spectra which may be useful in diagnosing breast cancer. In the past 12 months in which the award was active, 3 reviewed manuscripts have been accepted for publication, and two conference presentations have been completed.

Significant work includes characterization of the intrinsic fluorescence properties of normal and malignant human breast cell lines. It was found that the malignant cell lines have significantly different fluorescence properties for the fluorophores, tryptophan, and NAP(P)H. This suggests that these fluorophores could be important indicators of malignancy in tissue, and could be exploited in an in vivo diagnostic device. Additional work has focused on completion of a preliminary investigation to characterize fluorescence and diffuse reflectance properties in human breast tissue, and development of analysis techniques for interpreting spectral data.
DTIC
Cancer; Diagnosis; Fluorescence; Mammary Glands; Reflectance; Spectroscopy

20040043893 Academy of Health Sciences (Army), Fort Sam Houston, TX
Sports Medicine and Rehabilitation Team Clinic: Comparative Model Analysis of Navy and Marine Corps Options
Masters, Derrick; May 2003; 101 pp.; In English
Report No.(s): AD-A420814; HCA-35-03; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this project was to examine the suitability of several Sports Medicine and Rehabilitation Team (SMART) Clinic models. The staff elements required to staff each model was explained and the capacity each model was capable meeting was identified. The evaluation of each model included accessing the model's ability to meet the increased musculoskeletal treatment demand produced by a military training population. The costs, start-up and operating, for each model was identified so that the implementation cost of each model could be identified and compared. The economic value of the care provided by each model was assigned through the use of Civilian Health-and Medical Program Uniform Service (CHAMPUS) maximum allowable charge (CMAC) rates. The most suitable model identified by this project was model 3. Model 3's staff consists of: 1 Sports Medicine Physician, 1 Physical Therapist, 2 Certified Athletic Trainers, 2 Corpsmen, and 1 Administrative Clerk. The clinic is capable of providing up to 1,000 patient visits per month, International Classification of Disease (ICD-9) coded 99202 and 99203 visits, for musculoskeletal injuries or illnesses.
DTIC
Health; Medical Services; Military Operations; Navy; Sports Medicine

20040043897 TRICARE, San Diego, CA
Optimizing the Department of Defense Spatial Orientation Center Vestibular Rehabilitation Staffing Using Simulation Software
Buenger, Karen J.; Aug. 1999; 67 pp.; In English
Report No.(s): AD-A420822; No Copyright; Avail: CASI; A04, Hardcopy

The Naval Medical Center, San Diego (NMCSD) Commander created the Defense Spatial Orientation Center (DSOC) supporting advances in treating vestibular dysfunction. Now the DSOC needs to expand so that it may better support the military operational forces. Opening a clinic on Marine Corps AirStation (MCAS), Miramar facilitates increased exposure to the active duty personnel who will benefit from vestibular rehabilitation. The DSOC directors must therefore determine the staffing needed to run the clinic at both NMCSD and MCAS. This research hypothesizes that a single physical therapist can not successfully complete the necessary annual patient visits to support the beneficiary population. MedModel simulation software was selected to analyze this hypothesis; it allows for relatively quick results without disturbing patient care. The results predict the vestibular rehabilitation clinic staff must expand, at a minimum, by one physical therapist and two technicians. This staffing mix can then support approximately 4,600 annual visits. Also, the addition of technicians decreases the patient visit cost and therefore the government s cost of providing treatment. Thus, having a clinic at MCAS not only increases the number of active duty personnel who get this critical treatment but the change in staff composition ultimately helps the government avoid training and equipment replacement costs.
DTIC
Attitude (Inclination); Computerized Simulation; Defense Program; Medical Services; Personnel; Vestibules

20040043901 Academy of Health Sciences (Army), Fort Sam Houston, TX
Provider Level Satisfaction With Service Line Management at Blanchfield Army Community Hospital
Rimmer, Jeffery F.; Jun. 1999; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420826; HCA-12-99; No Copyright; Avail: CASI; A03, Hardcopy

The introduction of the Prospective Payment System (PPS) in the early 1980s, capitated financing from managed care organizations (MCO), and reduced payments from traditional fee-for-service payers have created an increasingly competitive climate for civilian hospitals. Likewise, military hospitals must contend with an ever- decreasing budget, force structure

reductions, and installation closures. These changes have forced hospitals to search for innovative ways to structure their organizations to remain viable. One method of structuring the hospital, which has gained popularity in the past 10 years, is to organize around products or services. This configuration is called product or service line management (PLM/SLM). This paper discusses PLM in hospitals, and it explores the applicability of implementing PLM in U.S. Army Medical Department Activities(USA MEDDACs). Finally, this paper evaluates provider level satisfaction with SLM and the implementation of that philosophy in a medium military medical treatment facility to support recommendations for sustainment and improvement where necessary.
DTIC
Health; Hospitals; Management Planning

20040043902 Academy of Health Sciences (Army), Fort Sam Houston, TX
A Feasibility Study Analyzing the Possibility of Creating an Inpatient Rehabilitation Product Line
Jacobson, Christopher M.; Apr. 2001; 122 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420828; HCA-32-01; No Copyright; Avail: CASI; A06, Hardcopy

This study is an analysis examining the feasibility of conducting inpatient rehabilitation at the Naval Medical Center San Diego (NMCSD). Over $9 million was spent caring for 703 patients that used 10,322 bed days in 1999-2000. Costs increased from $3.4 million in 1999 to $5.6 millionin 2000. A cost benefit analysis shows potential savings range from $1-$3.8 million per year. Milliman and Robertson criteria, when applied to NMCSD s population reveal that costs should range from $1.8 to $3.4 million. The literature and other data indicate that there is variability among rehabilitation patients outcomes, and quality is not readily measured. It was concluded that NMCSD could conduct less costly inpatient rehabilitation, and increase continuity of care. This would also facilitatean increased ability to measure outcomes and quality. Although a great deal depends on the changing healthcare benefit, primarily the elimination of TRICARE Senior Prime, TRICARE beneficiaries may benefit from a small inpatient rehabilitation unit. There are also opportunities to determine if active duty readiness could be improved by having inpatient rehabilitation. The MHS should continue to evaluate all opportunities to provide services across the continuum of care.
DTIC
Feasibility; Health; Management Planning

20040043903 Academy of Health Sciences (Army), Fort Sam Houston, TX
Balanced Scorecard Goal Four: Provide Policy Management, Advocacy and Problem Solving' Measuring Achievement of Internal Customer Objectives
Blondeau, Sharon E.; Jun. 2002; 62 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420829; HCA-35-02; No Copyright; Avail: CASI; A04, Hardcopy

The Great Plains Regional Medical Command is the headquarters for command and control, budget and resource allocation, direction of clinical and administrative operations and readiness for ten Army Medical Treatment Facilities within its geographical boundaries. In an effort to maximize its efficiency and improve internal customer relations, the GPRMC has incorporated use of a Balanced Scorecard within its management scheme. The scorecard serves as a strategy map to communicate its overall plans and goals throughout organization. However, being the first Regional Medical Command within the Army Medical Department to implement a Balanced Scorecard, the Great Plains was faced with establishing measurable standards and goals to track its current status and progress. This study serves as one method for establishing a measurement tool to assess a specific band of goals on the scorecard, chosen by the headquarters. The goal, 'Provide Policy Management, Advocacy and Problem Solving', addresses the relationship between the headquarters and its internal customers: the subordinate commanders and senior staff officers that directly manage the ten Medical Treatment Facilities within the region.
DTIC
Health; Management Planning; Policies

20040043906 Womack Army Medical Center, Fort Bragg, NC
A Business Case Analysis of the Direct Health Care Provider Program Womack Army Medical Center, Fort Bragg, N.C
Sharon L., Benson; May 2001; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420833; HCA-2-01; No Copyright; Avail: CASI; A04, Hardcopy

This research project conducts a business case analysis of the Direct Health Care Provider Program (DHCPP) at Womack Army Medical Center, Fort Bragg, NC to determine if this program is a sound business decision. It further investigates the individual productivity of each provider hired under this program. In order to determine the cost effectiveness of the DHCPP,

a comparision was made between the dollar amount of workload each doctor provided verses the salary amount paid for September - November 2000. The number of patients treated per day by each provider as well as the average number of laboratory tests, radiological studies and pharmacy prescriptions written by each provider was also calculated. In aggregate, the study demonstrates that Womack has made a sound business decision as the workload provided by the contract doctors exceeded the provider s salaries by nearly $900,000. On an individual basis, sixteen of the nineteen providers generated more workload than the dollar value of their salaries. The three who did not were doctors who provide unique specialty services that often operate at a loss. A productivity analysis of the contracted doctors reveals that 12 of the 19 doctors examined met or exceeded Womack's productivity standards.
DTIC
Bragg Angle; Commerce; Cost Effectiveness; Health; Medical Services

20040043907 Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD
Predicting Hearing Health Readiness as a Function of the Army Profile System Formula and Occupational Safety and Health Administration Reportable Hearing Loss
Smetana, Wayne R.; Apr. 1999; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420834; HCA-35-99; No Copyright; Avail: CASI; A03, Hardcopy

A standardized process of determining the hearing health readiness of personnel in uniform does not exist across the services in the Military Health System, (MHS). This study examines the interchangeability between the Occupational Safety and Health Administration (OSHA) Reportable Hearing Loss (ORL) and the U.S. Army s H-3 and H-4 profile formula. The Army employs a specific formula for determining the profiling measures for uniform personnel(AR 40-501, 1995). The Air Force also uses a published standard for identifying fitness (USA Air Force Instruction 48-123, 1997). The U.S. Navy and Marine Corps use publications outlining the management of their Hearing Conservation/Industrial Audiology programs, U.S. Navy Instruction 5100.19C forces Afloat and U.S. Navy Instruction 5100.19D Forces Ashore. These publications do not present criteria for evaluating the readiness of their uniform personnel using a classification system. If interchangeability exists between the ORL and Army s standards, this method may be applied across the Department of Defense to evaluate the hearing health readiness for uniform personnel.
DTIC
Auditory Defects; Health; Hearing; Predictions; Safety

20040043913 McGill Univ., Montreal, Quebec
Pilot Study to Measure the Effects of NSAID Use on Angiogenesis and Apoptosis in Female Invasive Breast Cancer
Richardson, John B.; Guiot, M. C.; Tagalakis, V.; Zorychta, E.; Sep. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0568
Report No.(s): AD-A420843; No Copyright; Avail: CASI; A02, Hardcopy

To examine the effects of NASIDs on invasive breast cancer we are performing a immunohistochemical analysis on 220 cases of breast cancer from Saskatchewan which has provided a complete drug history of each patient. We are assessing the tumors for COX 1 and COX 2, angiogenesis, estrogen receptor, proliferative index and the degree of apoptosis. Previous work has shown that some breast cancers over express cyclooxygenases COX 1 and 2 and a large epidemiological study conducted in Saskatchewan suggests that non-steroidal anti-inflammatory drugs may slow the growth of breast cancers and prevent metastases.
DTIC
Apoptosis; Cancer; Females; Mammary Glands

20040043914 Virginia Commonwealth Univ., Richmond, VA
Functional Characterization of Primary Mammary Cells with Life Span Extension Using Ectopic Telomerase
Holt, Shawn E.; Aug. 2003; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0661
Report No.(s): AD-A420844; No Copyright; Avail: CASI; A03, Hardcopy

The objective of the document is to define the changes/differences in gene expression patterns between normal, diploid mammary epithelial cells, both young and approaching senescence, telomerase-expressing mammary cells, and spontaneously immortalized mammary lines.
DTIC
Cancer; Life Span; Mammary Glands

20040043915 Pittsburgh Univ., Pittsburgh, PA
Can We Predict Which Women will Benefit from Tamoxifen Prophylaxis?
Davis, Peter L.; Sep. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0609
Report No.(s): AD-A420845; No Copyright; Avail: CASI; A02, Hardcopy

To prevent breast cancer, over 200,000 women are now taking tamoxifen and similar selective estrogen receptor modifiers (SERM) . We have laboratory data that shows that approximately 30% of women have defects in their breast cell's estrogen receptor or in its intracellular signaling mechanism. As a result, these women may not experience the antineoplastic effect of tamoxifen on breast cancer risk but only its side effects. We propose that contrast enhanced magnetic resonance imaging (CE MRI) can detect this defect. CE MRI will be performed on postmenopausal women on tamoxifen therapy.
DTIC
Cancer; Females; Mammary Glands; Prophylaxis

20040043916 Washington Univ., Saint Louis, MO
Enhanced Peptide Radiotherapy of Prostate Cancer Using Targeted Adenoviral Vectors
Rogers, Buck E.; Jun. 2003; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0013
Report No.(s): AD-A420846; No Copyright; Avail: CASI; A02, Hardcopy

An adenovirus encoding the genes for human somatostatin receptor subtype 2 and bacterial cytosine deaminase (AdSTR2CD) was constructed. The SSTR2 allows for non- invasive imaging of gene transfer and therapy with radiolabled somatostatin analogues. The CD converts the prodrug 5- fluorocytosine (5-FC) to the toxic and radiosensitizing 5- fluorouracil (5-FU). Thus, it is hypothesized that AdSSTR2CD can be used for the simultaneous expression of SSTR2 and CD for the detection and treatment of prostate cancer. The purpose of this report is to state that there was no progress in the previous year due to the PI changing institutions.
DTIC
Cancer; Peptides; Prostate Gland; Radiation Therapy

20040043917 Michigan Univ., Ann Arbor, MI
Role of the APAf-1Caspase-9 Pathway in Breast Tumor Development
Nunez, Gabriel; Sep. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0563
Report No.(s): AD-A420847; No Copyright; Avail: CASI; A02, Hardcopy

The Aim of this concept award project was to assess the function of Apaf-1/ Caspase-9 in tumorigenesis in the mouse. We planned to use mutant mice (FOG mice) expressing a hypomorphic allele of Apaf-1 gene in the breast as the Apaf- 1 KO mutation is embryonic lethal. Crosses of heterozygous FOG+/- mice yielded mostly FOG-I- mice that exhibited major cranial defects and died shortly after birth. Thus, FOG mutant could be not be used to assess the role of Apaf-1 in tumor development in vivo. In parallel studies, we have developed a system to express stably small (21-29 bp) interfering RNAs (siRNAs) targeted against Apaf-1 transcripts. Eight hairpin oligonucleotides were designed to target four different regions of the Apaf-1 transcript. We constructed and tested multiples constructs and identified a RNAi construct that effectively inhibit the expression of Apaf-I protein in breast cancer cells.
DTIC
Cancer; Mammary Glands; Tumors

20040043918 Florida Univ., Gainesville, FL
Steroid Hormones in NF1 Tumorigenesis
Wallace, Margaret R.; Aug. 2003; 17 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0707
Report No.(s): AD-A420848; No Copyright; Avail: CASI; A03, Hardcopy

NFl is characterized by benign Schwann cell tumors called neurofibromas; complex forms can become malignant (MPNST). Little is known about involvement of steroid hormones in %Fl tumors. This work will examine the role of estrogen and progesterone in NFl tumors, to test the hypothesis that human neurofibroma (and/ or MPNST) Schwann cells have increased growth or decreased apoptosis related to steroid hormones. Specific Aim 1 is examining steroid hormone receptor expression in human normal, NFl neurofibroma and MPNST Schwann cells. Real-time PCR shows very low levels of these

receptor transcripts in untreated normal and tumor cells, with very little change in the tumors (less than 2-fold). There is no detectable estrogen receptor in normal Schwann cells or NFl tumors by immunohistochemistry (IHC). However, IHC assay for progesterone receptor was weakly positive in 33% of neurofibromas. Specific Aim 2 is testing in vitro response of tumor cells to hormones. RT-PCR, proliferation assays, and apoptosis assays have thus far shown very few significant responses of the neurofibroma/ MPNST Schwann cell cultures to hormones or antagonists. Specific Aim 3 tests in vivo hormone response of human tumor cells xenografted into Nfl mouse nerve. Thus far, one MPNST has shown a dramatic effect with estrogen, with other cultures still under analysis but not showing such obvious results.
DTIC
Cancer; Cells (Biology); Estrogens; Hormones; Steroids

20040043920 Georgetown Univ., Washington, DC
Therapeutic Effect of Targeted Hyaluronan Binding Peptide on Neurofibromatosis
Zhang, Lurong; Sep. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0708
Report No.(s): AD-A420850; No Copyright; Avail: CASI; A03, Hardcopy

To test our hypothesis that the HA binding peptide may be a new anti-neurofibromatosis agent via inducing apoptosis, we have proposed to focus on three aims: 1) To examine the anti-tumor effect of synthetic HA binding peptide on malignant neurofibromatosis cells; 2) To examine the anti- tumor effect of genetically expressed targeted HA binding peptide; 3) To examine the effect of targeted HA binding peptide on molecules involved in apoptosis. The results of first year study indicated that: 1) large scale synthesized HA binding peptide did possess HA binding activity; 2) synthetic HA binding peptide exerted an anti-tumor effect of on ST88-14 NFl cells; 3) HA binding peptide could bind to Bcl-2/Bcl-x(L), which may be one of the mechanisms by which HA binding peptide inhibits ST88-14 NFl cells; and 4) the cells transfected with expression vector carrying cDNA of HABP could express this peptide. The results of this year study demonstrated that: 1) HA binding peptide is capable of reducing the level of phosphorylated ERK1; 2) HABP reduces the level of cell cycle related molecules, such as cyclin B1 and cdc 2; 3) HABP binds to Bcl-2 in vivo and induces apoptosis; and 4) the effort has been made to set up the model system of NFl tumor exnograft in mice for test the effect of HABP in vivo. In the next year, we will continue to examine the action mechanism of HABP and to test if the in vitro anti-tumor effect of HA binding peptide can be translated in vivo against the cell growth of neurofibromatosis.
DTIC
Diseases; Genetics; Peptides; Therapy

20040043921 Vanderbilt Univ. Medical Center, Atlanta, GA
In Vivo p53 Signaling in Breast Epithelial Cells After Oncogenic Stimulus
Hearnes, Jamie M.; Pietenpol, Jennifer; Sep. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0605
Report No.(s): AD-A420851; No Copyright; Avail: CASI; A02, Hardcopy

One of the most frequent alterations in breast cancer is deregulation of the p53 tumor suppression signaling pathways. The tumor suppressor p53 is a sequence-specific transcription factor that is activated in response to various cellular stresses. It has been predicted that there are hundreds of consensus p53 binding sites present in the human genome. To date, numerous seminal p53 target genes have been identified, leading to the further elucidation of the role of p53 in tumor suppression. However, only a subset of p53 target genes has been identified to date, and characterization of p53 signaling pathways in their entirety is not yet complete. The goal of this study is to further define and characterize such pathways through the identification of novel genes that are directly regulated by p53. Using chromatin immunoprecipitation followed by a yeast selection system we have isolated over 100 genomic DNA fragments that contain novel p53 binding sites. The new DNA fragments obtained have been mapped to various regions of the human genome, and putative novel p53 target genes have been identified, validated, and characterization is ongoing. This research will lead to a more complete understanding of p53-regulated signaling pathways in mammary epithelial cells.
DTIC
Cancer; Carcinogens; Cells (Biology); Epithelium; Mammary Glands; Tumors

20040043922 Academy of Health Sciences (Army), Fort Sam Houston, TX
Developing the Military Health System Balanced Scorecard: The Strategic Planning Process
Priest, Christopher D.; Apr. 2003; 254 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420852; HCA-30-03; No Copyright; Avail: CASI; A12, Hardcopy

An analysis of the MHS Strategy formulation process utilizing the Balanced Scorecard framework identifies - gaps between the theoretical model and the actual steps taken. Successful implementation of the strategic plan is not a given. Many factors will influence the ultimate success or failure of senior-leadership's current strategic management efforts. The Balanced Scorecard provides a.- framework to- balance financial objectives with other equally-important perspectives, overcoming the inherent overemphasis -on performance measurement governing the federal sector. While the Balanced Scorecard approach provides a valid theoretical construct for strategic-planning, political, financial, legal, and organizational relationships significantly impact effective implementation. Continued development of the strategic management process is necessary to refine and institutionalize change. Unlike previous strategic planning attempts, the current Balanced Scorecard must be a living tool. adaptable and capable of aligning the MHS into a strategy-focused organization. This study identifies key issues that must be addressed during the communications and institutionalization processes and recommends options to reduce the gaps between the theoretical construct and the current application.
DTIC
Health; Management Planning

20040043923 Baylor Coll. of Medicine, Houston, TX
USF-2 as an Inhibitor of Mammary Gland Carcinogenesis
Hadsell, Darryl L.; Sep. 2003; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-98-1-9070
Report No.(s): AD-A420853; No Copyright; Avail: CASI; A03, Hardcopy

The hypothesis tested in these studies is that overexpression of USF in the mammary glands of transgenic mice will inhibit myc-dependent tumorigenesis. Expression of a FLAG- tagged form or USF-2 was targeted to the mammary gland under the control of the mouse mammary tumor virus (mmtv) long terminal repeat. Of eight lines of transgenic mice that were generated, one demonstrated expression of flag-tagged USF-2 in the lactating mammary gland at levels 12-fold over that of endogenous USF-2. Evaluation of tumorigenesis in these mice (n=17) out to 453 days of age suggests that USF-2 when overexpressed by itself is not oncogenic. In contrast, 72% of mmtv-myc mice (n=18) analyzed have developed mammary tumors with an average latency of 156+/-33 days. Tumor frequency and latency in bigenic mmtv-USF-2/mmtv-C-myc mice out to 200 days of age was similar to that in mmtv-C-myc mice. In contrast the growth of these myc-dependent tumors in bigenic mice was significantly lower (P<O.O1) than that in mmtv-C-myc mice. This decreased growth, however was not associated with changes in cell proliferation or death. These data support the conclusion that while overexpression of USF-2 has only modest impact on mammary gland development and myc-dependent tumorigenesis.
DTIC
Carcinogens; Cells (Biology); Inhibitors; Mammary Glands; Tumors

20040043924 Academy of Health Sciences (Army), Fort Sam Houston, TX
The Development of Medical Readiness
Coleman, Joseph D.; Apr. 20, 2001; 92 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420854; No Copyright; Avail: CASI; A05, Hardcopy

The Navy Medical Department is improving its governance structure and implementing broad directional strategies to position itself at a strategic advantage in the development of medical readiness. This is being accomplished by addressing new operational concepts in joint doctrine amid recent outside concerns. In the development of medical readiness, strategic planning is centralizing the planning and decentralizing the execution. However, the medical department must align itself with other governance structures and implement specific adaptive strategies to address objectives mandated by higher authority. Current healthcare re- engineering efforts should be extended to include a strategic analysis implementing specific adaptive strategies. Understanding the current operational concepts and adapting appropriate structures and processes will optimize the development of medical readiness and justify resources for the primary military mission.
DTIC
Maintainability; Medical Personnel; Medical Services; Personnel

20040043925 Academy of Health Sciences (Army), Fort Sam Houston, TX
Feasibility of Recapturing Neonates with Minor to Moderate Illnesses
Fisher, Craig; Jun. 3, 2003; 63 pp.; In English
Report No.(s): AD-A420855; HCA-12-03; No Copyright; Avail: CASI; A04, Hardcopy

Blanchfield Army Community Hospital (BACH) is a medium sized Army Community Hospital that serves a rural military

population. The organization operates a five-bassinet Level I neonatal intensive care unit (NICU) as part of its Women's Health Services. The organization transfers mothers in labor prior to 36 weeks of gestational age and neonates born prior to 36 weeks of gestational age or with high acuity levels to facilities with greater NICU capabilities. In Fiscal Year 2001 BACH paid approximately $608,729 to two local community hospitals located within 25 miles of the facility for Level II neonatal care and the labor/delivery services associated with% that care. This study looked at several options for recapturing these costs, while maintaining or increasing the quality of patient care to BACH's beneficiaries. The options considered include: coordinating neonatal transfers back to the BACH, upgrading the NICU to a Level II by increasing the competency of the current staff, and upgrading the NICU to a Level II plus by hiring a neonatologist and neonatal nurse practitioners. The analysis indicated that retaining 35-week neonates by increasing the competency level of the current staff could generate cost savings of approximately $54,544 per year and make more effective use of the facility, staff, and equipment.
DTIC
Health

20040043926 North Carolina Univ., Chapel Hill, NC
P53 Mutation Analysis to Predict Tumor Response in Patients Undergoing Neoadjuvant Treatment for Locally Advanced Breast Cancer
Carey, Lisa A.; Oct. 2003; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0521
Report No.(s): AD-A420856; No Copyright; Avail: CASI; A03, Hardcopy

The two most effective classes of chemotherapeutic drugs in breast cancer are the anthracyclines and the taxanes, which differ in mechanisms of action and resistance. P53 may mediate responsiveness to these drugs. P53 mutations status has had limited usefulness as a predictive tumor marker given the technical complexity of previous methods to determine it, however the development of p53 Genechip technology has made high-throughput mutation analysis more feasible. In an ongoing multiinstitutional prospective trial that is not supported by this award, breast cancer patients receiving neoadjuvant chemotherapy using these drugs have serial response assessments and tumor sampling for research purposes. This project involves analyzing he banked tumor specimens for p53 mutations using the Genechip method. We hypothesize that p53 status of the primary tumor will predict response to anthracycline- based and taxane-based chemotherapy given at different times in the same patient. Progress to date includes optimizing the Genechip method of p53 mutation analysis for core biopsy specimens, successful scaling down of DNA requirements for such assays allowing evaluation of small tumor biopsy samples, and optimizing methods for p53 amplification within 1-2 large fragments so that SSCP and sequencing analysis will be feasible despite the small amount of DNA available.
DTIC
Cancer; Clinical Medicine; Mammary Glands; Mutations; Patients; Tumors

20040043931 Fox Chase Cancer Center, Philadelphia, PA
Telomerase Independent Telomere Maintenance in Ovarian Cancer: A Molecular Genetic Analysis
Broccoli, Dominique; Jul. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0724
Report No.(s): AD-A420861; No Copyright; Avail: CASI; A02, Hardcopy

The goal of this project is to elucidate some of the genetic and biological determinants of ovarian cancer, focusing on an in vitro model for ovarian cancer that we have developed. We found that immortalization and transformation of human ovarian surface epithelial (HOSE) cells can differ in the pathway used for telomere length maintenance, a phenomenon that we have also observed in the clinical disease. We have found that the majority of our HOSE cell cultures use the Alternative Lengthing of Telomeres (ALT) pathway for telomere maintenance, thereby providing an in vitro model to characterize the underlying basis of the ALT pathway in ovarian cancer. During this year of funding we have completed characterization of 50 ovarian tumors and found two that are telomerase negative and contain the characteristic long telomeres associated with the ALT pathway. We have also developed and optimized the technique to detect ALT- associated PML nuclear bodies in paraffin embedded tissues. This technology may distinguish additional ALT tumors among the cohort of telomerase negative tumors so far identified. Finally, we have improved our ability to profile RNA from these tumors by establishing and optimizing several technical aspects including isolation of RNA from microdissected tissue. The techniques developed in the last year will be critical in assessing expression patterns of ovarian tumors that use ALT for telomere maintenance.
DTIC
Cancer; Clinical Medicine; Culture Techniques; Genetics; Maintenance

20040043932 Kentucky Univ., Lexington, KY

REMIS: A Tool to Facilitate Innovation, Standardization and Validation in the Creation of Ergonomic Surgical Simulators

Seales, W. B.; Feb. 2004; 18 pp.; In English

Contract(s)/Grant(s): DAMD17-03-2-0015

Report No.(s): AD-A420862; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this work is to develop and test new technologies that will break down the barriers that block more surgeons from attaining and continuing to practice (without injury or pain) high levels of skill in minimally invasive surgery (MIS). This project will develop new technology by concentrating on three major research thrusts: Smart Image: the project will develop and evaluate new approaches for extracting, fusing, and presenting information cues from imagery and other data sources; Configurable Display: the project will develop new approaches for presenting existing data (video, CT data) and extracted cues (3D reconstruction, haptic cues, etc.) to the user within a flexible, configurable display environment; Ergonomic Assessment: the project will use existing technology and build new techniques as needed to acquire crucial ergonomic data relative to key factors of patient position, technology configuration, and instrument design.

DTIC

Display Devices; Human Factors Engineering; Simulators; Standardization; Surgery

20040043933 Wistar Inst. of Anatomy and Biology, Philadelphia, PA

Structure-Based Design of CSDK4-Specific Inhibitors

Marmorstein, Ronen; Oct. 2003; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0725

Report No.(s): AD-A420863; No Copyright; Avail: CASI; A03, Hardcopy

Distinct cancer types have been correlated with several proteins that are involved in the G1 to S transition of the mammalian cell cycle (Funk, 1999; Molinari, 2000). In particular, the inability to inhibit the activity of the paralogs cyclin-dependent kinases 4 and 6 (CDK4/6) are implicated in more than 80% of human neoplasias (Ortega et al., 2002). For example, the gene encoding the CDK4/6 inhibitory protein, p16INK4, is deleted or mutated in the majority of leukemias, bladder cancers and familial melanomas (Roussel, 1999). The CDK4/6 stimulatory subunit, cyclin Dl, is commonly found to be overexpressed or gene amplified in spontaneous breast cancers (Donnellan and Chetty, 1998; Khoo et al. , 2002), and overexpression of cyclin Dl in mice leads to death due to breast cancer (Wang et al., 1994). Finally, CDK4 itself is overexpressed or gene amplified in about one third of breast cancers (Ortega et al., 2002). Together, these observations indicate that deregulation of the G1 to S transition of the mammalian cell cycle is tightly linked to the onset of several different cancer types, and that the CDK4/6 protein, in particular, is an excellent candidate for targeted inhibition for the treatment of breast cancer.

DTIC

Cancer; Inhibitors; Mammary Glands

20040043936 West Virginia Univ., Morgantown, WV

Health-Related Quality of Life for Pediatic NF1 Patients

Bradlyn, Andrew S.; Aug. 2003; 21 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0654

Report No.(s): AD-A420866; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this project is to develop a neurofibromatosis 1-specific health-related quality of life (HRQL) instrument for pediatric patients. Semi-structured interviews with children with NF1, their parents, health care professionals, and teachers will yield relevant domains and content that can be used to develop the first-generation instrument. This instrument will then be tested and revised to produce a valid and reliable measure that is sensitive to changes in clinical status. It is the author's hypothesis that the development of this disease-specific measure will significantly improve the description and quantification of the impact of NF1 and its treatment on children and families. By the conclusion of the first year, the author has obtained human subject approval from both the Army and West Virginia University Institutional Review Boards for the Protection of Human Subjects, and has recruited and completed a number of parent and child interviews. Interviews with health care providers are scheduled and teacher interviews will be scheduled and completed once school has resumed. As the data set is not yet complete and ready for analysis, findings and conclusions are not reported here. Interview guides for parents, patients, health care professionals, and teachers are appended.

DTIC

Construction; Health; Measuring Instruments; Patients; Psychology

20040043938 Georgetown Univ., Washington, DC
Impact of Culture on Breast Cancer Screening in Chinese American Women
Wang, Judy H.; Sep. 2003; 127 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0390
Report No.(s): AD-A420871; No Copyright; Avail: CASI; A07, Hardcopy

The purpose of this study is to develop and use culturally appropriate and stage-tailored Chinese language breast cancer brochures to promote older Chinese-American women's intentions to obtain mammography. A three-year research plan is designed to pursue this purpose. In Year 1, the brochures are developed and refined based on previous findings of cultural and language barriers to breast cancer screening in Chinese women. Recruitment of 250 Chinese women aged 50 and older in the Washington DC area is currently being conducted. The consented women are receiving a telephone interview regarding their previous screening experience, cultural views, and screening barriers. Recruitment and baseline interview will be completed in the second year. In Year 3, women will be randomly assigned to an intervention group with stage-tailored brochures and a control group with standard brochures. They will also receive a second interview regarding their opinions about the brochures and intention to screening. Quantitative analyses of differences between the two groups and between the first and second interviews will be conducted to evaluate acceptability of the brochures and effect of brochure intervention. This project has successfully proceeded as scheduled. Results from the interview data will be reported in the second and third years.
DTIC
Cancer; China; Females; Mammary Glands

20040043939 Academy of Health Sciences (Army), Fort Sam Houston, TX
Inpatient Obstetric Care at Irwin Army Community Hospital: A Study to Determine the Most Efficient Organization
Bergeron, Timothy N.; Mar. 2001; 86 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420872; HCA-23-01; No Copyright; Avail: CASI; A05, Hardcopy

This study attempts to compare, analyze, and recommend the most efficient model with which to deliver inpatient obstetrics and gynecological services to the served population of Irwin Army Community Hospital. During a time in which the USA Armed Forces continue to experience increased budgetary constraints, the cost of delivering health care to military beneficiaries continues to increase. Decreases in the overall military budget after considering the effects of inflation have been translated into ever more severe restrictions on the budgets of military health care facilities. At a time when health care budgets are facing some of the greatest restrictions in recent memory, the military managed care model, TRICARE, has placed military facilities in competition with civilian institutions for what had previously been a captive market. This competition for enrollees translates into competition for funding as dollars follow patients to the facility of choice. The results of this study serve to identify the most cost effective delivery model for inpatient OB/GYN. As indicated, transformation from the traditional model of inpatient OB/GYN to the more modern LDR/LDRP model would serve to decrease costs and increase patient satisfaction. Increasing patient satisfaction would allow military health care to retain beneficiaries and funds that otherwise would be lost to the civilian sector.
DTIC
Health; Management Planning

20040043941 Academy of Health Sciences (Army), Fort Sam Houston, TX
Health Promotion and Wellness Staffing Methods
Thomsen, Kim N.; Jun. 1999; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420874; HCA-35-99; No Copyright; Avail: CASI; A05, Hardcopy

This study describes the current methods and procedures used to determine both military and civilian health promotion staffing levels. Health promotion and wellness programs positively influence the military mission readiness and force protection, increase productivity, reduce health care costs, minimize illness and non-battle injuries, and decrease the number of hospital visits. The Army does not have standardized staffing guidelines or models while the mechanisms to determine requirements are fragmented and inconsistent. Core staffing establishes a planning baseline, allows flexibility for the unique demographics of region, provides cost control, and increases clinical availability. Successful programs target high-cost and high-risk populations with documented outcome measures to substantiate cost- effectiveness and enhance financial support. The Automated Staffing Assessment Model (ASAM) is a new method of tracking manpower requirements that applies only to Medical Treatment Facilities (MTF). The MEDCOM Manpower Division is developing a multivariate model to determine the relationship between workload, money, and the population served. The recommendation to meet core health promotion activities includes a minimum of five positions: a director, dietitian, physical therapist or exercise physiologist, an occupational health nurse/health educator, and administrative/ clerical support. A licensed practical nurse, pharmacist and marketing staff

augments the core staff for a full range of activities. Recommended areas for further health promotion study include: objective data for staffing, cost savings and cost avoidancefor prevention, and establishing best practices.
DTIC
Health; Management Planning

20040043942 Academy of Health Sciences (Army), Fort Sam Houston, TX
Improving Patient Throughput in the Winn Army Community Hospital Department of Emergency Medicine
Rylander, Thomas R.; May 1999; 72 pp.; In English
Report No.(s): AD-A420875; HCA-25-99; No Copyright; Avail: CASI; A04, Hardcopy

The Military Health System (MHS) finds itself operating in a competitive market. TRICARE, the military managed care system, allows family members to seek care outside the uniformed network. In this competitive environment, it is necessary to deliver health care in such a way that meets or exceeds patients expectations and perceptions. Doing so not only ensures the existence of a robust MHS, but it is simply the right thing to do. As such, the staff at Winn Army Community Hospital (WACH) takes patient satisfaction very seriously. This project monitored the maturation and influence of a Process Action Team (PAT). The Hospital Commander chartered the team in order to find ways in which the Department of Emergency Medicine (DEM) staff could improve patient throughput for the most serious injuries and illnesses presenting to the department and, by so doing, increase patient satisfaction. The project followed the specific steps the team took to improve throughput, based on the variables it identified as having an influence on overall operations. Analysis of variance (ANOVA) compared the average time 1200 patients waited to see a physician in the DEM for the six months prior to and after the teams first meeting. There was a statistical difference between the study and control averages($p < .001$). There was also a measurable improvement in patient satisfaction. Several research studies suggest improving throughput will increase satisfaction only slightly. Evidence suggests patients respond more favorably to a physician s or nurse s ability to empathize and communicate with a patient. This project recommends extensive customer awareness, in addition to physical and process changes, to significantly influence our patients perceptions of how well we meet their expectations.
DTIC
Emergencies; Health; Hospitals; Management Planning; Patients

20040043943 Academy of Health Sciences (Army), Fort Sam Houston, TX
Bennett Health Clinic: Increasing Continuity With Primary Care Managers Through Modified Advanced Access
Childress, Cynthia Y.; May 22, 2002; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420876; HCA-15-01; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study was to determine whether a two fold modification, consisting of increasing the daily percentage of same day appointments to 70% for all full-time primary care managers (PCM) and enforcing appointment booking with assigned PCM with the patient appointment service clerks, would increase continuity of care at the Bennett Health Clinic, Darnall Army Community Hospital, Fort Hood, Texas. The research question was, how can Darnall measure and improve continuity of care? This study was a time series quasi- experimental design. Continuity, defined as visits with the assigned PCM, was measured before and after the modification. The percentage of primary care visits with the PCM for Bennett enrollees significantly increased from 34.8% to 59.5% after the modification CHI-SQUARE(1) = 716.82,$P < .00001$. The mean daily percentage of a providers schedule being filled with his or her own enrollees significantly increased from 53% to 79% after the modification U (1) = 9075,$p < .00001$. Changing provider templates to increase same day appointments and enforcing appointment booking with assigned PCM increased continuity of care at the Bennett Health Clinic.
DTIC
Health; Management Planning

20040043944 Academy of Health Sciences (Army), Fort Sam Houston, TX
The Analysis of Injury Presentations in Initial Entry Trainees at Fort Benning, Georgia
Coulthard, Michael; Apr. 2001; 129 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420877; HCA-11-01; No Copyright; Avail: CASI; A07, Hardcopy

The purpose of this research is to compare the effects certain risk factors have on injury presentation for basic trainees. Physical training related injuries are common in recruits during basic training, but little is known regarding the causation. The implications of these injuries on medical assets, lost training time, and total costs during a time when the military is expected to do more with less is staggering. In order to better understand some of the intrinsic factors that lead to injured trainees, this study prospectively surveyed two separate units during a 13-week basic-training cycle. Unit rosters were obtained from the

units at the beginning of the training cycle, medical records were screened for demographic information not in the unit rosters. Potential risk factors(age, injury history, push-up score, run score, cumulative Physical Fitness Test score, overweight status, and race) were compared to injury presentation for the sample set (n = 309). Statistical analysis of the sample set shows that the only risk category that has a significant effect on injury presentation is the Hispanic race, with r = .1321, ?2(1) = 5.390, and p = .020. Monitoring this category of trainees more closely for early signs of potential injury may reduce the number of trainees being injured during basic training at Fort Benning.
DTIC
Health; Injuries; Management Planning; Students

20040043947 Texas Univ. Health Science Center, San Antonio, TX
Neurofibromin and Neuronal Apoptosis
Vogel, Kristine S.; Jul. 2003; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0653
Report No.(s): AD-A420881; No Copyright; Avail: CASI; A03, Hardcopy

During development, neurons become dependent on target-derived neurotrophins for survival and maintenance of differentiated functions. Failed or inappropriate target interactions in vivo, or withdrawal of neurotrophins in vitro, lead to a characteristic sequence of molecular cell death events termed 'apoptosis', The purpose of the proposed research is to examine the roles of the Nf1 gene product, neurofibromin, in modulating the apoptotic response to neurotrophin withdrawal, as well as the survival response to depolarization. Previously, we demonstrated that many sensory neurons isolated from Nf1-/- mouse embryos survive in the absence of neurotrophins. The scope of the experiments proposed for Year 1 included 1) comparison of the response of embryonic mouse sensory neurons to nerve growth factor withdrawal and subsequent rescue with depolarizing levels of KCl, 2) analysis of the roles of downstream signaling molecules (P13 kinase, MAP kinase) in regulating the survival response to depolarization, and 3) analysis of the response of neurofibromin-deficient sensory neurons to neurotrophin withdrawal. In the first year of funding, we have demonstrated that Nfl haploinsufficient DRG neurons differ in their responses to NGF withdrawal and depolarization- mediated rescue. In addition, we found that loss of neurofibromin does not protect all sensory neurons from apoptosis following NGF removal.
DTIC
Apoptosis; Cells (Biology); Fibrosis; Nervous System; Neurophysiology

20040043948 Childrens Research Inst., Columbus, OH
Post Transcriptional Regulation of the Neurofibromatosis 2 Gene
Chang, Long-Sheng; Aug. 2003; 21 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0680
Report No.(s): AD-A420890; No Copyright; Avail: CASI; A03, Hardcopy

Neurofibromatosis type 2 (NF2) is associated with a homozygous inactivation of the neurofibromatosis 2 gene (NF2), which encodes a protein named merlin' for moesin-ezrin- radixin like protein (Trofatter et al., 1993). Despite Tntense study of the NF2 tumor- suppressor, the mechanism by which merlin acts to prevent tumor formation is not well understood (reviewed in Gusella et al., 1999; Gutmann, 2001). The NF2 transcripts undergo alternative splicing, generating a series of mRNA isoforms lacking one or more exons. Presently, the role of alternative splicing of NF2 mRNAs is not understood. NF2 isoform 1 (without exon 16) but not isoform 2 (containing all 17 exons) possess growth inhibitory properties (Gutmann et al., 1999).
DTIC
Neoplasms; Transcription (Genetics)

20040043952 DeWitt Army Community Hospital, Fort Belvoir, VA
A Strategic Marketing Plan for Women and Infant Services, DeWitt Army Community Hospital and the DeWitt Health Care System
Soh, Kelly E.; Apr. 1999; 50 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420894; No Copyright; Avail: CASI; A03, Hardcopy

This market research paper analyzes DeWitt Army Community Hospital and the DeWitt Health Care System's Women and Infant Services from a marketing perspective, and proposes 10 'action plans' for attracting and retaining more patients. Maternal/Child Health is DeWitt's second most important product line, with a target market of 25,000 female beneficiaries between the ages of 18 and 45. Currently, DeWitt has a 75 percent share of this market. The goal is to increase this market

share to 85 percent. The 'Women and Infant' product line consists of care provided in the Well Woman/OB/GYN Clinic, the Labor and Delivery Unit, and the Mother/Baby Unit. Expectant mothers spend approximately 9 months as customers of this product line. DeWitt does not currently use product line management to integrate these services. Both secondary and primary data were used to gather information about the market. Primary data were collected using two survey instruments. The outpatient survey was mailed to beneficiaries who requested non-availability statements for obstetrical care from 1 January 1998 to 1 December 1998 (N=254). The inpatient survey was given to patients who delivered babies at DeWitt during the month of January 1999 (N=66). Outpatient responses indicated relatively low satisfaction with DeWitt's atmosphere, staff friendliness, appointment system, and wait times in the clinic. The inpatient questionnaire highlighted patients' concerns about the atmosphere, the facilities, and their likelihood to recommend the clinic or unit to a friend. As a result of this study, 10 recommended marketing action plans are identified. These include creating a 'Women and Infant Services Center' on the hospital's third floor that is both functional and aesthetically pleasing to patients, appointing a product line manager to oversee the integration and marketing of Women and Infant services, and investing in a personalized 'OB Registration' process for newly pregnant patients. (9 tables, 43 refs.7

DTIC

Clinical Medicine; Females; Health; Hospitals; Human Behavior; Market Research; Marketing; Medical Services; Patients; Psychology

20040043953 Johns Hopkins Univ., Baltimore, MD

Pathogenesis of Ovarian Serous Carcinoma as the Basis for Immunologic Directed Diagnosis and Treatment. Project 2 - Identification of Autologous Antigens in Early Stage Serous Carcinoma

Kurman, Robert J.; Roden, Richard; Aug. 2003; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0667

Report No.(s): AD-A420895; No Copyright; Avail: CASI; A03, Hardcopy

Our goal is to develop an early detection screening test for serous carcinoma. Specific aim 1: Obtain cDNAs of autologous tumor antigens recognized by sera of patients with early stage serous carcinoma, but not controls. Progress: While our ovarian cancer cDNA library is construction for SEREX analysis, we have developed an alternative, complementary methodology. We employed patient sera to immunoprecipitate proteins from autologous cancer cells and identified these antigens by mass spectrometry. One antigen, SMAP-1, has homology to genes that facilitate cell division. Specific aim 2: Identify autologous tumor antigens expressed in serous carcinoma but absent from, or a low level in normal tissue. Progress: We have expressed recombinant SMAP- 1 protein and generated specific antisera. We the SMAP-1 mRNA is ubiquitous in all tissues tested thus far, and immunohistochemical studies are currently underway. We have already several identified several other SEREX antigens, including the homeobox HOXB7 transcription factor. We have generated peptide antiserum to HOXB7 and confirmed its over expression in cancer cell lines. Interestingly, we also note a shift from a nuclear localization in normal tissue to the cytoplasm in most carcinomas.

DTIC

Antigens; Cancer; Diagnosis; Pathogenesis

20040045183 Washington Univ., Seattle, WA, USA

Archive and Analysis of Data Collected Aboard the University of Washington's Convair-580 Research Aircraft in CLAMS

Hobbs, Peter V.; [2004]; 3 pp.; In English

Contract(s)/Grant(s): NAG5-11665; No Copyright; Avail: CASI; A01, Hardcopy

Work under this grant has been concerned with: (a) quality-assurance (QA) checking of the data collected on the University of Washington s (UW) Convair- 580 in the Chesapeake Lighthouse and Measurements for Satellites (CLAMS) field study in the Summer of 2001, (b) providing these data to the Langley DAAC, (c) providing specific data to users as requested, (d) analysis of portions of the data and publication of results, and (e) presentation of CLAMS results at workshop and conferences.

Author

Mollusks; Quality Control; Data Management; Data Transmission; Aerosols

52
AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20040036243 Kentucky Univ., Lexington, KY

Anxiety and Heart Disease

De Jong, Marla J.; Moser, Debra K.; Jan. 2003; 55 pp.; In English

Report No.(s): AD-A420275; AFIT-CI-04-124; No Copyright; Avail: CASI; A04, Hardcopy

Despite impressive gains made in the treatment of coronary heart disease (CHD), it remains the number one cause of death and a major cause of disability among women and men in the USA. By the year 2020, CHD is projected to be the number one cause of death worldwide.(American Heart Association, 2002; Chockalingam et al., 2000; Reddy & Yusuf 1998) Coronary heart disease claims more lives each year than the next five causes of death combined.(American Heart Association, 2002) The effect of various demographic (e.g., age, gender) and clinical (e.g., presence of comorbidities) characteristics on development of cardiac events and on recovery has been well- studied.(Breithardt et al., 1995) These demographic and clinical characteristics are used commonly in clinical practice to determine patient risk for future events. Far less attention has been paid to the impact of psychological risk factors despite compelling evidence that they confer equal and, in some cases, greater risk than demographic or clinical risk factors.(Kubzansky & Kawachi, 2000; Kubzansky, Kawachi, Weiss, & Sparrow, 1998b; Rozanski, Blumenthal, & Kaplan, 1999a) Failure to understand and address psychological risk factors for CHE) events may be one reason that CHD morbidity and mortality remain so high. Anxiety disorders are among the most prevalent psychiatric disorders. (Kubzansky et al., 1998b) Given the prevalence of anxiety in the general population and in patients with CHD, the potential public health impact for preventing CHD development and progression is high if the nature of the relationship between anxiety and CHD is appreciated.

DTIC

Heart Diseases; Stress (Psychology)

20040036311 Air Force Research Lab., Brooks AFB, TX

The Efficacy of Modafinil for Sustaining Alertness and Simulator Flight Performance in F-117 Pilots During 37 Hours of Continuous Wakefulness

Caldwell, John; Caldwell, Lynn; Smith, Jennifer; Alvarado, Linda; Heintz, Tara; Jan. 2004; 100 pp.; In English

Contract(s)/Grant(s): Proj-7757

Report No.(s): AD-A420330; AFRL-HE-BR-TR-2004-0003; No Copyright; Avail: CASI; A05, Hardcopy

The present study determined whether modafinil (100-mgs after 17, 22, and 27 hours without sleep) attenuated the effects of fatigue on fighter-pilot alertness and performance. A quasi-experimental, single-blind, counterbalanced design was used in which 5 pilots from a previous F-117 fatigue study (in which no fatigue remedy was employed) were retested with modafinil. Their data were combined with the data from 5 newly-recruited F-117 pilots who were evaluated under modafinil and then placebo. Modafinil improved vigilance and tracking performance in a divided- attention task, CNS activation, oculomotor performance, and aspects of subjective mood. Flight performance decrements were mitigated on six of eight maneuvers. Benefits were most noticeable after 24 to 32 hours of continuous wakefulness. Although modafinil did not sustain performance at pre- deprivation levels, its numerous positive effects make it a useful adjunct to the currently-approved fatigue countermeasure dextroamphetamine. However, modafinil should not be considered a replacement for this older compound. A follow-on in-flight study is recommended.

DTIC

Fighter Aircraft; Flight Characteristics; Jet Aircraft; Sleep Deprivation

20040036585 Naval Postgraduate School, Monterey, CA

Reengineering Human Performance and Fatigue Research Through Use of Physiological Monitoring Devices, Web-Based and Mobile Device Data Collection Methods, and Integrated Data Storage Techniques

O'Connor, Maureen J.; Patillo, Paul L.; Dec. 2003; 137 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420562; No Copyright; Avail: CASI; A07, Hardcopy

In the field of human research particularly in operational environments data collection techniques arc difficult. Researchers often focus their efforts on the data analysis and overlook the shortcomings of their data collection and storage methodologies. In order to demonstrate effective data collection and storage methodology in a representative human research

process the process used by human fatigue and performance researchers at the Human Systems Integration Lab at Naval Postgraduate School (NPS) served as a Proof of Concept. Most recent studies conducted at NPS provided a model of the current process. The Knowledge Value Added (KVA) methodology was used as a tool of comparison of the current process to the reengineered process. Information technologies including wireless physiological monitoring devices web-based and mobile device data collection methods and integrated data storage techniques were incorporated in the reengineering effort. The data storage process included the design of a standard relational database format allowing research teams to easily access their data. This repository also enables data to be archived for future use (e.g. meta- analyses). To demonstrate the reengineered process in an operational environment a field fatigue study was conducted at the Naval Officer Indoctrination School (OIS) in Newport Rhode Island.
DTIC
Data Acquisition; Data Storage; Human Performance

20040040075 Institute of Space Medico-Engineering, Beijing, China
Space Medicine and Medical Engineering, Volume 16, Supplment 2003
SU, Shuang-ning, Editor; Jiang, Shi-zhong, Editor; Wang, Xian-min, Editor; Liu, Xin-min, Editor; Su, Hong-yu, Editor; Bai, Jing, Editor; Sun, Xi-qing, Editor; Xiao, Zhi-jun, Editor; Wei. Jin-he, Editor; Wang, Xi-ji, Editor; Yu, Meng-sun, Editor; Shen, Li-ping, Editor; Zhang, Ru-guo, Editor; Yang, Tian-de, Editor; Huang, Duan-sheng, Editor; Xiu, Zheng, Editor; Grigoriev, A. I., Editor; White, Ronald J., Editor, et al.; December 15, 2003; ISSN 1002-0837; 135 pp.; In Chinese
Report No.(s): CN-11-2774/R; Copyright; Avail: Other Sources

This issue of Space Medicine and Medical Engineering includes invited papers, original research, special articles, and a literature review. The invited papers include an exclusive interview with Yang Li-wei, the first Chinese astronaut in space. Some of the other areas of Chinese aerospace medicine covered in this issue include: man-machine systems, artificial intelligence, quality control, closed ecological systems, vestibular function in Chinese astronauts, bioinstrumentation, food and nutrition in space, environmental control, weightlessness, and ergonomics.
CASI
Chinese Space Program; Manned Space Flight; Aerospace Medicine; Astronauts

20040040077 Institute of Space Medico-Engineering, Beijing, China
Space Medicine and Medical Engineering, Volume 16, No. 6
Wei, Jin-He, Editor; Su, Shuang-Ning, Editor; Jiang, Shi-Zhong, Editor; Wang, Xian-Min, Editor; Liu, Xin-Min, Editor; Su, Hong-Yu, Editor; Bai, Jing, Editor; Sun, Xi-Qing, Editor; Su, Hong-Yu, Editor; Xiao, Zhi-Jun, Editor, et al.; December 2003; ISSN 1002-0837; 102 pp.; In English; In Chinese
Report No.(s): CN-11-2774/R; Copyright; Avail: Other Sources

This issue of Space Medicine and Medical Engineering includes original research, brief reports, literature reviews, and news. The articles under these categories cover optokinetic illusions, burns, experiments on the cardiovascular and skeletal systems of rats, electrocardiograms, microgravity effects on cardiac gap junction protein CX43 and on human cognitive function, visual spatial attention, peroxidative damage, and experimental facilities for life sciences on onboard the International Space Station.
CASI
Chinese Space Program; Aerospace Medicine

20040040344 Fourth Military Medical Univ., Jilin, China
Measurement of Cerebral Blood Oxygen Saturation with Near Infrared Spectroscopy and Its Application in Hyper-Gravity
Sun, Jia-Shi; Tong, Wen-Ge; Chen, Mo-Ran; Xiao, Zhi-Wei; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 371-373; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to measure the oxygen saturation of blood in rat s brain non-invasively after acceleration with near infrared spectroscopy technique. A series of models about different ischemia and hypoxia of head, measured oxygen saturation by phlebotomize were made, and the difference with normal group was obtained. Its absorption intensity was measured and a curve showing the difference between the normal value was drawn. According to the curve, cerebral blood oxygen saturation after acceleration was calculated with the measured absorption intensity after high + Gz or push-pull maneuver by near infrared spectroscopy. Compared high Gz and push pull effect group with 0 Gz group, the content of ox hemoglobin reduced, in opposition the deox hemoglobin increased, the greater the difference, the lower the content of oxygen

saturation of blood. Oxygen saturation of blood in the rat's brain can be obtained non-invasively with near infrared spectroscopy.
Derived from text
Blood; Cerebrum; Infrared Spectroscopy; Near Infrared Radiation; Saturation; Oximetry; High Gravity Environments

20040040345 Institute of Space Medico-Engineering, Beijing, China
Study on Space Motion Sickness Before, During and After Spaceflight
Wang, Lin-Jie; Zhang, Dan; Dong, Wei-Jun; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 382-386; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

Space motion sickness has long been a difficult medical problem in human space flight. Because it is a group of syndromes of the astronauts in adaptation to the new space environment and is related to a wide range of factors, the research of space motion sickness is different from that of cardiovascular and pulmonary system. Subjective methods and qualitative investigation are frequently used, and quantitative analysis is limit- ed since objective stimuli that can be used in specific space environment are few and the samples are small. So precise localization of the problem is very difficult. In this paper space vestibular experiments and works on perceptions of space motion sickness completed by Russian and American scientists are reviewed, in the hope that it may provide some references for future space medical researches.
Author
Aerospace Environments; Motion Sickness

20040040347 Sichuan Univ., Chengdu, China
A New Membrane-permeable Peptide from Human
Peng, Tao; Yang, Chun-Lei; Xiao, Jing; Guo, Hui-Ling; Liu, Ying-Hui; Wang, Zheng-Rong; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 368-370; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to study the translocation ability of a new protein domain (Circadian locomotor output cycles kaput protein's DNA-binding peptide, hCLOCK's DNA_BIND) from human through the membrane. hCLOCK's DNA-BIND, which was chemically synthesized and labeled with FITC at N-terminal, was incubated with the vascular endothelial cell (ECV-304) and primary culture neuroglial cells in the culture medium, the distribution of it was observed on a fluorescence microscope. hCLOCK's DNA-BIND has the ability to translocate through the cell membrane and accumulate in the nucleus. The quantification of cellular uptake of it increases with the increase of incubation time and concentration. However, the peptide was internalized at 4 C as efficiently as that at 37 C. It is promising to provide a new safe carrier for the intracellular treatment.
Derived from text
Peptides; Deoxyribonucleic Acid; Cell Membranes (Biology); Permeability

20040040348 Academy of Space Technology, Beijing, China
Effect of Space Flight on Yield of Monascus Purpureus
Yin, Hong; Xie, Shen-Yi; Zhang, Guang-Ming; Xie, Shen-Meng; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 374-376; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to select high Lovastatin-producing microbial breed by space flight. Monascus purpureus species was carried into space by the recoverable spaceship, Shenzhou 3. After flight, the strain was rejuvenized, segregated and selected. The content of Lovastatin produced in the solid fermentation was examined. Mutants with high productivity of Lovastatin were obtained. A series of tests showed that the acquired character of the mutants was stable. Space flight is an effective method for the selection of fine strains.
Author
Aerospace Medicine; Microorganisms; Breeding (Reproduction); Space Flight

20040040349 Institute of Aviation Medicine, Beijing, China
Effects of Short-action Hypnotics Triazolam and Zopiclone on Simulated Flight Performance
Jing, Bai-Sheng; Zhan, Hao; Li, Yan-Feng; Zhou, Ya-Jun; Guo, Hua; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 329-331; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to evaluate the effects of short-action hypnotics triazolam and zopiclone on simulated flight performance so as to provide experimental evidences for the use of these drugs in aircrew. Six healthy young male

volunteers served as the subjects. They were asked to take triazolam (0.25 mg), zopiclone (7.5 mg) or placebo at noon time (13:00) and sleep for 1 h. Simulated flight performances were tested in a simulator 1 h, 2 h, 3 h, 4 h, 6 h, 8 h, 10 h and 20 h (next morning 9:00) after taking the drugs. The experiments were done once a week for 3 weeks. No significant difference was found between simulated flight performances before and after taking triazolam while simulated flight performances at 2 h and 3 h after taking zopiclone showed significant decrease ($P < 0.05$), but restored to normal 4 h after taking the drug. Short-action hypnotic triazolam had no significant effect on simulated flight performance, while zopiclone had significant adverse effects on simulated flight performance at 2 h and 3 h after taking the drug.
Author
Sedatives; Flight Crews; Pilot Performance

20040040353 People's Liberation Army, Yechen, China
Effects of Enriched Oxygen on Human Free Radical Metabolism during Exercise at 5 380 m Plateau
Cui, Jian-Hua; Zhang, Xi-Zhou; Zhang, Jian-Lin; Zhang, Fang; Ma, Yong; Wang, Da-Wen; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 377-378; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to study the effect of enriched oxygen on free radical metabolism at high altitudes. SOD, GSH-Px and MDA were measured in 10 healthy young men after stepping in a room with or without oxygen enrichment at high altitude of 5 380 m. After exercise in the oxygen-enriched room, SOD and GSH-Px increased significantly while MDA decreased notably (P less than 0.01) than those after exercised in the room without oxygen enrichment (P less than 0.05 or P less than 0.01). Enriched oxygen can decrease damage from free radical at high altitudes.
Derived from text
Free Radicals; Metabolism; Oxygen; Physical Exercise

20040040355 Shanghai Jiao Tong Univ., China
An Improved Portable Fiber Optic Sensor for Continuous Clinical Monitoring of Entero-gastric Reflux
Chen, Guo-Ping; Jiang, Zhi-Ru; Xia, Rong-Min; Shou, Wen-De; Gong, Jun; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 317-321; In English; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to develop a method for on-line continuous monitoring of entero-gastric reflux in clinical diagnosis. The development of a fiber optic sensor for clinical monitoring of entero-gastric reflux based on characteristic absorption of bilirubin at analytical wavelength was reported in detail. The whole measuring system was composed of two LEDs as light sources, a bifurcated optic bundle and a detection circuit. A wonderful dynamic response with a linear range of up to 10 mg/dl was achieved. The pH effect on sample analysis was investigated and the in-vitro test demonstrated that the sensor worked preferably in acid environment. In vitro analyses of bile sample were carried out using the sensor. The sensor shows good accuracy and sensitivity. With further development, the sensor can be made easily transportable, compact and inexpensive for biomedical analysis.
Derived from text
Gastrointestinal System; Fiber Optics; Sensors; Portable Equipment; Bioinstrumentation

20040040356 Institute of Space Medico-Engineering, Beijing, China
WMN: A Negative ERPs Component Related to Working Memory during Non-target Visual Stimuli Processing
Zhao, Lun; Wei, Jin-He; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 322-325; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

To study non-target stimuli processing in the brain. Features of the event-related potentials (ERPs) from non-target stimuli during selective response task (SR) was compared with that during visual selective discrimination (DR) task in 26 normal subjects. The stimuli consisted of two color LED flashes (red and green) appeared randomly in left (LVF) or right (RVF) visual field with same probability. ERPs were derived at 9 electrode sites on the scalp under 2 task conditions: a) SR, making switch response to the target (T) stimuli from LVF or RVF in one direction and making no response to the non-target (NT) ones; b) DR, making switching response to T stimuli differentially, i.e., to the left for T from LVF and to the right for T from RVF. 1) the non-target stimuli in DR conditions, compared with that in SR condition, elicited smaller P2 and 3 components and larger N2 component at the frontal brain areas; 2) a significant negative component, named as WMN (working memory negativity), appeared in the non-target ERPs during DR in the period of 100 to 700 ms post stimulation which was predominant at the frontal brain areas.According to the major difference between brain activities for non-target stimuli during SR and DR, the predominant appearance of WMN at the frontal brain areas demonstrated that the non-target stimulus

processing was an active process and was related to working memory, i.e., the temporary elimination and the retrieval of the response mode which was stored in working memory.
Author
Targets; Probability Theory; Stimulation; Visual Stimuli

20040041295 Chinese Inst. of Engineers, Taipei, Taiwan, Province of China
Journal of the Chinese Institute of Engineers. Special Issue: Biomechanics, Volume 26, No. 6
Chen, Shun-Tyan, Editor; Chou, Yi-Shyong, Editor; Shiou, Fang-Jung, Editor; Lee, Liang-Sun, Editor; Young, Der-Liang, Editor; Pan, Ching-Tsai, Editor; Chen, Jean-Lien, Editor; Chung, Chung-Ping, Editor; Chao, Ching-Kong, Editor; Chang, Kai, Editor, et al.; November 2003; ISSN 0253-3839; 161 pp.; In English; Copyright; Avail: Other Sources

This special issue is the first in the area of Biomechanics published in the Journal of the Chinese Institute of Engineers. There are a total of 16 full length manuscripts written by leading researchers in specific area of Biomechanics. Both the topics and authors were selected by members of the advisory board and the editors. Each manuscript underwent technical peer review consistent with the standards of scientific publications. The first 5 papers are related to advances in analysis of ortho- paedic biomechanics. The next 6 papers cover topics in the research and development of orthopaedic implant and devices. The last 5 papers are related to the advances in the area of rehabilitation, sports and cardiovascular research. We believe that the readers of this special issue will benefit from the new ideas and results presented in the papers. Special thanks will be given to the reviewers for their valuable comments. Finally, we hope that this special issue will serve as a catalyst to further advances in the area of Biomechanics.
Author
Biodynamics; China; Engineers; Periodicals

20040043736 NASA Manned Spacecraft Center, USA
Experiment M-1: Cardiovascular Conditioning
Dietlein, Lawrence F.; Judy, William V.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 75-99; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Intermittent venous occlusion of the extremities of man, during weightlessness simulation studies, has been demonstrated to be effective in preventing or mitigating the orthostatic hypotension observed following such simulations. A similar preventive measure was employed on the pilot of Gemini V with a view to determining the efficacy of pulsatile leg cuffs in preventing or lessening the orthostatic hypotension observed following previous space flights. Unfortunately, the cuff device was operative continuously during only the first 4 days of the 8-day mission. Post flight tilt-table responses of the command pilot and the pilot were considerably different, but the data cannot be construed as a conclusive demonstration that the observed differences were the result of the action of the pulsatile cuffs. The differences in the tilt responses of the Gemini V flight crew may be only a reflection of individual variability so commonly observed in biological experimentation. More data shall be required before a judgement can be rendered as to the efficacy of the pulsatile-leg-cuff technique in lessening postflight postural or orthostatic hypotension.
Author
Cardiovascular System; Aerospace Medicine; Gemini 5 Flight; Deconditioning; Orthostatic Tolerance; Spaceborne Experiments

20040043737 Scripps Institution of Oceanography, CA, USA
Experiment S-8/D-13: Visual Acuity and Astronaut Visibility
Duntley, Seibert Q.; Austin, Roswell W.; Taylor, John H.; Harris, James L.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 45-74; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Reports by Mercury astronauts of their sighting small objects on the ground prompted the initiation of a controlled visual acuity experiment which was first conducted in Gemini V. The first objective of Experiment S-8/D-13 was to measure the visual acuity of the crew members before, during, and after long-duration space flights in order to ascertain the effects of a prolonged spacecraft environment. The second objective was to test the use of basic visual-acuity data combined with measured optical properties of ground objects and their natural lighting, as well as of the atmosphere and the spacecraft window, to predict the flight crew's limiting naked-eye visual capability to discriminate small objects on the surface of the earth in daylight.
Derived from text
Astronauts; Visibility; Visual Acuity; Gemini 5 Flight; Pilot Performance

20040043740 NASA Manned Spacecraft Center, USA

Experiment M-3: In-Flight Exerciser

Dietlein, Lawrence F.; Rapp, Rita M.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 101-108; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A02, Hardcopy

The response of the cardiovascular system to a quantified workload is an index of the general physical condition of an individual. Utilizing mild exercise as a provocative stimulus, no significant decrement in the physical condition of either of the two astronauts could be detected during the Gemini V mission. The rate of return of the pulse rate to pre-exercise levels, following in-flight exercise periods, was essentially the same as that observed during preflight baseline studies.

Author

Cardiovascular System; Physical Exercise; Aerospace Medicine; Spaceborne Experiments; Gemini 5 Flight; Workloads (Psychophysiology); Physiological Responses

20040043741 NASA Manned Spacecraft Center, USA

Experiment M-6: Bone Demineralization

Mack, Pauline B.; Vose, George; Vogt, Fred B.; LaChance, Paul A.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 109-128; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Densitometric evaluations of serial radiographs of 'normal' subjects have often shown rather frequent changes in bone mass within relatively short periods of time. For this reason it was decided to make two pre-flight and two post flight radiographs of the Gemini V backup crew. In comparing the changes observed preflight and post flight as the conventional os calcis scanning site between the two crews, it was found that no changes greater than 4 percent were evident in either member of the backup crew. In comparing the changes observed preflight and postflight as the conventional o calcis scanning site between the two crews, it was found that no changes greater than 4 percent were evident in either member of the backup crew. This is in contract to the 15.1 and 8.9 percent losses observed in the prime crew. It has long been known that the skeletal system experiences a general loss of mineral under immobilization or extended bed rest. However, in both Gemini IV and Gemini V studies, bone mass losses were greater in both the os calcis and phalanx than were shown by the TWU bed-rest subjects during the same period of time. Although the bone mass losses in the 8-day Gemini V flight were generally greater than in the 4-day Gemini IV flight, the information to date is still insufficient to conclude that the losses tend to progress linearly with time, or whether a form of physiological adaptation may occur in longer space flights.

Derived from text

Bone Demineralization; Musculoskeletal System; Bone Mineral Content; Gemini 5 Flight; Spaceborne Experiments

20040043742 Naval School of Aviation Medicine, Pensacola, FL, USA

Experiment M-9: Human Otolith

Graybiel, A.; Manned Space-Flight Experiments: Gemini V Mission; January 06, 1966, pp. 129-140; In English; See also 20040043732; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this experiment was to obtain two types of information during orbital space flight. One type of information desired was to determine the ability of the astronauts to estimate horizontality with reference to the spacecraft in the absence of visual and primary gravitational cues. The other type was to determine the possible effect of prolonged weightlessness on otolith function.

Derived from text

Otolith Organs; Aerospace Medicine; Spaceborne Experiments; Manned Space Flight; Weightlessness

20040045155 NASA Ames Research Center, Moffett Field, CA, USA

Numerical Models of Human Circulatory System under Altered Gravity: Brain Circulation

Kim, Chang Sung; Kiris, Cetin; Kwak, Dochan; David, Tim; December 17, 2003; 12 pp.; In English; 42nd Aerospace Science Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA

Report No.(s): AIAA Paper 2004-1092; Copyright; Avail: CASI; A03, Hardcopy

A computational fluid dynamics (CFD) approach is presented to model the blood flow through the human circulatory system under altered gravity conditions. Models required for CFD simulation relevant to major hemodynamic issues are introduced such as non-Newtonian flow models governed by red blood cells, a model for arterial wall motion due to fluid-wall interactions, a vascular bed model for outflow boundary conditions, and a model for auto-regulation mechanism. The three-dimensional unsteady incompressible Navier-Stokes equations coupled with these models are solved iteratively using the

pseudocompressibility method and dual time stepping. Moving wall boundary conditions from the first-order fluid-wall interaction model are used to study the influence of arterial wall distensibility on flow patterns and wall shear stresses during the heart pulse. A vascular bed modeling utilizing the analogy with electric circuits is coupled with an auto-regulation algorithm for multiple outflow boundaries. For the treatment of complex geometry, a chimera overset grid technique is adopted to obtain connectivity between arterial branches. For code validation, computed results are compared with experimental data for steady and unsteady non-Newtonian flows. Good agreement is obtained for both cases. In sin-type Gravity Benchmark Problems, gravity source terms are added to the Navier-Stokes equations to study the effect of gravitational variation on the human circulatory system. This computational approach is then applied to localized blood flows through a realistic carotid bifurcation and two Circle of Willis models, one using an idealized geometry and the other model using an anatomical data set. A three- dimensional anatomical Circle of Willis configuration is reconstructed from human-specific magnetic resonance images using an image segmentation method. The blood flow through these Circle of Willis models is simulated to provide means for studying gravitational effects on the brain circulation under auto-regulation.
Author
Circulatory System; Mathematical Models; Brain Circulation; Microgravity; Computational Fluid Dynamics; Hemodynamic Responses

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20040040194 Defence Science and Technology Organisation, Fishermans Bend, Australia
A Comparison of the Predictive Accuracy of Human Thermoregulatory Models
Sanders, Peter; September 2003; 30 pp.; In English
Report No.(s): DSTO-TR-1513; DODA-AR-012-926; Copyright; Avail: Other Sources

The core temperature predictions from four computer models of the human thermoregulatory response were compared with results from laboratory exercise studies published locally and in the open literature. Although none of the models were able to predict deep body temperatures to within an accuracy of 0.1 C to 0.5 C in all instances, the model from the USA ,4my Research Institute of Environmental Medicine (ARIEM) in the form modified by DSTO performed better than the original and better than the rational models published by Xu and Werner and by Lotens and Havenith. However these latter two models are amenable to incremental improvements resulting from relatively small studies and it is therefore recommended that their I development be continued at DSTO.
Author
Body Temperature; Computerized Simulation; Human Reactions; Physiological Responses; Thermoregulation

20040045212 Defence Science and Technology Organisation, Edinburgh, Australia
Human Performance Issues in Urban Military Operations
Collyer, R. S.; October 2003; 36 pp.; In English
Report No.(s): DSTO-GD-0380; DODA-AR-012-935; Copyright; Avail: Other Sources

This paper outlines the key human factors issues associated with urban operations. It first describes the urban operations environment from the commanders and soldiers perspective. It then uses their perspectives to identify the human factors which should be considered in the development of a system for conducting urban operations. The urban environment is characterized as comprising three subsystems, physical, functional and social, and discussion of the issues that influence human performance in urban warfare is structured around well established principles of human performance in combat, but relates these to the anticipated specific nature of urban warfare.
Author
Human Factors Engineering; Human Performance; Cities

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20040035859 Lawrence Livermore National Lab., Livermore, CA
National Ignition Facility Project Site Safety Program
Moses, E.; Sep. 30, 2003; 130 pp.; In English
Report No.(s): DE2003-15005462; UCRL-ID-125990-REV-5; No Copyright; Avail: Department of Energy Information Bridge

This Safety Program for the National Ignition Facility (NIF) presents safety protocols and requirements that management and workers shall follow to assure a safe and healthful work environment during activities performed on the NIF Project site. The NIF Project Site Safety Program (NPSSP) requires that activities at the NIF Project site be performed in accordance with the 'LLNL ES&H Manual' and the augmented set of controls and processes described in this NIF Project Site Safety Program. Specifically, this document: (1) Defines the fundamental NIF site safety philosophy. (2) Defines the areas covered by this safety program . (3) Identifies management roles and responsibilities. (4) Defines core safety management processes. (5) Identifies NIF site-specific safety requirements. This NPSSP sets forth the responsibilities, requirements, rules, policies, and regulations for workers involved in work activities performed on the NIF Project site.
NTIS
Accidents; Ignition; Personnel

20040035999 Oregon Graduate Inst. of Science and Technology, Beaverton, OR
Something from Nothing: Augmenting a Paper-Based Work Practice via Multimodal Interaction
McGee, David R.; Cohen, Philip R.; Wu, Lizhong; Jan. 2000; 10 pp.; In English
Contract(s)/Grant(s): N66001-99-D-8503; N00014-95-1-1164
Report No.(s): AD-A420070; No Copyright; Avail: CASI; A02, Hardcopy

In this paper, we describe Rasa: an environment designed to augment, rather than replace, the work habits of its users. These work habits include drawing on Post- it(TradeMark) notes using a symbolic language. Rasa observes and understands this language, assigning meaning simultaneously to objects in both the physical and virtual worlds. With Rasa, users rollout a paper map, register it, and move the augmented objects from one place to another on it. Once an object is augmented, users can modify the meaning represented by it, ask questions about that representation, view it in virtual reality, or give directions to it, all with speech and gestures. We examine the way Rasa uses language to augment objects, and compare it with prior methods, arguing that language is a more visible, flexible, and comprehensible method for creating augmentations than other approaches.
DTIC
Habits; Human Performance; Human-Computer Interface; Operator Performance

20040036115 Pacific Science and Engineering Group, Inc., San Diego, CA
DARPA Augmented Cognition Technical Integration Experiment (TIE)
St. John, M.; Kobus, D. A.; Morrison, J. G.; Dec. 2003; 239 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-99-D-0050
Report No.(s): AD-A420147; TR-1905; No Copyright; Avail: CASI; A11, Hardcopy

The Defense Advanced Research Projects Agency (DARPA) Augmented Cognition program is developing innovative technologies that will transform person-machine interaction by making information systems sensitive to the capabilities and limitations of the human component of the person-machine system. By taking better advantage of individual human capabilities, and being sensitive to human limitations, it is expected that an order of magnitude improvement in system performance can be achieved. There have been many recent advances in the field of Cognitive Science toward understanding human decision making, and the Augmented Cognition program is taking advantage of them. The technologies developed over the last decade in measuring brain activity and various facets of cognition are serving as the basis for managing the way information is presented to the human operators of complex systems. The Augmented Cognition program will result in demonstrable, quantifiable augmentations to human cognitive ability in realistic operational environments. Towards this goal, the first phase of the program was to empirically assess the utility and validity of various psychophysiological measures in dynamically identifying changes in human cognitive activity as decision makers engaged in cognitive tasks. This report is the culmination of Phase I - Measuring Cognitive State. It describes the empirical results of a Technical Integration Experiment

(TIE) involving the evaluation of 20 psychophysiologically derived measures (cognitive state gauges) that were developed under Phase I of the Augmented Cognition program. The results of the TIE assessment discussed in this report concluded that 11 of the gauges successfully identified changes in cognitive activity during the task, and 5 more gauges showed promise. The report also describes the issues created with sensor technology integration in developing next-generation cognitive state gauges. (14 tables, 31 figures, 14 refs.)
DTIC
Decision Making; Man Machine Systems; Physiological Effects; War Games

20040040090 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Access-To-Egress III: Repeated Measurement of Factors That Control the Emergency Evacuation of Passengers Through the Transport Airplane Type-III Overwing Exit
McLean, Garnet A.; Corbett, Cynthia L.; January 2004; 24 pp.; In English
Contract(s)/Grant(s): AM-B-01-PRS-93
Report No.(s): DOT/FAA/AM-04/2; No Copyright; Avail: CASI; A03, Hardcopy

Simulated emergency evacuations were conducted from a narrow-body transport airplane simulator through a Type-III overwing exit. The independent variables were passageway configuration, hatch disposal location, subject group size (density), and subject motivation level. Additional variables of interest included individual subject characteristics, i.e., gender, age, waist size, and height, shown in previous studies to significantly affect emergency egress. Subjects were restricted to those who had no previous emergency evacuation (research) history. Evacuation trials were conducted with 48 groups of either 30, 50, or 70 subjects per group, totaling 2,544 subject participants. Each subject group completed 4 evacuation trials, totaling 192 group evacuations, which included 10,176 individual subject exit crossings. The dependent variable of interest was individual subject egress time. Small but significant independent variable main effects on mean individual egress times were found for passageway configuration ($p<.001$), subject group motivation ($p<.001$), and subject group density ($p<.05$); significance of these effects was potentiated by the extremely large number of subject observations. The effects of subject waist size ($p<.0001$), gender ($p<.0001$), and age ($p<.0001$) on mean individual egress times were much more robust. The within-subjects main effect of evacuation trial (experience) failed to achieve significance ($p<.63$), although within-subjects effects were found for group motivation level ($p<.0004$), the combination of group motivation level and hatch disposal location ($p=.03$), and the combination of passageway configuration and hatch disposal location ($p<.007$), via their interactions with individual egress trial. The findings replicate prior research showing that the physical attributes of subjects produce large differences in emergency evacuation performance whereas airplane configuration has minimal effects on emergency egress, as long as ergonomic minimums are respected. Where such problems do exist, evacuation experience acts to mitigate such negative effects, as does proper passenger management by flight attendants.
Author
Hatches; Egress; Simulation; Emergencies; Evacuating (Transportation); Passengers

20040040350 Harbin Inst. of Tech., China
Principles and Experimental Analysis of a Measuring System for Measuring Spacesuit Joint's Damping Parameters
Wang, Hao; Jin, Ming-He; Liu, Hong; Gao, Xiao-Hui; Li, Tan-Qiu; Zhao, Yong-Jun; Space Medicine and Medical Engineering, Volume 16, No. 5; October 2003, pp. 349-353; In Chinese; See also 20040040339; Copyright; Avail: Other Sources

The objective of this research is to measure the damping parameters of the spacesuit joint. The principles of the passive robot system for measuring spacesuit joint's damping parameters were presented. Basing on its special mechanical structure, a 3 DOF model of the flexible IVA (intra-vehicular activity) spacesuit's sleeve was built. The optimal approximation of inverse calculation based on 6 dimension space interval was described. The damping parameters of an actual IVA spacesuit's sleeve were measured on the actual testbed. Also, the potential application of the measuring system was discussed. The model of spacesuit sleeve and the forward/inverse kinematics were proved by experimental measurements and real time 3D simulation. The principles and the proposed method of the measurement were testified.
Author
Space Suits; Sleeves; Damping; Joints (Anatomy)

20040043712 NASA Ames Research Center, Moffett Field, CA, USA
Designing to Mitigate Food Growing Failures in Space
Jones, Harry; January 2004; 1 pp.; In English; 34th International Conference on Environmental Systems, 19-22 Jul. 2004, Colorado Springs, CO, USA
Contract(s)/Grant(s): 131-20-10; No Copyright; Avail: Other Sources; Abstract Only

Future space life support systems may use crop plants to grow most of the crew s food. A harvest failure can reduce the food available for future consumption. If the previously stored food is insufficient to reach the next harvest, the crew may go hungry. This paper considers how the overall food supply system should be modified to cope with food production failures. The food supply concept for a mission will use grown food, or stored food, cIr both. The optimum food supply mix depends on the costs and failure probabilities of stored and grown food. A simple food system model assumes that either we obtain the nominal harvest or a failure occurs and no food is harvested. Given the probability that any particular harvest fails, it is easy to compute the expected number of failures and the total food shortfall over a mission. If some food is grown and the probability of harvest failure is high, a non-redundant system has an unacceptable likelihood that the crew will have no food for a full harvest period. Food supply reliability must be increased either by supplying more food initially or by increasing food production capacity. We can obtain a very reliable food supply even when the harvest failure rate is high. If the cost of growing food is much less than the cost of providing stored food, it is better to provide redundant food growing capacity than to increase initial storage. A more realistic biomass production failure model allows the harvest amount or time to vary around the nominal values, using stochastic modeling with repeated Monte Carlo simulation, but such failures have minor impact compared to a complete harvest failure.
Author
Life Support Systems; Aerospace Systems; Stochastic Processes

20040043715 NASA Ames Research Center, Moffett Field, CA, USA
A Probabilistic Risk Analysis (PRA) of Human Space Missions for the Advanced Integration Matrix (AIM)
Jones, Harry W.; Dillon-Merrill, Robin L.; Thomas, Gretchen A.; [2003]; 1 pp.; In English; 34th International Conference on Environmental Systems, 19-22 Jul. 2004, Colorado Springs, CO, USA
Contract(s)/Grant(s): 131-20-10; No Copyright; Avail: Other Sources; Abstract Only

The Advanced Integration Matrix (AIM) Project u7ill study and solve systems-level integration issues for exploration missions beyond Low Earth Orbit (LEO), through the design and development of a ground-based facility for developing revolutionary integrated systems for joint human-robotic missions. This paper describes a Probabilistic Risk Analysis (PRA) of human space missions that was developed to help define the direction and priorities for AIM. Risk analysis is required for all major NASA programs and has been used for shuttle, station, and Mars lander programs. It is a prescribed part of early planning and is necessary during concept definition, even before mission scenarios and system designs exist. PRA cm begin when little failure data are available, and be continually updated and refined as detail becomes available. PRA provides a basis for examining tradeoffs among safety, reliability, performance, and cost. The objective of AIM's PRA is to indicate how risk can be managed and future human space missions enabled by the AIM Project. Many critical events can cause injuries and fatalities to the crew without causing loss of vehicle or mission. Some critical systems are beyond AIM's scope, such as propulsion and guidance. Many failure-causing events can be mitigated by conducting operational tests in AIM, such as testing equipment and evaluating operational procedures, especially in the areas of communications and computers, autonomous operations, life support, thermal design, EVA and rover activities, physiological factors including habitation, medical equipment, and food, and multifunctional tools and repairable systems. AIM is well suited to test and demonstrate the habitat, life support, crew operations, and human interface. Because these account for significant crew, systems performance, and science risks, AIM will help reduce mission risk, and missions beyond LEO are far enough in the future that AIM can have significant impact.
Author
Human Performance; Life Support Systems; Risk; NASA Programs; Low Earth Orbits

20040043716 NASA Ames Research Center, Moffett Field, CA, USA
Using System Mass (SM), Equivalent Mass (EM), Equivalent System Mass (ESM) or Life Cycle Mass (LCM) in Advanced Life Support (ALS) Reporting
Jones, Harry; [2003]; 1 pp.; In English; 34th International Conference on Environmental Systems, 19-22 Jul. 2004, Colorado Springs, CO, USA
Contract(s)/Grant(s): 131-20-10; No Copyright; Avail: Other Sources; Abstract Only

The Advanced Life Support (ALS) has used a single number, Equivalent System Mass (ESM), for both reporting progress and technology selection. ESM is the launch mass required to provide a space system. ESM indicates launch cost. ESM alone is inadequate for technology selection, which should include other metrics such as Technology Readiness Level (TRL) and Life Cycle Cost (LCC) and also consider perfom.arxe 2nd risk. ESM has proven difficult to implement as a reporting metric, partly because it includes non-mass technology selection factors. Since it will not be used exclusively for technology selection, a new reporting metric can be made easier to compute and explain. Systems design trades-off performance, cost, and risk, but

a risk weighted cost/benefit metric would be too complex to report. Since life support has fixed requirements, different systems usually have roughly equal performance. Risk is important since failure can harm the crew, but it is difficult to treat simply. Cost is not easy to estimate, but preliminary space system cost estimates are usually based on mass, which is better estimated than cost. Amass-based cost estimate, similar to ESM, would be a good single reporting metric. The paper defines and compares four mass-based cost estimates, Equivalent Mass (EM), Equivalent System Mass (ESM), Life Cycle Mass (LCM), and System Mass (SM). EM is traditional in life support and includes mass, volume, power, cooling and logistics. ESM is the specifically defined ALS metric, which adds crew time and possibly other cost factors to EM. LCM is a new metric, a mass-based estimate of LCC measured in mass units. SM includes only the factors of EM that are originally measured in mass, the hardware and logistics mass. All four mass-based metrics usually give similar comparisons. SM is by far the simplest to compute and easiest to explain.
Author
Life Support Systems; Systems Engineering; Cooling; Technology Assessment; Life Cycle Costs; Life (Durability)

20040045202 Research and Technology Organization, Neuilly-sur-Seine, France
Operator Functional State Assessment
February 2004; 220 pp.; In English
Report No.(s): RTO-TR-HFM-104; AC/323(HFM-104)TP/48; Copyright; Avail: CASI; A10, Hardcopy

The human operator is a crucial component of complex modern systems. The complexity of these systems, the rapid tempo of contemporary military operations and reduced staffing all contribute to the high cognitive demands experienced by military personnel. The rate of information flow, the number of decisions, and actions that must be carried out can exceed the cognitive capacity of the operator. This can result in disastrous consequences. Other system components are continuously scrutinized so that problems can be identified and rectified. The functional state of the human operator is not monitored and remediation is not implemented. Proper assessment of the functional state of the operator and appropriate intervention will result in improved mission effectiveness. The goal of this report is to assemble the pertinent information concerning the factors that produce suboptimal performance in human operators. Numerous methods are available to detect the presence of these factors. This report provides a comprehensive survey of the risk factors that impact human performance and the assessment methods for measuring these effects. The risk factors include environmental features such as noise, acceleration and thermal stress. States within the individual operator can interfere with optimal performance and include illness, sleep loss and disruption of circadian rhythms. Task characteristics include the cognitive and physical demands of the task. Theoretical concerns are presented as a framework for the risk factors that reduce the functioning of human operators. Methods for detecting impaired operator functional state are presented and include physiological, performance, and subjective assessment procedures. The rationale for each measure is presented along with the technological required to make the measurements.
CASI
Human Performance; Information Flow; Acceleration (Physics); Aerospace Environments; Circadian Rhythms

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EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20040040095 Kyoto Univ. of Art and Design, Kyoto, Japan
Memoirs of the Faculty of Science, Kyoto University (Series of Biology), Volume 18, No. 1
December 2002; ISSN 0454-7802; 35 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

The phylogenetic or taxonomic relationships among Northern Hemisphere osmeroid fish including the families Osmeridae and Salangidae have been investigated mainly on the basis of morphological characteristics, but conclusions from these studies differ markedly and have been controversial. The authors reconstructed molecular phylogenetic trees, based on a 402-base pair region of the mitochondrial cytochrome b gene, among six Osmeridae species from (Plecoglossus altivelis, Hypomesus japonicus, Hypomesus transpacificus, Osmerus dentex, Spirinchus lanceolatus and Mallotus villosus), one Salangidae species (Salangichthys microdon), and one Galaxiidae species (Galarias maculatus), a Southern Hemisphere osmeroid. The molecular phylogenetic trees constructed by the maximum parsimony and maximum likelihood methods indicated monophyly of Northern Hemisphere osmeroids, and a sister-group relationship between Galaxiidae and the other species examined. In the Northern Hemisphere osmeroids, the present results suggested that Plecoglossus is an ancestral

genus, and that there are close relationships between the genera Osmerus and Spirincbus and between Salangichtbys and Mallotus.
Author
Cytochromes; Morphology; Fishes; Mitochondria

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20040035718 Lawrence Livermore National Lab., Livermore, CA
PDE-Based Non-Linear Diffusion Techniques for Denoising Scientific and Industrial Images: an Empirical Study
Weeratunga, S. K.; Kamath, C.; Dec. 2001; 20 pp.; In English
Report No.(s): DE2003-15005986; UCRL-JC-145574; No Copyright; Avail: Department of Energy Information Bridge

Removing noise from data is often the first step in data analysis. Denoising techniques should not only reduce the noise, but do so without blurring or changing the location of the edges. Many approaches have been proposed to accomplish this; in this paper, they focus on one such approach, namely the use of non-linear diffusion operators. This approach has been studied extensively from a theoretical viewpoint ever since the 1987 work of Perona and Malik showed that non-linear filters outperformed the more traditional linear Canny edge detector. They complement this theoretical work by investigating the performance of several isotropic diffusion operators on test images from scientific domains. They explore the effects of various parameters such as the choice of diffusivity function, explicit and implicit methods for the discretization of the PDE, and approaches for the spatial discretization of the non-linear operator etc. They also compare these schemes with simple spatial filters and the more complex wavelet-based shrinkage techniques. The empirical results show that, with an appropriate choice of parameters, diffusion-based schemes can be as effective as competitive techniques.
NTIS
Data Processing; Image Resolution

20040035734 Illinois Univ., Urbana, IL, USA
Nonlinear Harmonic Measures on Trees
Kaufman, Robert; Llorente, Jose G.; Wu, Jang-Mei; Annales Academiae Scientiarum Fennicae: Mathematica; 2003; ISSN 1239-629X; Volume 28, NO. 2, pp. 279-302; In English
Contract(s)/Grant(s): NSF DMS-00-70312; Copyright; Avail: Other Sources

We show that nonlinear harmonic measures on trees lack many desirable properties of set functions encountered in classical analysis. Let F be an averaging operator on R(sup k) and Omega(sub F) be the F-harmonic measure on a k-regular forward branching tree. Unless F is the usual average, Omega(sub F) is not a Choquet capacity; union of sets of Omega(sub F) measure zero can have positive Omega(sub F) measure when F is permutation invariant; and there exist sets of full Omega(sub F) measure having 'small' dimension. Let A be a monotone operator on R(sup k), then A-harmonic functions on trees need not obey the strong maximum principle unless the ratio of the ellipticity constants is close to 1.
Author
Harmonic Functions; Nonlinearity; Trees (Mathematics); Maximum Principle

20040035750 Swedish Defence Research Establishment, Stockholm, Sweden
Computer Generated Forces: Method and Means
Castor, M.; Wallin, N.; Nilsson, S. A.; Moradi, F.; Dec. 2002; In Swedish; In English
Report No.(s): PB2004-101833; FOI-R-0688-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Defense driven Modeling and Simulation (M&S) is demanding more realistic Human Behavior Representations (HBR) models in simulations. To confront the growing need of such models, the Swedish Armed Forces has sponsored a study of CGF development since 2001, conducted at FOI. The main purpose of the project is to construct a framework to support CGF development and to maintain a component based library of HBR models to be used in existing and future simulations. This report describes the following activities performed during 2001 through 2002: evaluations of existing architectures and tools to produce HBR models; five prototype descriptions; proposals for interface design to produce 'plug'n'play compatibility with different simulation systems; proposals for a consistent praxis of developing CGF; some words of how to incorporate

experimental data into HBR models; VV&A considerations; and future work.
NTIS
Computerized Simulation; Military Operations

20040035766 European Organization for Nuclear Research, Geneva, Switzerland, Fermi National Accelerator Lab., Batavia, IL, USA
ROOT Status and Future Developments
Brun, R.; Rademakers, F.; Canal, P.; Goto, M.; Oct. 2003; 10 pp.; In English
Report No.(s): DE2003-815747; FERMILAB-CONF-03/268; No Copyright; Avail: Department of Energy Information Bridge
In this talk the authors review the major additions and improvements made to the ROOT system in the last 18 months and present their plans for future developments. The additions and improvements range from modifications to the I/O sub-system to allow users to save and restore objects of classes that have not been instrumented by special ROOT macros, to the addition of a geometry package designed for building, browsing, tracking and visualizing detector geometries. Other improvements include enhancements to the quick analysis sub-system (TTree::Draw()), the addition of classes that allow inter-file object references (TRef, TRefArray), better support for templates and STL classes, amelioration of the Automatic Script Compiler and the incorporation of new fitting and mathematical tools. Efforts have also been made to increase the modularity of the ROOT system with the introduction of more abstract interfaces and the development of a plug-in manager. In the near future, they intend to continue the development of PROOF and its interfacing with GRID environments. They plan on providing an interface between Geant3, Geant4 and Fluka and the new geometry package. The ROOT-GUI classes will finally be available on Windows and they plan to release a GUI inspector and builder. In the last year, ROOT has drawn the endorsement of additional experiments and institutions. It is now officially supported by CERN and used as key I/O component by the LCG project.
NTIS
Computer Programs; Augmentation; Graphical User Interface; Modularity; Templates

20040035810 Lawrence Livermore National Lab., Livermore, CA
How to Create, Modify, and Interface Aspen In-House and User Databanks for System Configuration 1
Camp, D. W.; Oct. 27, 2000; 58 pp.; In English
Report No.(s): DE2003-15004778; UCRL-MA-143535; No Copyright; Avail: Department of Energy Information Bridge
The goal of this document is to provide detailed instructions to create, modify, interface, and test Aspen User and In-House databanks with minimal frustration. The level of instructions are aimed at a novice Aspen Plus simulation user who is neither a programming nor computer-system expert. The instructions are tailored to Version 10.1 of Aspen Plus and the specific computing configuration summarized in the Title of this document and detailed in Section 2. Many details of setting up databanks depend on the computing environment specifics, such as the machines, operating systems, command languages, directory structures, inter-computer communications software, the version of the Aspen Engine and Graphical User Interface (GUI), and the directory structure of how these were installed.
NTIS
Data Bases; Manuals

20040035814 Lawrence Livermore National Lab., Livermore, CA
Development of Control Models and a Robust Multivariable Controller for Surface Shape Control
Winters, S. E.; Jun. 18, 2003; 180 pp.; In English
Report No.(s): DE2003-15005369; UCRL-LR-154047; No Copyright; Avail: Department of Energy Information Bridge
Surface shape control techniques are applied to many diverse disciplines, such as adaptive optics, noise control, aircraft flutter control and satellites, with an objective to achieve a desirable shape for an elastic body by the application of distributed control forces. Achieving the desirable shape is influenced by many factors, such as, actuator locations, sensor locations, surface precision and controller performance. Building prototypes to complete design optimizations or controller development can be costly or impractical. This shortfall, puts significant value in developing accurate modeling and control simulation approaches. This thesis focuses on the field of adaptive optics, although these developments have the potential for application in many other fields.
NTIS
Adaptive Optics; Shape Control; Algorithms; Robustness (Mathematics)

20040035816 Lawrence Livermore National Lab., Livermore, CA

Micro Benchmarking, Performance Assertions and Sensitivity Analysis: A Technique for Developing Adaptive Grid Applications

Corey, I. R.; Johson, J. R.; Vetter, J. S.; Feb. 25, 2002; 12 pp.; In English

Report No.(s): DE2003-15004800; UCRL-JC-147446; No Copyright; Avail: Department of Energy Information Bridge

This study presents a technique that can significantly improve the performance of a distributed application by allowing the application to locally adapt to architectural characteristics of distinct resources in a distributed system. Application performance is sensitive to application parameter - system architecture pairings. In a distributed or Grid enabled application, a single parameter configuration for the whole application will not always be optimal for every participating resource. In particular, some configurations can significantly degrade performance. Furthermore, the behavior of a system may change during the course of the run. The technique described here provides an automated mechanism for run-time adaptation of application parameters to the local system architecture. Using a simulation of a Monte Carlo physics code, we demonstrate that this technique can achieve speedups of 18% - 37% on individual resources in a distributed environment.

NTIS

Computational Grids; Sensitivity; Distributed Processing; Performance Tests; Architecture (Computers)

20040035868 National Defence Research Establishment, Linkoeping, Sweden

Guaranteed Quality of Service in Tactical IP Networks

Persson, K.; Groenkvist, J.; Hansson, A.; Nov. 2002; 48 pp.; In Swedish

Report No.(s): PB2004-102693; FOI-R-0641-SE; No Copyright; Avail: CASI; A03, Hardcopy

In network centric warfare, it is important that the tactical communication is seamless. This means that independent of terminal, access network and military unit, it should be possible to use those command and control communications services that are needed. TCP/IP, the technology behind Internet, has great potential for satisfying these requirements. A drawback with the TCP/IP protocols is that they have been designed for high capacity fixed networks, resulting in a quite low ability to guarantee the quality of offered communication services. Typical examples of quality requirements in this context are capacity and delay. Speech and video services, for example, require data transmissions with a low and steady delay. Some command and control communications services may not be possible to implement in low capacity networks without quality of service guarantees. This is especially true for mobile ad hoc networks, with high variations in radio link conditions. Hence, it is important to follow the ongoing development of TCP/IP protocols for Quality of Service (QoS) guarantees.

NTIS

Qualitative Analysis; Warfare; Internets; Information Systems

20040035880 Helsinki Univ. of Technology, Espoo (Finland), Espoo, Finland

Correlation Between the Geometrical Characteristics and Dielectric Polarizability of Polyhedra

Sihvola, A.; Ylae-Oijala, P.; Jaervenpaeae, S.; Avelin, J.; May 2003; 22 pp.; In English

Report No.(s): PB2004-103311; REPT-409; Copyright; Avail: National Technical Information Service (NTIS)

This article analyzes polarizability characteristics of the five regular polyhedra (tetrahedron cube, octahedron, dodecahedron, and icosahedron) and sphere. In particular, the variation of the polarizabilities (polarizability is the amplitude of the static dipole moment for the incident electric field of unit amplitude) is correlated with various geometrical parameters of these Platonic solids: specific surface, number of edges, vertices, and faces, and the volumes of inscribed and circumscribed spheres. It is found that polarizabilities of perfect electric conductor (PEC) and perfect electric insulator (PEI) objects are most strongly correlated with two different parameters: the radius ratio of circum-inscribed spheres (PEC case) and the normalized radius of the inscribed sphere (PEI case).

NTIS

Polyhedrons; Dielectrics; Electric Conductors; Electric Fields; Polarization Characteristics

20040035886 Lawrence Livermore National Lab., Livermore, CA

Supervised and Unsupervised Discretization Methods for Evolutionary Algorithms

Cantu-Paz, E.; Jan. 24, 2001; 14 pp.; In English

Report No.(s): DE2003-15005541; UCRL-JC-142243; No Copyright; Avail: Department of Energy Information Bridge

This paper introduces simple model-building evolutionary algorithms (EAs) that operate on continuous domains. The algorithms are based on supervised and unsupervised discretization methods that have been used as preprocessing steps in machine learning. The basic idea is to discretize the continuous variables and use the discretization as a simple model of the

solutions under consideration. The model is then used to generate new solutions directly, instead of using the usual operators based on sexual recombination and mutation. The algorithms presented here have fewer parameters than traditional and other model-building EAs. They expect that the proposed algorithms that use multivariate models scale up better to the dimensionality of the problem than existing EAs.
NTIS
Algorithms; Multivariate Statistical Analysis; Domains

20040035899 Lawrence Livermore National Lab., Livermore, CA
Profiling Users in the UNIX OS Environment
Dao, V. N. P.; Vemuri, R.; Templeton, S. J.; Sep. 29, 2000; 16 pp.; In English
Report No.(s): DE2003-15004770; UCRL-JC-141022; No Copyright; Avail: Department of Energy Information Bridge

This paper presents results obtained by using a method of profiling a user based on the login host, the login time, the command set, and the command set execution time of the profiled user. It is assumed that the user is logging onto a UNIX host on a computer network. The paper concentrates on two areas: short-term and long-term profiling. In short-term profiling the focus is on profiling the user at a given session where user characteristics do not change much. In long-term profiling, the duration of observation is over a much longer period of time. The latter is more challenging because of a phenomenon called concept or profile drift. Profile drift occurs when a user logs onto a host for an extended period of time (over several sessions).
NTIS
Computer Networks; Unix (Operating System); User Requirements

20040035900 Budapest Univ. of Technology and Economics (Hungary), Budapest, Hungary
Periodica Polytechnica Mechanical Engineering, Volume 47, 1, 2003
2003; 98 pp.; In English
Report No.(s): PB2004-102860; No Copyright; Avail: CASI; A05, Hardcopy

Contents include the following: Programs of the Jubilee Session at the 50th Anniversary of Department of Geometry; A brief History of the Department of Geometry between Anniversaries 40 and 50; Space Fillings with many Symmetries; Skew Lines in Hyperbolic Space; On the Second-order Reed-Muller Code; On Nil Geometries; On the Affine Maps of E(sup n); Simply Transitive Optimal Ball Packing for the Orientable Crystallographic Groups of the Cubic System; Localization Theorems in Topology: A Brief Summary; Some Problems in Wagner Spaces with Vanishing Douglas Tensor. Filling Triangular Holes by Convex Combination of Surfaces.
NTIS
Mechanical Engineering; Geometry; Crystallography; Hyperbolic Coordinates

20040035941 Helsinki Univ. of Technology, Espoo (Finland), Espoo, Finland
Associative Clustering by Maximizing a Bayes Factor
Sinkkonen, J.; Nikkilae, J.; Lahti, L.; Kaski, S.; Jun. 2003; 18 pp.; In English
Report No.(s): PB2004-102760; REPT-A68; Copyright; Avail: National Technical Information Service (NTIS)

Cluttering by maximizing the dependency between (margin) groupings or partitioning of co-occurring data pairs is studied. We suggest a probabilistic criterion that generalizes discriminative clustering (DC), an extension of the information bottleneck (IB) principle to labeled continuous data. The criterion is the Bayes factor between models assuming dependence and independence of the two cluster sets, and it can be used as a well-founded criterion for IB for small data sets. With suitable prior assumptions the Bayes factor is equivalent to the hypergeometric probability of a contingency table with the optimized clusters at the margins, and for large data it becomes the standard mutual information. An algorithm for two-margin clustering of paired continuous data, associative clustering (AC) is introduced.
NTIS
Genes; Cluster Variation Method; Bayes Theorem; Alternating Current

20040036221 Defence Science and Technology Organisation, Salisbury
Local Oscillators in Electronic Warfare Applications
Nguyen, Linh V.; Sep. 2003; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420255; DSTO-TR-1490; DODA-AR-012-889; No Copyright; Avail: CASI; A03, Hardcopy

Local oscillators (LOs) are required whenever heterodyning is utilized in receiver architectures to convert high-frequency signals to an intermediate-frequency (IF) spectrum for ease of processing. Utilization of the heterodyning technique includes

applications ranging from Electronic Warfare (EW) to radio astronomy. While EW involves the interception and exploitation of signals across the complete electromagnetic (EM) spectrum, the range of frequencies of interest in this report is from near DC and up to millimeter wave (^110 GHz). Radio astronomy shares similarities with EW in the detection of wideband EM signals ranging from radio and up to submillimetric frequencies. This technical report focuses on the requirements of LOs in EW receiver systems. In particular, LO technologies including frequency synthesizers, quartz, yttrium from garnet (YIC) and Gunn-effect electronics will be discussed in order to derive a suitable benchmark, in terms of tunability, amplitude accuracy and stability, frequency accuracy and stability, and phase noise level, for the development of photonic LOs.
DTIC
Electronic Warfare

20040037710 General Accounting Office, Washington, DC
Information Security: Further Efforts Needed to Address Serious Weaknesses at USDA
Jan. 2004; 38 pp.
Report No.(s): PB2004-103968; GAO-04-154; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Department of Agriculture (USDA) performs critical missions that enhance the quality of life for the American people, relying on automated systems and networks to deliver billions of dollars in programs to its customers; process and communicate sensitive payroll, financial, and market data; and maintain personal customer information. Interruptions in USDA's ability to fulfill its missions could have a significant adverse impact on the nation's food and agricultural production. In addition, securing sensitive information is critical to USDA's efforts to maintain public confidence in the department. GAO was asked to evaluate the effectiveness of USDA's information security controls.
NTIS
Security; Automatic Control

20040037712 General Accounting Office, Washington, DC
Defense Acquisitions: Stronger Management Practices Are Needed to Improve DOD's Software-Intensive Weapon Acquisitions
Mar. 2004; 58 pp.
Report No.(s): PB2004-103971; GAO-04-393; No Copyright; Avail: CASI; A04, Hardcopy

The Department of Defense (DOD) has been relying increasingly on computer software to introduce or enhance performance capabilities of major weapon systems. To ensure successful outcomes, software acquisition requires disciplined processes and practices. Without such discipline, weapon programs encounter difficulty in meeting cost and schedule targets. For example, in fiscal year 2003, DOD might have spent as much as $8 billion to rework software because of quality-related issues. GAO was asked to identify the practices used by leading companies to acquire software and to analyze the causes of poor outcomes of selected DOD programs. GAO also was asked to evaluate DOD's efforts to develop programs for improving software acquisition processes and to assess how those efforts compare with leading companies' practices.
NTIS
Management Methods; Computer Programs; Weapon Systems

20040037723 Draper (Charles Stark) Lab., Inc., Cambridge, MA, USA
Commercial-Off-The Shelf (COTS) Hardware and Software for Train Control Applications: System Safety Considerations
Clough, A.; Apr. 2003; 52 pp.; In English
Report No.(s): PB2004-103369; No Copyright; Avail: CASI; A04, Hardcopy

The objective of this study was to assess the feasibility of using commercial off-the-shelf (COTS) processor-based systems for safety-related railroad applications. From the safety perspective, the fundamental challenges of using COTS products are most pronounced within the product evaluation and safety assurance phases of the traditional development life cycle. Even in the case of COTS components that can be considered commodities, such as certain microprocessors and operating systems, there are some necessary life cycle modifications. First, more iteration at the system level is required to accommodate component evaluation and selection as well as deal with technical and business requirements and tradeoffs. Second, the entire development life cycle has to be modified to address realities such as component evaluation and the high pace of change in the commercial market of today. To address these realities, an iterative life cycle was proposed for systems incorporating COTS components. Finally, traditional safety verification and validation methodologies were contrasted with safety validation approaches for integrating COTS components into hardware and software systems. This effort resulted in a

structure to support the development of a system safety program plan for COTS operating system platforms executing safety-critical applications.
NTIS
Commercial Off-the-Shelf Products; Control Equipment

20040037726 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Calculation of the Full Scattering Amplitude without Partial Wave Decomposition II
Shertzer, J.; Temkin, A.; [2003]; 1 pp.; In English; XXII International Conference on Photonic, Electronic, and Atomic Collisions, 23-29 Jul. 2003, Stockholm,, Sweden; No Copyright; Avail: Other Sources; Abstract Only

As is well known, the full scattering amplitude can be expressed as an integral involving the complete scattering wave function. We have shown that the integral can be simplified and used in a practical way. Initial application to electron-hydrogen scattering without exchange was highly successful. The Schrodinger equation (SE) can be reduced to a 2d partial differential equation (pde), and was solved using the finite element method. We have now included exchange by solving the resultant SE, in the static exchange approximation. The resultant equation can be reduced to a pair of coupled pde's, to which the finite element method can still be applied. The resultant scattering amplitudes, both singlet and triplet, as a function of angle can be calculated for various energies. The results are in excellent agreement with converged partial wave results.
Author
Scattering Amplitude; Schroedinger Equation; Decomposition; Two Dimensional Models

20040037733 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
ZioLib: a Parallel I/O Library
Yang, W. S.; Ding, C.; 2003; 82 pp.; In English
Report No.(s): DE2004-819966; No Copyright; Avail: Department of Energy Information Bridge

In a distributed memory parallel environment, many applications rely on a serial I/O strategy, where the global array is gathered on a single MPI process and then written out to a file. I/O performance with this approach is largely limited by single process I/O bandwidth. Even when parallel I/O is used, satisfactory parallel scaling is not always observed. It is because in many applications fields are not necessarily in a most favorable parallel decomposition for I/O. The best I/O rates are obtained when a field is decomposed with respect to the array's last dimension (referred to here as Z). Another situation often encountered in many applications is that a field in CPU resident memory is in one index order but must be stored in a disk file in another order. Changing index orders can complicate a parallel I/O implementation and slow down I/O. ZioLib facilitates an efficient parallel I/O for arrays in such situations. In case of a write, ZioLib remaps a distributed field into a Z-decomposition on a subset of processes (which will be called the I/O staging processes) and from there writes to a disk file in parallel. In this Z-decomposition, the data layout of the remapped array on the staging processes memory is the same as on disk, thus only block data transfer occurs during parallel I/O, achieving maximum efficiency. In case of a read the steps are reversed to build the required distributed arrays on the computational processes.
NTIS
Distributed Processing; Input/Output Routines; Distributed Memory

20040037740 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Collaborative Editing within the Pervasive Collaborative Computing Equipment
Perry, M.; Agarwal, D.; 2003; 10 pp.; In English
Report No.(s): DE2003-817641; No Copyright; Avail: Department of Energy Information Bridge

Scientific collaborations are established for a wide variety of tasks for which several communication modes are necessary, including messaging, file-sharing, and collaborative editing. In this position paper, we describe our work on the Pervasive Collaborative Computing Environment (PCCE) which aims to facilitate scientific collaboration within widely distributed environments. The PCCE provides a persistent space in which collaborators can locate each other, exchange messages synchronously and asynchronously and archive conversations. Our current interest is in exploring research and development of shared editing systems with the goal of integrating this technology into the PCCE. We hope to inspire discussion of technology solutions for an integrated approach to synchronous and asynchronous communication and collaborative editing.
NTIS
Messages; Editing; Distributed Processing

20040037743 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
New Security Model for Collaborative Environments
Agarwal, D.; Thompson, M.; Perry, M.; Lorch, M.; 2003; 12 pp.; In English
Report No.(s): DE2003-816544; No Copyright; Avail: Department of Energy Information Bridge

Prevalent authentication and authorization models for distributed systems provide for the protection of computer systems and resources from unauthorized use. The rules and policies that drive the access decisions in such systems are typically configured up front and require trust establishment before the systems can be used. This approach does not work well for computer software that moderates human-to-human interaction. This work proposes a new model for trust establishment and management in computer systems supporting collaborative work. The model supports the dynamic addition of new users to a collaboration with very little initial trust placed into their identity and supports the incremental building of trust relationships through endorsements from established collaborators. It also recognizes the strength of a user's authentication when making trust decisions. By mimicking the way humans build trust naturally the model can support a wide variety of usage scenarios. Its particular strength lies in the support for ad-hoc and dynamic collaborations and the ubiquitous access to a Computer Supported Collaboration Workspace (CSCW) system from locations with varying levels of trust and security.
NTIS
Management Systems; Computer Programs; Distributed Processing; Computer Information Security

20040037762 Swedish Defence Research Establishment, Stockholm, Sweden
FoRMA UV: Summary of Accomplished Work
Kindvall, G.; Nordstrand, E.; Feb. 2003; 60 pp.; In Swedish
Report No.(s): PB2004-102687; FOI-R-0795-SE; No Copyright; Avail: CASI; A04, Hardcopy

The Group for analysis of information warfare (the IW group) started within the FoRMA project early in 2000. The group was formed to identify threats and opportunities in the IW field. The purpose of this report is to present a summary of the work accomplished and the conclusions that the IW group arrived at, mainly through war gaming. The report contains a discussion of terms within the IW field, conclusions from several war games and a number of concepts that have been produced in close connection with the war gaming process. For anyone wanting to read more, there are references to other documents published by the IW group. Another purpose of this summarizing report is to spread the results of the IW group and to contribute to the discussion about the role of IW in the future.
NTIS
War Games; Warfare

20040037764 National Defence Research Establishment, Stockholm, Sweden
Can Sweden Handle a Cyber Attack. Documentation from an Exercise
Eriksson, E. A.; Nov. 2002; 84 pp.; In Swedish
Report No.(s): PB2004-102691; FOI-R-0635-SE; No Copyright; Avail: CASI; A05, Hardcopy

This report is about a gaming-based exercise that was performed for middle and to some extent top management in the Swedish Government Office in the spring of 2002. The Government Office is the entity that supports the Cabinet ministers in their policymaking and oversight of the independent agencies that make up the Swedish national government. The exercise was performed according to a modified The Day After format. The report deals with both method and content. According to the chosen format, the scenario material consists of a Future History leading up to the progressively more dramatic story told in Steps 1 and 2. For Step 1 we used a prepared Decision Memo according to the standard version of The Day After methodology. In Step 2 instead we used a structured brainstorming format under very tight time constraints. Also in Step 3, where the players are invited to take advantage of the crisis management experience gained in Steps 1 and 2 to discuss present strategic choices, we utilized structured brainstorming.
NTIS
Physical Exercise; Management Methods; Data Transmission

20040037768 Sandia National Labs., Albuquerque, NM
Projection of the Cost-Effectiveness of PIMs for Particle Transport Codes
Christopher, T. W.; Jun. 2003; 78 pp.; In English
Report No.(s): DE2004-820890; SAND2003-1887; No Copyright; Avail: Department of Energy Information Bridge

PIM (Processor in Memory) architectures are being proposed for future supercomputers, because they reduce the problems that SMP MMPs have with latency. However, they do not meet the SMP MPP balance factors. Being relatively

processor rich and memory starved, it is unclear whether an ASCI application could run on them, either as-is or with recoding. The KBA (Koch-Baker-Alcouffe) algorithm (Koch, 1992) for particle transport (radiation transport) is shown not to fit on PIMs as written. When redesigned with a 3-D allocation of cells to PIMs, the resulting algorithm is projected to execute an order of magnitude faster and more cost-effectively than the KBA algorithm, albeit with high initial hardware costs.
NTIS
Algorithms; Architecture (Computers)

20040037772 Sandia National Labs., Albuquerque, NM
GILA User's Manual
Christon, M. A.; Jun. 2003; 142 pp.; In English
Report No.(s): DE2004-820886; SAND2003-1781; No Copyright; Avail: Department of Energy Information Bridge

GILA is a finite element code that has been developed specifically to attack the class of transient, incompressible, viscous, fluid dynamics problems that are predominant in the world that surrounds us. The purpose for this document is to provide sufficient information for an experienced analyst to use GILA in an effective way. The GILA User's Manual presents a technical outline of the governing equations for time-dependent incompressible flow, and the explicit and semi-implicit projection methods used in GILA to solve the equations. This manual also presents a brief overview of some of GILA's capabilities along with the keyword input syntax and sample problems.
NTIS
Finite Element Method; Fluid Dynamics; Time Dependence; Incompressible Flow; Incompressible Fluids

20040037773 Sandia National Labs., Albuquerque, NM
Distributed Denial-of-Service Characterization
Berg, M.; Campbell, P.; Draelos, T.; Duggan, D.; Torgerson, M.; Jun. 2003; 52 pp.; In English
Report No.(s): DE2004-820887; SAND2003-1866; No Copyright; Avail: Department of Energy Information Bridge

Distributed denial of service (DoS) attacks on cyber-resources are complex problems that are difficult to completely define, characterize, and mitigate. We recognize the process-nature of DoS attacks and view them from multiple perspectives. Identification of opportunities for mitigation and further research may result from this attempt to characterize the DoS problem space. We examine DoS attacks from the point of view of (1) a high-level that establishes common terminology and a framework for discussing the DoS process, (2) layers of the communication stack, from attack origination to the victim of the attack, (3) specific network and computer elements, and (4) attack manifestations. We also examine DoS issues associated with wireless communications. Using this collection of views, one begins to see the DoS problem in a holistic way that may lead to improved understanding, new mitigation strategies, and fruitful research.
NTIS
Computer Networks; Wireless Communication; Computer Components

20040041301 National Central Univ., Chung-Li, Taiwan, Province of China
A Re-Examination of the IEM Model for Microwave Scattering from Randomly Rough Boundary
Liu, Wei-Yi; Chen, Kun-Shan; Tsay, Mu-King; Wu, Tzong-Dar; Journal of the Chinese Institute of Engineers; May 2003; ISSN 0253-3839; Volume 26, No. 3, pp. 271-276; In English
Contract(s)/Grant(s): NSC-90-2212-E-008-037; NSC-90-2212-E-008-038; Copyright; Avail: Other Sources

An IEM surface scattering model was examined in terms of its applicability to simulations and laboratory measurements. New expressions for both single scattering and multiple scattering were obtained by re-deriving the scattering coefficient to keep all the phase terms in the spectral representation of Green's function. After quite intricate mathematical manipulations, a fairly compact form for an advanced IEM model (AIEM) is obtained for the scattering coefficients. In addition, the Fresnel reflection coefficients used in the model were replaced by a transition function. The comparisons in this paper were concentrated in the case of backscattering with both numerical simulations and measurement data. The results indicate that the IEM is improved, becoming more accurate and practical to use.
Author
Mathematical Models; Integral Equations; Microwave Scattering; Boundaries; Surface Geometry

20040041303 Princeton Univ., NJ
DbAccess: Interactive Statistics and Graphics for Plasma Physics Databases
Davis, W.; Mastrovito, D.; Oct. 2003; 14 pp.; In English
Report No.(s): DE2004-820083; PPPL-3880; No Copyright; Avail: Department of Energy Information Bridge

DbAccess is an X-windows application, written in IDL(Trademark), meeting many specialized statistical and graphical needs of NSTX(National Spherical Torus Experiment) plasma physicists, such as regression statistics and the analysis of variance. Flexible 'views' and 'joins,' which include options for complex SQL expressions, facilitate mixing data from different database tables. General Atomics Plot Objects add extensive graphical and interactive capabilities. An example is included for plasma confinement-time scaling analysis using a multiple linear regression least-squares power fit.
NTIS
Computer Graphics; Plasmas (Physics); Confinement

20040041324 Lawrence Livermore National Lab., Livermore, CA
Parallelization of an Adaptive Multigrid Algorithm for Fast Solution of Finite Element Structural Problems
Crane, N. K.; Parsons, I. D.; Hjelmstad, K. D.; Mar. 2002; 12 pp.; In English
Report No.(s): DE2003-15005342; UCRL-JC-147742; No Copyright; Avail: Department of Energy Information Bridge
Adaptive mesh refinement selectively subdivides the elements of a coarse user supplied mesh to produce a fine mesh with reduced discretization error. Effective use of adaptive mesh refinement coupled with an a posteriori error estimator can produce a mesh that solves a problem to a given discretization error using far fewer elements than uniform refinement. A geometric multigrid solver uses increasingly finer discretizations of the same geometry to produce a very fast and numerically scalable solution to a set of linear equations. Adaptive mesh refinement is a natural method for creating the different meshes required by the multigrid solver. This paper describes the implementation of a scalable adaptive multigrid method on a distributed memory parallel computer.
NTIS
Algorithms; Computational Grids; Finite Element Method; Distributed Memory; Grid Refinement (Mathematics); Memory (Computers)

20040041328 Lawrence Livermore National Lab., Livermore, CA
Spatio-Temporal Data Mining of Scientific Trajectory Data. Final Report
Gaffney, S.; Smyth, P.; Jan. 2001; 16 pp.; In English
Report No.(s): DE2003-15005339; UCRL-ID-142043; No Copyright; Avail: Department of Energy Information Bridge
With the increasing availability of massive observational and experimental data sets (across a wide variety of scientific disciplines) there is an increasing need to provide scientists with efficient computational tools to explore such data in a systematic manner. For example, techniques such as classification and clustering are now being widely used in astronomy to categorize and organize stellar objects into groups and catalogs, which in turn provide the impetus for scientific hypothesis formation and discovery. Data-driven exploration of massive spatio-temporal data sets is an area where there is particular need of data mining techniques. Scientists are overwhelmed by the vast quantities of data which simulations, experiments, and observational instruments can produce. Analysis of spatio-temporal data is inherently challenging, yet most current research in data mining is focused on algorithms based on more traditional feature-vector data representations.
NTIS
Spatial Distribution; Trajectories; Temporal Distribution; Data Management; Data Mining; Data Collection Platforms

20040041329 Lawrence Livermore National Lab., Livermore, CA
FOSPACK
Ruge, J. W.; Dean, D.; Nov. 2000; 12 pp.; In English
Report No.(s): DE2003-15005340; UCRL-CR-142046; No Copyright; Avail: Department of Energy Information Bridge
The goal of this subcontract was to modify the FOSPACK code, to call the BoomerAMG solver developed at LLNL through the HYPRE interface. FOSPACK is a package developed for the automatic discretization and solution of First-Order System Least-Squares (FOSLS) formulations of 2D partial differential equations. The major parts of this work were implementation and testing of the HYPRE package, writing a C wrapper/driver for the FOSPACK code, and modifying the wrapper to call BoomerAMG through the HYPRE interface.
NTIS
Partial Differential Equations; Comsat Program; Differential Equations

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COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20040035885 Lawrence Livermore National Lab., Livermore, CA
Static Load Balancing for CFD Distributed Simulations
Chronopoulos, A. T.; Grosu, D.; Wissink, A. M.; Benche, M.; Jan. 26, 2001; 26 pp.; In English
Report No.(s): DE2003-15005539; UCRL-JC-142207; No Copyright; Avail: Department of Energy Information Bridge

The cost/performance ratio of networks of workstations has been constantly improving. This trend is expected to continue in the near future. The aggregate peak rate of such systems often matches or exceeds the peak rate offered by the fastest parallel computers. This has motivated research towards using a network of computers, interconnected via a fast network (cluster system) or a simple Local Area Network (LAN) (distributed system), for high performance concurrent computations. Some of the important research issues arise such as (1) Optimal problem partitioning and virtual interconnection topology mapping; and (2) Optimal execution scheduling and load balancing.
NTIS
Static Loads; Computational Fluid Dynamics; Computerized Simulation

20040036219 Defence Science and Technology Organisation, Salisbury
Photonic Radio Frequency Memory - Design Issues and Possible Solutions
Nguyen, Linh V.; Dec. 2003; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420254; DSTO-TR-1491; DODA-AR-012-890; No Copyright; Avail: CASI; A03, Hardcopy

False target generation, range and velocity gate pull-off are Electronic Attack (EA) techniques in which received radar pulses are stored, then read out and re- transmitted back to the source radar after the desired length of time. The memory can be either a recirculating delay line or a digital radio-frequency (RF) memory (DRFM). The DREM stores a digitized sample of each received pulse, which can provide high fidelity of the analogue-digital conversion process has sufficient dynamic range. The speed of digital signal processing and memory plays a critical role in DRFM design. The analogue-digital conversion process and bit-rate limit the range of frequencies that DRFMs can cover. Photonics is currently being investigated to implement EA techniques such as false target generation, range and velocity gate pull- off. To fully take advantage of the unique benefits offered by photonics to implement EA techniques, the development of photonic RF memory (PRFM) is required. PRFM can potentially cover frequencies from near DC to 110 GHz, which are of interest in Electronic Warfare (EW). Photonic technology offers the opportunity for high fidelity signal storage without the use of down-conversion or analogue-to-digital converters. In this report, design issues and possible solutions of PRFM are discussed to assist with the ongoing experimental investigation.
DTIC
Computer Storage Devices; Electronic Warfare; Memory (Computers); Radio Frequencies

20040036579 Naval Postgraduate School, Monterey, CA
Benchmarking and Analysis of the SRC-6E Reconfigurable Computing System
Macklin, Kendrick R.; Dec. 2003; 149 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420557; No Copyright; Avail: CASI; A07, Hardcopy

This thesis evaluates the usefulness of the SRC-6E re- configurable computing system for a radar signal processing application and documents the process of creating and importing VHDL code to configure the user definable logic on the SRC-6E. A false-target radar-imaging algorithm was chosen and implemented on the SRC-6E. Data from alternative computational approaches to the same problem are compared to determine the effectiveness of SRC-6E solution. The results show that the implementation of the algorithm does not provide an effective solution when executed on the SRC-6E. An evaluation of the SRC-6E difficulty of use is conducted, including a discussion of required skills, experience and development times. The algorithm test code and collected data are included as appendices.
DTIC
Architecture (Computers)

20040042444 NASA Ames Research Center, Moffett Field, CA, USA
Worlds First SSI 512 Altix
Brooks, Walter; January 05, 2004; 6 pp.; In English
Contract(s)/Grant(s): 21-302-15-41; No Copyright; Avail: CASI; A02, Hardcopy

Altix 512 at NASA Advanced Supercomputing (NAS) is the fastest cache coherent SSI HPC system in the world. This viewgraph presentation gives a brief overview of its specifications and capabilities.
CASI
Supercomputers; Computer Systems Performance

20040043774 Naval Postgraduate School, Monterey, CA
Digital Enhancement of Night Vision and Thermal Images
Teo, Chek K.; Dec. 2003; 93 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420635; No Copyright; Avail: CASI; A05, Hardcopy

Low image contrast limits the amount of information conveyed to the user With the proliferation of digital imagery and computer interface between man-and-machine, it is now viable to consider digitally enhancing the image before presenting it to the user, thus increasing the information throughput. This thesis explores the effect of the Contrast Limited Adaptive Histogram Equalization (CLAHE) process on night vision and thermal images With better contrast, target detection and discrimination can be improved. The contrast enhancement by CLAHE is visually significant and details are easier to detect with the higher image contrast. Analyzing the image frequency response reveals increases in the higher spatial frequencies. As higher frequencies correspond to image edges, the power increase is viewed as corresponding to edge enhancement and hence, an increase in visible image details. This edge enhancement is perceived as improvement in image quality. This is further substantiated by a subjective testing, where a majority of human subjects agreed that CLAHE-enhanced images are more informative than the original night vision images.
DTIC
Augmentation; Digital Systems; Image Processing; Night Vision

20040045211 Defence Science and Technology Organisation, Edinburgh, Australia
A Review of Selected Nanotechnology Topics and Their Potential Military Applications
Wang, Jun; Dortmans, Peter; January 2004; 47 pp.; In English
Report No.(s): DSTO-TN-0537; DODA-AR-013-012; Copyright; Avail: Other Sources

This report presents the review of progress in selected nanotechology topics and some possible applications. We survey four major branches within the field: nanotubes, quantum dots, nanomaterials and nanodevices. For each of these, we review the underlying scientific concepts, potential enabling technologies and current limitations to the realization of nanotechnology applications. Possible implications for the future Land Force are discussed by examining potential nanotechnology impacts across seven core military skills within the Army-as-a-System construct.
Author
Military Technology; Nanotechnology; Quantum Dots; Nanotubes

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20040035838 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Intelligent Archives in the Context of Knowledge Building Systems: Concepts for the Future
Ramapriyan, H. K.; McConaughy, Gail; Lynnes, G. Chris; Kempler, Steve; McDonald, Ken; [2004]; 34 pp.; In English; AR and IDU PI Workshop, 4-6 Feb. 2004, Dana Point, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy

The technical objectives are: 1. Formulate concepts and architectures that support data archiving for NASA science research and applications in the 10 to 20 year time frame. 2. Focus on architectural strategies that will support intelligent processes and functions. 3. Identify and characterize science and applications scenarios that drive intelligent archive requirements. 4. Assess technologies and research that will need the development of an intelligent archive. 5. Identify and characterize potential research projects that will be needed to develop and create an intelligent archive.
Derived from text
Architecture (Computers); Smart Materials

20040035883 Lawrence Livermore National Lab., Livermore, CA

Use of Numerical Models as Data Proxies for Approximate Ad-Hoc Query Processing

Kamimura, R.; Abdulla, G.; Baldnwin, C.; Critchlow, T.; Lee, B.; May 19, 2003; 12 pp.; In English

Report No.(s): DE2003-15005465; UCRL-JC-153329; No Copyright; Avail: Department of Energy Information Bridge

As datasets grow beyond the gigabyte scale, there is an increasing demand to develop techniques for dealing/interacting with them. To this end, the DataFoundry team at the Lawrence Livermore National Laboratory has developed a software prototype called Approximate Adhoc Query Engine for Simulation Data (AQSim). The goal of AQSim is to provide a framework that allows scientists to interactively perform adhoc queries over terabyte scale datasets using numerical models as proxies for the original data. The advantages of this system are several. The first is that by storing only the model parameters, each dataset occupies a smaller footprint compared to the original, increasing the shelf-life of such datasets before they are sent to archival storage. Second, the models are geared towards approximate querying as they are built at different resolutions, allowing the user to make the tradeoff between model accuracy and query response time. This allows the user greater opportunities for exploratory data analysis. Lastly, several different models are allowed, each focusing on a different characteristic of the data thereby enhancing the interpretability of the data compared to the original. The focus of this paper is on the modeling aspects of the AQSim framework.

NTIS

Data Processing; Numerical Analysis

20040035890 Lawrence Livermore National Lab., Livermore, CA

Application Software Structure Enables NIF Operations

Fong, K. W.; Estes, C. M.; Fisher, J. M.; Shelton, R. T.; Oct. 17, 2001; 10 pp.; In English

Report No.(s): DE2003-15005544; UCRL-JC-143317; No Copyright; Avail: Department of Energy Information Bridge

The NIF Integrated Computer Control System (ICCS) application software uses a set of service frameworks that assures uniform behavior spanning the front-end processors (FEPs) and supervisor programs. This uniformity is visible both in the way each program employs shared services and in the flexibility it affords for attaching graphical user interfaces (GUIs). Uniformity of structure across applications is desired for the benefit of programmers who will be maintaining the many programs that constitute the ICCS. In this paper, the framework components that have the greatest impact on the application structure are discussed.

NTIS

Research Facilities; Applications Programs (Computers); Control Systems Design

20040035993 Oregon Health Sciences Univ., Portland, OR

Use What You've Got: Steps Toward Opportunistic Computing

McGee, David R.; Cohen, Philip R.; Jan. 2000; 10 pp.; In English

Contract(s)/Grant(s): N66001-99-D-8503; N00014-95-1-1164

Report No.(s): AD-A420066; No Copyright; Avail: CASI; A02, Hardcopy

We define opportunistic computing environments as augmented reality environments that attempt to minimally perturb existing work practices and allow users to opportunistically take advantage of them. In this paper, we present Rasa, an opportunistic computing environment for military command and control that augments the physical objects on a command post map by observing and understanding the users' speech, pen, and touch- based multimodal language. We give a thorough account of Rasa's underlying multiagent framework, recognition, understanding, and multimodal integration components. Finally, we examine three properties of language- generativity, comprehensibility, and compositionality-that render it suitable as an augmentation scheme, and we compare these properties to those of current tagging technologies and approaches.

DTIC

Programming Languages

20040036109 Army Research Lab., Adelphi, MD

Small Robot Team System Design

Young, Stuart H.; Nguyen, Hung M.; Oct. 2003; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420144; ARL-TR-3107; No Copyright; Avail: CASI; A03, Hardcopy

The transformation of the U,S Army toward an objective force that is more lethal, survivable, sustainable, and responsive to worldwide threats will include robotic systems. The Future Combat System (FCS) and Objective Force Warrior (OFW) are two critical initiatives leading toward the Objective Force that will include robotic systems. The U.S. Army Chief of Staff

General Shinseki stresses that soldiers will 'remain the centerpiece of our formations' and will be the 'heart' of the Objective Force. The U.S. Army Research Laboratory (ARL) is developing technology that supports the FCS and the soldier-centric OFW initiatives. For OFW 2010, there is an immediate need for a robotic follower within the next 2-3 years. OFW focuses on extending small team capabilities without overburdening the warrior (this will include robotic systems). This report will discuss some of the work that ARL is doing with the Land Warrior (LW) program and the OFW Program.
DTIC
Computer Programming; Software Engineering; Systems Engineering

20040036111 Army Research Lab., Adelphi, MD
An Analysis of CyberSleuth Traffic in a Tactical Internet Environment
Nguyen, Binh Q.; Oct. 2003; 42 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420145; ARL-TR-3108; No Copyright; Avail: CASI; A03, Hardcopy

Preliminary results of an analysis of CyberSleuth traffic data are reported in this document. CyberSleuth is a prototype of an adaptive agent-based vulnerability system intended for digitized tactical information systems. The analysis focuses on identifying the size of the mobile agents used in CyberSleutb and the required time for a mobile agent to travel between two networked computers. The traffic data were captured in an experiment conducted in the Tactical Internet laboratory of the U.S. Army Communications-Electronic Research, Development, and Engineering Center (CERDEC) in August 2002. The knowledge learned from studying the analyzed results could potentially lead to a better understanding of the constrained behavior of a very low bandwidth communication environment in which a potential application of mobile agents would have to operate.
DTIC
Information Systems

20040036185 California Inst. of Tech., Pasadena, CA
From PM to Petaflops Computing, MIND: Scalable Embedded Computing through Advanced Processor in Memory
Sterling, Thomas; May 21, 2003; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420202; No Copyright; Avail: CASI; A03, Hardcopy

No abstract available
Architecture (Computers); Computer Programs; Memory (Computers)

20040036223 Defence Science and Technology Organisation, Salisbury
Commercial-Off-The-Shelf (COTS) Systems, Architecture and Knowledge
Collignon, Stephane; Sep. 2003; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420256; DSTO-TR-1493; DODA-AR-012-892; No Copyright; Avail: CASI; A03, Hardcopy

Large or specialized software systems-of-systems are now mostly composed of Commercial-Off-The- Shelf (COTS) software packages. In mainstream application areas, such as office automation, this approach has proved satisfactory once the teething problems have been overcome. Defense and Research have also followed this trend in a desire to cut costs and take advantage of the functionality of commercial software. However, the difference between the often demanding requirements for defense systems-of-systems, and those against which COTS software has been designed, has resulted in unfavorable outcomes. This paper discusses the insights that can be gleaned from systems theory and practice to improve the probability of successfully integrating COTS components into defense systems. In particular the paper will provide a practical definition of systems of systems (SOS) and then will compare the generic design drivers for software of this scale with that of modest stand alone packages. A systems approach is invoked to help understand the problem context presented by the SOS evolution task and uses this to identify ideas that may be able to mitigate some of the issues. The paper will conclude by identifying some practical approaches that can help realize evolving Defense and Research SOS.
DTIC
Architecture (Computers); Commercial Off-the-Shelf Products; Computer Programs

20040036273 Naval Postgraduate School, Monterey, CA
Simulation of Distributed Object Oriented Servers
Khan, Chee; Dec. 2003; 235 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420304; No Copyright; Avail: CASI; A11, Hardcopy

Distributed object oriented (00) computing such as RMI, COBRA and SOAP etc is fast becoming the de- facto standard

for software development. The aim of the system designer is to determine the optimal deployment strategy for the system to perform efficiently. This is an enormous task especially when multiple object servers are fielded on hardware of different specifications. The number of possible deployment strategy of object servers to hardware grows exponentially with increase number of object server and machine. For example, with 3 machines and 10 object servers there are 59049 possible deployment patterns. Eventually, the number of possible deployment makes it impossible for system designer to setup test bed to determine the optimal deployment strategy. The main goal of the simulation model is to analyze the object server deployment, verify an existing optimization model and to determine the optimal deployment strategy that will reduce the client response time. In one of the experiment conducted with the simulation model, in an environment with 3 machine and 10 object servers, it will take 53 years to attempt all deployment patterns in the lab environment. The simulation model will take only 13 days, which is an improvement of 1480%.
DTIC
Computer Programs; Object-Oriented Programming

20040036325 Naval Postgraduate School, Monterey, CA
Bistatic Radar System Analysis and Software Development
Teo, Ching L.; Dec. 2003; 116 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420338; No Copyright; Avail: CASI; A06, Hardcopy

Bistatic radar has some properties that are distinctly different from monostatic radar. Recently bistatic radar has received attention for its potential to detect stealth targets due to enhanced target forward scatter. Furthermore, the feasibility of hitchhiker radar has been demonstrated, which allows passive radar receivers to detect and track targets. This thesis developed a software simulation package in Matlab that provides a convenient tool to examine the bistatic radar design parameters and predict system performance. The software model is suitable for instructional purposes due to its user-friendly graphical user interface. Several bistatic radar applications were used to illustrate the software features, and their results were analyzed and discussed.
DTIC
Computer Programming; Forward Scattering; Multistatic Radar; Software Engineering; Systems Analysis; Target Acquisition

20040036351 Naval Postgraduate School, Monterey, CA
A Methodology for Developing Timing Constraints for the Ballistic Missile Defense System
Miklaski, Michael H.; Babbitt, Joel D.; Dec. 2003; 309 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420353; No Copyright; Avail: CASI; A14, Hardcopy

The Department of Defense (DoD) is developing a Ballistic Missile Defense System (BMDS) based on a layered defense that employs complementary sensors, weapons and C2 elements integrated by software into a system-of-systems to engage and destroy threat ballistic missiles through all phases of its flight. Inherent to the ultimate success of the BMDS will he the timely execution of the kill chain process against threat ballistic missiles. In this thesis we will apply the Unified Software Development Process, utilizing the BMDS as a case study, to investigate a means to identify and validate timing behaviors and constraints of system-of-systems. In particular, we will examine the information exchange needed for processors to share, collaborate, fuse, and distribute sensor information in a distributed sensor network and utilize modeling and simulation to provide insight into the timing aspects of interactions among subsystems comprising a system-of-system. The case study will involve deriving and documenting system and software requirements, developing a test-ready model for representing the timing requirements, and then validating this model through the use of an OMNET++ simulation. The simulation will then be used to provide feedback to further refine the system requirements and the functional specifications of the subsystems.
DTIC
Antimissile Defense; Ballistic Missiles; Computer Programming; Missile Defense; Software Engineering

20040036391 Naval Postgraduate School, Monterey, CA
Scenario Selection and Student Assessment Modules for CyberCIEGE
Leng, Tiat; Dec. 2003; 127 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420389; No Copyright; Avail: CASI; A07, Hardcopy

CyberCIEGE aims to provide an information Assurance (IA) teaching/learning Laboratory in the form of an interactive entertaining commercial-grade PC-based computer game. Each game plays as a single scenario that serves to teach a particular IA concept. However, more synergy can be gained if there is higher-order organization of these scenarios, such as by grouping around a set of desired concepts to be taught or by increasing the complexity of the scenarios built around a common theme.

This thesis aims to provide an instructor tool for this purpose. In addition by tapping the CyberCIEGE event log files generated at the end of each game, we can reconstruct the game progress to support After Action Reviews (AAR) to assist the instructor and student to analyze game decisions and the student's progress. This provides a constructive follow-up to review and reinforce the concepts being taught.
DTIC
Game Theory

20040036467 Naval Postgraduate School, Monterey, CA
Evaluation of a Multi-Agent System for Simulation and Analysis of Distributed Denial-of-Service Attacks
Huu, Tee; Dec. 2003; 72 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420448; No Copyright; Avail: CASI; A04, Hardcopy

DDoS attack is evolving at a rapid and alarming rate; an effective solution must be formulated using an adaptive approach Most of the simulations are performed at the attack phase of the DDoS attack; thus the defense techniques developed focus mainly on filtering and isolating the attack, In order to develop and verify the effectiveness of a defense strategy, we needed a robust and flexible simulation tool, The Multi-Agent System Development Kit (MASDK) provided us a means to generate DDoS attack in a safe experimental environment for testing and validating security solutions, starting from the implantation phase: this allows researchers to develop new defense strategy even before the DDoS attack is launched, The paper begins with the study of the characteristics of DDoS attacks, the types of detection-and-response techniques, and the available DDoS attack simulation tools, The result generated by the MASDK simulation tool was used to evaluate the performance of the tool in simulating the DDoS attack over the networking environment
DTIC
Computer Networks; Distributed Interactive Simulation

20040036471 Naval Postgraduate School, Monterey, CA
An Enhanced Graphical User Interface for Analyzing the Vulnerability of Electrical Power Systems to Terrorist Attacks
Stathakos, Dimitrios; Dec. 2003; 123 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420451; No Copyright; Avail: CASI; A06, Hardcopy

This thesis develops a Graphical User Interface (GUI) to represent electric power grids subject to interdiction (attack) by terrorists The work enhances the prototypic One-line Diagram (OD) representations of electric power networks in the VEGA 1.O decision-support system (Vulnerability of Electrical Power Grids Analysis, version 1. O) Conforming to Windows standards, the new OD GUI incorporates advanced graphical features, which help the user visualize the model and understand the consequences of interdiction The new ODs also capture the details of system restoration over time following an attack The enhanced OD GUI has been incorporated into the updated version of the system, VEGA 2.O
DTIC
Graphical User Interface

20040036477 Naval Postgraduate School, Monterey, CA
Defending IEEE 802.11-Based Networks Against Denial Of Service Attacks
Tan, Boon H.; Dec. 2003; 133 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420456; No Copyright; Avail: CASI; A07, Hardcopy

The convenience of IEEE 8O2.11-based wireless access networks has led to widespread deployment in the consumer, industrial and military sectors However, this use is predicated on an implicit assumption of confidentiality and availability In addition to widely publicized security flaws in IEEE 8O2.11's basic confidentially mechanisms, the threats to network availability presents any equal, if not greater danger to users of IEEE 8O2.11-based networks It has been successfully demonstrated that IEEE 8O2.11 is highly susceptible to malicious denial-of-service (DoS) attacks targeting its management and media access protocols Computer simulation models have proven to be effective tools in the study of cause and effect in numerous fields This thesis involved the design and implementation of a IEEE 8O2.11-based simulation model using OMNeT++, to investigate the effects of different types of DoS attacks on a IEEE 8O2.11 network, and the effectiveness of corresponding countermeasures.
DTIC
Computer Networks; Computerized Simulation

20040036581 Naval Postgraduate School, Monterey, CA

The Extensible Run-Time Infrastructure (XRTI): An Experimental Implementation of Proposed Improvements to the High Level Architecture

Kapolka, Andrzej; Dec. 2003; 133 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420560; No Copyright; Avail: CASI; A07, Hardcopy

The establishment of a large-scale network of persistent shared virtual worlds depends on the presence of a robust standard for communicating state information between the applications that host and provide access to those worlds. The High Level Architecture (HLA) can serve as the basis for such a standard, but not before several of its shortcomings are resolved. First, it must be made easier to use. Second, it must specify a standardizable message protocol. Third, it must support dynamic object model extension and composition. Finally, its authors must provide an open-source, freely redistributable run-time infrastructure. This thesis documents the creation of the Extensible Run-Time Infrastructure (XRTI), an experimental platform that addresses the above requirements while retaining full backwards compatibility with the existing HLA standard. To increase ease-of-use, the XRTI provides a proxy compiler that generates customized sets of Java(trade mark) source files based on the contents of arbitrary Federation Object Model Document Data (FDDs). To encourage message protocol standardization, the XRTI uses a novel bootstrapping methodology to define its low-level interactions in terms of an HLA object model. The XRTI supports the dynamic composition and extension of such object models through its Reflection Object Model (ROM), and this thesis demonstrates that ability by depicting the integration of the XRTI into NPSNET-V, a dynamically extensible platform for virtual environment applications.

DTIC

Computer Networks; Virtual Reality

20040036601 Naval Postgraduate School, Monterey, CA

A Metric Model for Intranet Portal Business Requirements

Jacoby, Grant A.; Dec. 2003; 193 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420583; No Copyright; Avail: CASI; A09, Hardcopy

This research provides the first theoretical model the Intranet Efficiency and Effectiveness Model (IEEM) for the Family of measures approach to measure Web activity as well as a holistic framework and multi-disciplinary quality paradigm approach not previously derived in viewing and measuring intranet contributions in the context of a corporation's overall critical business requirements. This is accomplished by applying a balanced baseline set of metrics and conversion rations linked to business processes as they relate to knowledge workers, IT managers and business decision makers seeking to increase value. It also outlines who should conduct these measurements and how in the form of a business intelligence team and provides a means in which to calculate return on intranet metrics investment (ROIMI) with a common unit of analysis for both aggregate and sub-corporate levels through forms of the Knowledge Value Added (KVA) and Activity Based Costing (ABC) methodologies.

DTIC

Computer Networks

20040036607 Naval Postgraduate School, Monterey, CA

Creating Digital Environments for Multi-Agent Simulation

Tanner, Mark B.; Dec. 2003; 95 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420589; No Copyright; Avail: CASI; A05, Hardcopy

There are few tools available for military and civilian simulation developers to quickly and efficiently develop high-fidelity digital environments capable of supporting high-resolution, agent-based simulation. In this work, the author has tried to lay a solid foundation for further understanding the digital terrain support available to simulation developers. This thesis explores numerous digital terrain data representations and tools available to create digital environments. The work explores the specific problem of terrain database generation for agent-based ground combat simulation. To accomplish this, the author explores the more general problem of where to find the data, what tools are available, and how to put the pieces together to create a registered digital environment on a state-of-the-art computer. The author envisions this methodology to be the first step in the design of an automated planning tool capable of importing real world digital terrain data and quickly generating agent- based military combat scenarios for any location on earth. This work provides a logical construct and design methodology for an analyst to create high fidelity terrain data sets. It functions as a 'how to' manual to help analysts understand which information and tools are available to use for different types of simulation projects.

DTIC

Computerized Simulation; Digital Simulation

20040036613 Pittsburgh Univ., Pittsburgh, PA
Dynamic Spectrum Allocation Algorithms
Pruhs, Kirk; Kalyanasundaram, Bala; Dec. 31, 2002; 7 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0103
Report No.(s): AD-A420598; AFRL-SR-AR-TR-04-0104; No Copyright; Avail: CASI; A02, Hardcopy

In our previous funding, we reported the following. The standard online scheduling method to avoid fragmentation is called First Fit, which roughly speaking tries to schedule every task as early in time and as low in the spectrum as possible. We find that for the input distributions that we tested, First Fit does not perform appreciably bettor than random placement, We then considered offline algorithms that can do the jobs in some predefined order. We also give some theoretical evidence of the difficulty of producing good schedules in the online setting 2. More precisely, we showed that if one is given a sequence of tasks that can be fit into a spectrum of size B, there is no online algorithm that can fit these tasks into spectrum of size c*B, for any constant c. In the offline setting, we have found that, among the simple heuristic algorithms, the best are those that in some sense try to schedule the jobs from earliest in time to latest in time. We call it Timeline. On the inputs we tested these algorithms were consistently able to schedule 5% to 10% more jobs than Random. While a 5% to 10% improvement may seem modest, one needs to ask oneself about the benefit of being able to schedule a few more tests per day relative to the cost of the system required to produce such a schedule.
DTIC
Algorithms; Performance

20040037725 NASA Goddard Space Flight Center, Greenbelt, MD, USA
XML in an Adaptive Framework for Instrument Control
Ames, Troy J.; [2004]; 11 pp.; In English; IEEE Aerospace Conference, 6-13 Mar. 2004, Big Sky, MT, USA
Report No.(s): IEEEAC Paper 1175; No Copyright; Avail: CASI; A03, Hardcopy

NASA Goddard Space Flight Center is developing an extensible framework for instrument command and control, known as Instrument Remote Control (IRC), that combines the platform independent processing capabilities of Java with the power of the Extensible Markup Language (XML). A key aspect of the architecture is software that is driven by an instrument description, written using the Instrument Markup Language (IML). IML is an XML dialect used to describe interfaces to control and monitor the instrument, command sets and command formats, data streams, communication mechanisms, and data processing algorithms.
Author
Document Markup Languages; Remote Control; Algorithms; Computer Programs

20040040052 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Optical Path Design Software for Photonic MPLS Networks
Tokuhisa, Masaki; Nogami, Shinya; Abe, Takeo; Nagatsu, Naohide; Takigawa, Yoshihiro; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 76-81; In English; See also 20040040049; Copyright; Avail: Other Sources

NTT Service Integration Laboratories has developed optical path design software for setting optical paths between start and end routers in wavelength-division-multiplexing-based photonic multiprotocol label switching networks. This article gives an overview of this software.
Author
Optical Paths; Optical Switching; Photonics; Optical Communication; Computer Programs

20040040156 Defence Science and Technology Organisation, Edinburgh, Australia
Joint Warrior Interoperability Demonstration (JWID) Web Data Collection Tool (WDCT) Developer Guide
Kuster, Egon; September 2003; 53 pp.; In English
Report No.(s): DSTO-GD-0377; DODA-AR-012-920; Copyright; Avail: Other Sources

This document has been created for the developer of the WDCT system. It contains documentation of the WDCT architecture and components that are part of the system. To support this document is the WDCT Developer CD-ROM, which contains all the WDCT source files and support files that are required in the development or alteration of the system. The structure of the database and the data contained within is explained. All Java Class files are discussed as to their function within the WDCT. Each JSP used is described as to the functionality that it provides. Also contained is a brief discussion of what new functionality that could be added.
Author
Interoperability; Computer Programs; User Manuals (Computer Programs)

20040040332 NASA Glenn Research Center, Cleveland, OH, USA
Refinement and Use of the OTIS Program for RLV and Low-Thrust Mission Design
[2004]; 5 pp.; In English
Contract(s)/Grant(s): NCC3-1002; No Copyright; Avail: CASI; A01, Hardcopy

NASA Glenn s Systems Analysis Branch (SAB) is involved in mission analysis and associated software tool development for Earth-to-Orbit and In-Space (low thrust) missions. One of the key software analysis programs used by the SAB is the Optimal Trajectories by Implicit Simulation (OTIS) program. This program is developed and managed by NASA Glenn s SAB and is used on a national level by government and contractor affiliates. The SAB is also involved in the mission design activities for the Next Generation Launch Technology (NGLT) program as well as In-Space mission design involving new In-Space propulsion technologies. It is in these two main areas that support, in-depth studies, and development were performed. Below is a brief summary of the study and development activities.
Author
Mission Planning; Software Development Tools; Systems Analysis

20040040362 Plymouth Univ., Plymouth, UK
Simulation of Resin Intrusion During Injection Molding
Matthews, G. Peter; Ridgway, Cathy J.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 91-97; In English; See also 20040040360; Copyright; Avail: Other Sources

A void structure model has been developed, named 'Pore-Cor' (Pore-level Properties Correlator), which simulates the void structures and pore-level properties of fibrous materials. The main experimental input to the model is mercury porosimetry, which can be coupled with additional information if available. We demonstrate how this new technique can give insights into the resin intrusion of fibrous mats. In common with other computer models, the results are precise rather than accurate. This precision can be put to use in explaining structural effects which occur during resin injection, exemplified here by the simulation of the effect of trapped air on injected resin volume and hence final product strength.
Derived from text
Computerized Simulation; Injection Molding; Resins; Intrusion

20040040367 Cooperative Research Center for Advanced Composite Structures, Fishermens Bend, Australia
Isothermal Flow Simulation of Liquid Composite Molding
Liu, Xiao-Lin; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 99-106; In English; See also 20040040360; Copyright; Avail: Other Sources

This paper proposes a finite element/nodal volume procedure for the isothermal flow simulation of liquid composite molding processes. The formulation and the numerical implementation of the procedure are described. A scheme is introduced to prevent the procedure from possible locking in the flow calculation. The capability and the numerical accuracy of the procedure are investigated through a number of numerical examples.
Author
Finite Element Method; Isothermal Flow; Simulation; Casting; Numerical Analysis

20040042408 NASA Ames Research Center, Moffett Field, CA, USA
Automated Euler and Navier-Stokes Database Generation for a Glide-Back Booster
Chaderjian, Neal M.; Rogers, Stuart E.; Aftosmis, Mike J.; Pandya, Shishir A.; Ahmad, Jasim U.; Tejnil, Edward; [2004]; 2 pp.; In English; Third International Conference on Computational Fluid Dynamics, 12-16 Jul. 2004, Toronto, Canada; No Copyright; Avail: CASI; A01, Hardcopy

The past two decades have seen a sustained increase in the use of high fidelity Computational Fluid Dynamics (CFD) in basic research, aircraft design, and the analysis of post-design issues. As the fidelity of a CFD method increases, the number of cases that can be readily and affordably computed greatly diminishes. However, computer speeds now exceed 2 GHz, hundreds of processors are currently available and more affordable, and advances in parallel CFD algorithms scale more readily with large numbers of processors. All of these factors make it feasible to compute thousands of high fidelity cases. However, there still remains the overwhelming task of monitoring the solution process. This paper presents an approach to automate the CFD solution process. A new software tool, AeroDB, is used to compute thousands of Euler and Navier-Stokes solutions for a 2nd generation glide-back booster in one week. The solution process exploits a common job-submission grid environment, the NASA Information Power Grid (IPG), using 13 computers located at 4 different geographical sites. Process automation and web-based access to a MySql database greatly reduces the user workload, removing much of the tedium and

tendency for user input errors. The AeroDB framework is shown. The user submits/deletes jobs, monitors AeroDB's progress, and retrieves data and plots via a web portal. Once a job is in the database, a job launcher uses an IPG resource broker to decide which computers are best suited to run the job. Job/code requirements, the number of CPUs free on a remote system, and queue lengths are some of the parameters the broker takes into account. The Globus software provides secure services for user authentication, remote shell execution, and secure file transfers over an open network. AeroDB automatically decides when a job is completed. Currently, the Cart3D unstructured flow solver is used for the Euler equations, and the Overflow structured overset flow solver is used for the Navier-Stokes equations. Other codes can be readily included into the AeroDB framework. Author

Computational Fluid Dynamics; Euler Equations of Motion; Navier-Stokes Equation; Data Bases; Computer Programs

20040043669 NASA Ames Research Center, Moffett Field, CA, USA

Recent Developments in OVERGRID, OVERFLOW-2 and Chimera Grid Tools Scripts

Chan, William M.; January 02, 2004; 6 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

OVERGRID and OVERFLOW-2 feature easy to use multiple-body dynamics. The new features of OVERGRID include a preliminary chemistry interface, standard atmosphere and mass properties calculators, a simple unsteady solution viewer, and a debris tracking interface. Script library development in Chimera Grid Tools has applications in turbopump grid generation. This viewgraph presentation profiles multiple component dynamics, validation test cases for a sphere, cylinder, and oscillating airfoil, and debris analysis.

CASI

Computer Programs; Dynamics; Many Body Problem

20040043677 NASA Ames Research Center, Moffett Field, CA, USA

Simulation-Based Verification of Autonomous Controllers via Livingstone PathFinder

Lindsey, A. E.; Pecheur, Charles; [2004]; 14 pp.; In English; Tools and Algorithms for the Construction and Analysis of Systems, [2004]; No Copyright; Avail: CASI; A03, Hardcopy

AI software is often used as a means for providing greater autonomy to automated systems, capable of coping with harsh and unpredictable environments. Due in part to the enormous space of possible situations that they aim to addrs, autonomous systems pose a serious challenge to traditional test-based verification approaches. Efficient verification approaches need to be perfected before these systems can reliably control critical applications. This publication describes Livingstone PathFinder (LPF), a verification tool for autonomous control software. LPF applies state space exploration algorithms to an instrumented testbed, consisting of the controller embedded in a simulated operating environment. Although LPF has focused on NASA s Livingstone model-based diagnosis system applications, the architecture is modular and adaptable to other systems. This article presents different facets of LPF and experimental results from applying the software to a Livingstone model of the main propulsion feed subsystem for a prototype space vehicle.

Author

Autonomy; Controllers; Architecture (Computers); Simulation; Automatic Control; Algorithms; Proving

20040043725 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Performance Bottleneck Analysis of Web Applications with eASSIST

Yamamoto, Tomohide; Yamada, Yasuharu; Ogata, Tetsuya; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 64-68; In English; See also 20040043721; Copyright; Avail: Other Sources

This article introduces eASSIST, which enables us to monitor and evaluate the performance of each internal component of an e-Business application consisting of a WWW server application and Java components without needing the application s Java source code. It helps us to determine the application s performance bottlenecks easily.

Author

Computer Programs; World Wide Web; Reliability Analysis

20040043726 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

An Application Sharing Platform with Low Management Costs

Higuchi, Masafumi; Okamoto, Manabu; Shinoda, Naoaki; Tanabe, Naohisa; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 69-73; In English; See also 20040043721; Copyright; Avail: Other Sources

ITT Information Sharing Platform Laboratories is researching and developing an application sharing system based on

server-based computing that facilitates collaborative work among several participants using unmodified applications. This article gives a brief overview of the technologies.
Author
Information Management; Computer Programs; Low Cost

20040043731 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Advanced Virtualization and Sharing of IT Resources for Shared Data Centers
Oonishi, Yasuhiro; Tamura, Takahiro; Suzuki, Takayasu; Yanagimoto, Kiyoshi; Kuribayashi, Shin-Ichi; NTT Technical Review, Volume 2, No. 2; January 2004, pp. 74-79; In English; See also 20040043721; Copyright; Avail: Other Sources

We present a shared data center approach that facilitates the outsourcing of information technology (IT) systems and describe one of its key components, the shared load balancer, which is implemented by replacing the conventional physical load balancer function and helps to implement the sharing of servers and firewalls.
Author
Information Systems; Technology Assessment; Data Bases; Data Transfer (Computers)

20040043760 Air Univ., Maxwell AFB, AL
An Extensible Markup Language (XML) Strategy for Focused Logistics Background and Value of Standards Development and Management
Simcox, Frank W.; Apr. 2002; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420617; AU/ACSC/104/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

Accurate, up-to-date information concerning transportation and movement of forces, equipment and supplies is critical to the success of a Joint Task Force. Joint Vision 2020 outlines the concept of Focused Logistics, which calls for total asset visibility (TAV). The primary provider of TAV will be the USA Transportation Command (USTRANSCOM) which is responsible for the Defense Transportation System (DTS). Critical to TAV throughout the DTS cycle is the implementation of web-based standards. The World Wide Web has changed the way the world, including the Department of Defense (DoD), thinks about and views information. The ability to access and use information rests on information technology (IT) standards. One standard that has seen recent widespread acceptance is the Extensible Markup Language (XML). This research paper addresses two important questions related to the proliferation of XML specifications throughout industry and the DoD. First, what are the current industry and DoD trends in transportation related XML standards development? Second, should USTRANSCOM interact with the IT standards development community in order to influence the XML standards development process?
DTIC
Document Markup Languages; Internets; Logistics; Military Operations; Transportation

20040043765 Bassett Army Community Hospital, Wainwright, AR
Function and Decision - The Modeling of Selected Ancillary Activities in a Medium Sized Hospital
Patterson, Larry R., Jr.; Aug. 1999; 61 pp.; In English
Report No.(s): AD-A420626; No Copyright; Avail: CASI; A04, Hardcopy

The Bassett Army Community Hospital (BACH) is located in the interior of Maska on Fort Wainwright just outside the city of Fairbanks. BACH is the northernmost military hospital in the USA and the BACH staff contends with several location specific issues. These issues include 'cartel-styled' pricing practiced by doctors in the civilian sector, the extremes of an Arctic climate, and the high costs associated with re-supplying a remote hospital. The facility was built in 1952 and there have been limited major upgrades and renovations to the building since that time. Several minor renovations of the 'band-aid' variety have occurred. These projects were designed as temporary fixes only. A new facility is currently planned to begin in 2000. A survey of the hospital's challenges revealed several departments struggling with the legacy and future. Many departments have operational issues but questions arise concerning the level of effort to be applied when ground will be broken on a new facility in a few years. The majority of renovation efforts have revolved around inpatient wards and operating rooms. Officers working in the ancillary services revealed staffing and physical layout problems which could be addressed with simulation.
DTIC
Computerized Simulation; Hospitals; Physicians

20040043804 Massachusetts Inst. of Tech., Cambridge, MA

Building Blocks for High Performance, Fault- Tolerant Distributed Systems

Lynch, Nancy; Feb. 26, 2004; 32 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0097

Report No.(s): AD-A420689; AFRL-SR-AR-TR-04-0138; No Copyright; Avail: CASI; A03, Hardcopy

This project developed theory and systems support to aid in the construction of adaptive, survivable distributed systems. The systems are designed to run in highly dynamic environments such as the internet, wireless networks, and sensor networks. Participating processes may join, leave, and fail during computation. The systems that were considered solve problems of data sharing and management, resource sharing and management, communication, and coordination. Specifically, the project involved developing reusable 'building blocks' global service specifications and distributed algorithms-for dynamic distributed systems. The work included an extensive study of view- oriented group communication services and algorithms, which is now 'transitioning' into use at Lincoln Laboratories. A major focus was on design and analysis of algorithms for implementing reliable atomic shared memory in highly dynamic networks. Other algorithmic work covered dynamic algorithms for atomic broadcast, scalable reliable multicast, and topology control. In addition, the project produced results on mathematical semantic foundations to support modeling and analysis of highly dynamic distributed systems, and on tools to support this effort.

DTIC

Computer Systems Design; Fault Tolerance

20040043838 Stanford Univ., Stanford, CA

Chip Multiprocessors Offer an Economical, Scalable Architecture for Future Microprocessors, Thread-Level Speculation Support Allows Them to Speed Up Past Software

Hammond, Lance; Hubbert, Benedict A.; Siu, Michael; Prabhu, Manohar K.; Chen, Michael; Apr. 2000; 14 pp.; In English

Contract(s)/Grant(s): DABT63-95-C-0089; MDA904-98-C-A933

Report No.(s): AD-A420740; No Copyright; Avail: CASI; A03, Hardcopy

The Hydra chip multiprocessor (CMP) integrates four MIP-based processors and their primary caches on a single chip together with a shared secondary cache. A standard CMP offers implementation and performance advantages compared to wide-issue superscalar design& However, it must be programmed with a more complicated parallel programming model to obtain maximum performance. To simplify parallel programming, the Hydra CMP supports thread-level speculation and memory renaming, a paradigm that allows performance similar to a uniprocessor of comparable die area on integer programs. This article motivates the design of a CMP, describes the architecture of the Hydra design with a focus on its speculative thread support, and describes our prototype implementation.

DTIC

Chips; Chips (Electronics); Computer Programming; Integers; Microprocessors; Multiprocessing (Computers); Threads

20040043847 Single Integrated Air Picture System Engineering Task Force, Arlington, VA

Single Integrated Air Picture (SIAP) Attributes Version 2.0

Karoly, S. J.; Wilson, J. W.; Dutchyshyn, H.; Maluda, J. W.; Aug. 2003; 53 pp.; In English

Report No.(s): AD-A420755; SIAP SE TF-TR-2003-029; No Copyright; Avail: CASI; A04, Hardcopy

The SIAP Implementation Plan states that the overarching objective of the SIAP SE TF is 'to identify incremental improvements in the - SIAP capability that will provide commensurate incremental improvements in warfighter capabilities' (SIAP Implementation Plan 2001). Quantification of the SIAP capability in evaluative, predictive, and prescriptive terms is a necessary step towards assessment of such improvements. Multiple measures currently exist to evaluate the SIAP, but there is much overlap and some potential for conflict and confusion between similar measures. Furthermore, many of these existing measures have not been precisely quantified, or have been quantified with no apparent predictive or prescriptive goals in mind. Therefore, there is a clear need to consolidate and more rigorously define a core set of attributes, which provide the joint community with a common point of departure for quantifying and assessing a SIAP. These attributes must be traceable to Theater Air and Missile Defense (TAMD) and Combat Identification (CID) Capstone Requirements Document (CRD) Key Performance Parameters (KPPs), augmenting the latter where either quantitative precision or a sharper focus on warfighting benefit is necessary. The SIAP SE TF Technical Reports 2001-001, 2001-002, 2001-003, and 2002- 007 were developed by the SIAP SE TF to correct for the deficiencies cited above by providing a standard set of definitions and algorithms for quantitative evaluation of air picture quality within the TAMID community. The measures apply to models, simulations, hardware and software in the loop experiments, operator in the loop exercises, and field exercises and evaluations. This

revision is based on experience gained within the community from application of those technical reports across the spectrum of those venues.
DTIC
Images; Missile Defense

20040043852 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Internet Protocol (IP) over Link-16
Stinson, Clinton W.; Mar. 2003; 86 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420762; AFIT/GCE/ENG/03-04; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of Link- 16 is to exchange real-time tactical data among units of the USA and allied forces. Primary Link-16 functions include exchange of friendly unit position and status data, fl%the dissemination of tactical surveillance track data, and the control/management of air, surface, and subsurface engagements. Because Link- 16 will play an integral role in fl% network- centric Joint Battlespace Infosphere (JBI), the performance of Internet Protocol version six (IPv6) and IP Security (IPSec) over Link-16 needs to be determined. Using OPNET modeling software to simulate a Link- 16 network, the investigation of this research revealed that the overhead from IPv6 and IPSec does not significantly affect end-to-end delay and effective throughput of the Link- 16 network. As long as the encryption and authentication protocols are preprocessed, these protocols add minimal amounts of latency overhead to the Link- 16 network. However, as the offered load is extended beyond the 90% level, the overhead from the IPSec extensions begins to have more of a negative effect on the End-to-End delay and throughput. Therefore, as the offered load increases beyond the 90% level, it begins to have a significant impact act on the performance of the Link- 16 network.
DTIC
Computer Information Security; Computer Programs; Internets; Protocol (Computers)

20040043890 Micro Analysis and Design, Boulder, CO
Improved Behavioral Representation for Operations other than War Within Aggregate Level Simulations
LaVine, Nils D.; Peters, Steven D.; Napravnik, Lee; Nov. 2003; 35 pp.; In English
Contract(s)/Grant(s): F41624-98-C-6012; DAAD17-00-A-5003; Proj-2830
Report No.(s): AD-A420810; AFRL-HE-WP-TR-2003-0150; No Copyright; Avail: CASI; A03, Hardcopy

This technical effort was sponsored by the Defense Modeling and Simulation Office (DMSO) and performed over a 14-month period under Army Research Laboratory (ARL) contract DAADl7-00-A-5003, 'Improved Behavioral Representation for Operations Other Than War Within Aggregate Level Simulations.' This program will be referred to as the Operations Other Than War (OOTW) Human Behavioral Representation (HBR) program. This report summarizes the objectives and outcomes of this program. The focus of this effort was to implement improved OOTW HER into a constructive simulation. For this effort we reviewed various constructive simulations to evaluate their ability to portray human behaviors in an OOTW setting, and based upon this review, a candidate constructive simulation was selected. We then cataloged currently available HER behaviors within our selected OOTW constructive simulation. Next, within the constructive simulation, we implemented an advanced client- server architecture to incorporate improved HER via an external server. We also developed and demonstrated a proof-of- concept OOTW HER server using the client-server architecture.
DTIC
Aggregates; Mathematical Models; Simulation; Warfare

20040043896 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Deception Detection in a Computer-Mediated Environment: Gender, Trust, and Training Issues
Dziubinski, Monica A>; Mar. 2003; 121 pp.; In English
Report No.(s): AD-A420817; AFIT/GIR/ENV/03-03; No Copyright; Avail: CASI; A06, Hardcopy

The Department of Defense is increasingly relying on computer-mediated communications to conduct business. This reliance introduces an amplified vulnerability to strategic information manipulation, or deception. This research draws on communication and deception literature to develop a conceptual model proposing relationships between deception detection abilities in a computer-mediated environment, gender, trust, and training. An experiment was conducted with 119 communications personnel to test the proposed hypotheses. No relationship between gender or trust and deception detection accuracy was found. Partial support was found showing that training improves deception detection accuracy. The most significant finding was that individuals deception detection abilities deteriorate in lean media environments. The results showed significant differences in deception detection abilities across media types; indicating lower accuracy rates in the lean

media environments (i.e. audio and text). This suggests that deception detection is more difficult when the deceptive message is presented in a lean medium such as a text only online chat, than when delivered in richer medium. Future research should be conducted to further explore this finding.
DTIC
Computer Programs; Deception; Education; Interprocessor Communication

20040043898 Air Force Research Lab., Rome, NY
Analysis and Summary of Business Processes and Requirements for JIFFY R & D Program Management Software Capabilities
Smith, Jacqueline D.; Jan. 2004; 41 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-ARCH
Report No.(s): AD-A420823; AFRL-IF-RS-TR-2004-4; No Copyright; Avail: CASI; A03, Hardcopy

This document describes the methodology and requirements for a subset of the functionality of the JIFFY R&D Program Management software, scheduled for deployment at the Air Force Research Laboratory (AFRL) in September 2003. The incorporation of new capabilities for the Laboratory Management Review process and the AFRL 2913 LMR reporting form required the formation of a focus group to investigate current business processes and make recommendations for the software design, build and testing of new software modules for JIFFY. This document specifically describes the outcome of the focus group's efforts. The purpose of the JIFFY software program is to provide an automated tool that is customized for managing AFRL Research and Development (R&D) program execution and to host a common repository for data elements related to Technical Programs for Scientists and Engineers (S&E), Financial & Administrative, Plans & Programs and Management Staff.
DTIC
Commerce; Computer Programs; Computer Systems Programs; Project Management; Research and Development

20040043900 General Dynamics Advanced Technology Systems, Arlington, VA
Communication Requirements in the Cooperative Control of Wide Area Search Munitions Using Iterative Network Flow
Mitchell, Jason W.; Ramussen, Steven J.; Sparks, Andrew G.; Feb. 2004; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-01-D-3105; Proj-AO5V
Report No.(s): AD-A420825; AFRL-VA-WP-TP-2004-305; No Copyright; Avail: CASI; A03, Hardcopy

Communication requirements are considered for the cooperative control of wide area search munitions where resource allocation is performed by an iterative network flow. We briefly outline both the single and iterative network flow assignment algorithms and their communication requirements. Then, using the abstracted communication framework recently incorporated into AFRL's MultiUAV simulation package, a model is constructed to investigate the peak and average data rates occurring in a sequence of vehicle-target scenarios using an iterative network flow for task allocation, implemented as a redundant, centralized optimization, that assumes perfect communication.
DTIC
Iterative Networks; Network Analysis; Radio Equipment; Scanners; Scanning; Telecommunication; Wide Area Networks

20040043908 Integrated Sensors, Inc., Utica, NY
Heterogeneous Embedded Real-Time Systems Environment
Castellano, Cosmo; Graham, James; Dec. 2003; 74 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-C-0259; Proj-D002
Report No.(s): AD-A420835; AFRL-IF-RS-TR-2003-290; No Copyright; Avail: CASI; A04, Hardcopy

The primary objective of the H-RTExpress effort is to provide enabling technology and domain specific tools that will quickly and effectively move systems targeted for heterogeneous architectures containing adaptive and embedded computing nodes from concept to implementation. The approach to accomplishing this objective is to build an integrated graphical development environment that will provide the capability to allow direct mapping and execution of sequential MATLAB code into heterogeneous embedded parallel computing systems containing both embedded processing and adaptive computing nodes comprised of field programmable gate array (FPGA) technology. The benefit of such an approach is that it provides an easy to use software development environment that significantly reduces the software development cost associated with building applications for these heterogeneous hardware systems. H-RTExpress allows the user to develop their application in

a high level language (MATLAB) and frees the user from having to worry about data distribution and communication, since the tool automatically handles these details for the user. The H- RTExpress development environment leverages existing technology developed under previous DARPA/ITO funding as well as ISI commercial product technology RTExpress and Annapolis Microsystems COREFIRE.
DTIC
Computer Programming; Embedding; Heterogeneity; Real Time Operation; Signal Processing

20040043928 California Univ., San Diego, La Jolla, CA
Agile Objects: Component-Based Inherent Survivability
Chien, Andrew A.; Bettati, Riccardo; Liu, Jane W.; Dec. 2003; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0534; DARPA ORDER-H548; Proj-H548; Proj-J366
Report No.(s): AD-A420858; AFRL-IF-RS-TR-2003-288; No Copyright; Avail: CASI; A04, Hardcopy

We have developed a framework called Agile Objects which leverages component object models and enables the construction of survivable systems that support increased application survivability through elusive technologies: location elusiveness, interface elusiveness, and dynamic elusiveness. Location elusiveness is the capability of application components to be reconfigured across distributed resources while the application is running and preserving the performance and real-time properties of the application both across and during the migration. In short, an application can flee systems that are likely (or already) compromised, dynamically reconfiguring to continue its mission. Interface elusiveness (a.k.a. High Performance Invocation Protection) enables a component middleware system to manage automatic change and configuration of application components and distributed object interfaces to maintain application security. Dynamic elusiveness is the capability to dynamically manage the dimensions of elusiveness in response to a complex and evolving security/ intrusion environment. Both location and interface elusiveness are supported by Agile Objects in dynamic form. The project efforts have demonstrated location elusiveness, interface elusiveness, and dynamic elusiveness which enable the construction of component-based inherently survivable systems. These technologies were embedded in a component middleware which allows applications, based on component technologies, to exploit survivability capabilities.
DTIC
Computer Techniques; Configuration Management

20040043951 Teknowledge Corp., Palo Alto, CA
ACME: A Basis for Architecture Exchange
Wile, David S.; Garlan, David; Dec. 2003; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-96-2-0224; DARPA ORDER-D929; Proj-D929
Report No.(s): AD-A420893; AFRL-IF-RS-TR-2003-305; No Copyright; Avail: CASI; A03, Hardcopy

The Acme project began with the goal of providing a common language that could be used to support the interchange of architectural descriptions between a variety of design tools. It remains useful in that role, but since the project's inception the Acme language and its support toolkit have grown into a solid foundation upon which new software architecture design and analysis tools can be built without the need to rebuild standard infrastructure. The Acme Language and the Acme Tool Developer's Library (AcmeLib) provide a generic, extensible infrastructure for describing, representing, generating, and analyzing software architecture descriptions. They provide three fundamental capabilities: (1) a generic interchange format for architectural designs, allowing architectural tool developers to readily integrate their tools with other complementary tools; (2) an extensible foundation and infrastructure, allowing tool builders to avoid needlessly rebuilding standard tooling infrastructure for describing, storing, and manipulating architectural designs; and (3) a useful architecture description language in its own right, providing a straightforward set of language constructs for describing architectural structure, architectural types and styles, and annotated properties of the architectural elements. (22 refs.)
DTIC
Computer Programming; Software Engineering

20040045165 NASA Ames Research Center, Moffett Field, CA, USA, Computer Sciences Corp., Moffett Field, CA, USA
Paramedir: A Tool for Programmable Performance Analysis
Jost, Gabriele; Labarta, Jesus; Gimenez, Judit; March 07, 2004; 10 pp.; In English; International Conference on Computational Science, 7-9 Jun. 2004, Krakow, Poland
Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; TIC2001-0995-C02-01; No Copyright; Avail: CASI; A02, Hardcopy

Performance analysis of parallel scientific applications is time consuming and requires great expertise in areas such as programming paradigms, system software, and computer hardware architectures. In this paper we describe a tool that facilitates the programmability of performance metric calculations thereby allowing the automation of the analysis and reducing the application development time. We demonstrate how the system can be used to capture knowledge and intuition acquired by advanced parallel programmers in order to be transferred to novice users.
Author
Computer Programs; Performance Prediction; Reliability Analysis; Time Functions

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20040035873 Lawrence Livermore National Lab., Livermore, CA
National Ignition Facility; Status of the Integrated Computer Control System
Van Arsdall, P. J.; Bryant, R.; Carey, R.; Casavant, D.; Demaret, R.; Oct. 13, 2003; 12 pp.; In English
Report No.(s): DE2003-15005463; UCRL-JC-152832; No Copyright; Avail: Department of Energy Information Bridge

The National Ignition Facility (NIF), currently under construction at the Lawrence Livermore National Laboratory, is a stadium-sized facility containing a 192-beam, 1.8-Megajoule, 500-Terawatt, ultraviolet laser system together with a 10-meter diameter target chamber with room for nearly 100 experimental diagnostics. When completed, NIF will be the world's largest and most energetic laser experimental system, providing an international center to study inertial confinement fusion and the physics of matter at extreme energy densities and pressures. NIF's 192 energetic laser beams will compress fusion targets to conditions required for thermonuclear burn, liberating more energy than required to initiate the fusion reactions. Laser hardware is modularized into line replaceable units such as deformable mirrors, amplifiers, and multi-function sensor packages that are operated by the Integrated Computer Control System (ICCS). ICCS is a layered architecture of 300 front-end processors attached to nearly 60,000 control points and coordinated by supervisor subsystems in the main control room. The functional subsystems--beam control including automatic beam alignment and wavefront correction, laser pulse generation and pre-amplification, diagnostics, pulse power, and timing--implement automated shot control, archive data, and support the actions of fourteen operators at graphic consoles. Object-oriented software development uses a mixed language environment of Ada (for functional controls) and Java (for user interface and database backend). The ICCS distributed software framework uses CORBA to communicate between languages and processors. ICCS software is approximately three quarters complete with over 750 thousand source lines of code having undergone off-line verification tests and deployed to the facility. NIF has entered the first phases of its laser commissioning program. NIF's highest 3(omega) single laser beam performance is 10.4 kJ, equivalent to 2 MJ for a fully activated NIF, exceeding the NIF energy point design of 1.8 MJ. In July 2003, 26.5 kJ of infrared light per beam was produced. NIF has now demonstrated the highest energy 1(Omega), 2(Omega), and 3(Omega) beamlines in the world. NIF's target experimental systems are also being installed in preparation for experiments to begin in late 2003. This talk will provide a detailed look at the initial deployment of the control system and the results of recent laser commissioning shots.
NTIS
Control Systems Design; Research Facilities

20040035877 Lawrence Livermore National Lab., Livermore, CA
Testing and Quality Assurance of the Control System During NIF Commissioning
Casavant, D.; Carey, R.; Cline, B.; Lagin, L.; Ludwigsen, P.; Oct. 13, 2003; 12 pp.; In English
Report No.(s): DE2003-15005464; UCRL-JC-152870; No Copyright; Avail: Department of Energy Information Bridge

The strategy used to develop the National Ignition Facility Integrated Computer Control System (NIF ICCS) calls for incremental cycles of construction and formal test to deliver nearly one million lines of code. Software releases that implement specific functionality are approved for deployment when offline tests conducted in the ICCS Integration and Test Facility verify functional, performance and interface requirements using test procedures derived from system requirements. At this stage of the project the controls team has delivered approximately 3/4 of the planned software by performing dozens of development and test cycles within offline test facilities and followed by online tests to confirm integrated operation in the NIF. Test incidents are recorded and tracked from development to successful deployment by the verification team, with hardware and software changes approved by the appropriate change control board. Project metrics are generated by the Software Quality

Assurance manager and monitored by ICCS management. Test results are summarized and reported to responsible individuals and Project managers under a work authorization and permit process that assesses risk and evaluates control system upgrade readiness. NIF is well into the first phases of its laser commissioning program to characterize and operate the first four laser beams and target systems. The integrated control system has successfully fired over 100 coordinated shots into beam diagnostics and an initial set of target diagnostics in the 10-m diameter target chamber. Extensive experience has been gained by integrating controls in prototype laboratories and in the NIF. This paper will discuss NIF's software QC and QA processes, capabilities of offline test facilities, and metrics collection.
NTIS
Research Facilities; Performance Tests; Control Systems Design

20040035949 Massachusetts Inst. of Tech., Lexington, MA
Preliminary Design Review: GMTI Narrowband for the Basic PCA Integrated Radar-Tracker Application
Reuther, A. I.; Feb. 6, 2004; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A419856; PR-PCA-IRT-3; DARPA-ESC-TR-2003-076; No Copyright; Avail: CASI; A03, Hardcopy

This report describes ground moving target indicator (GMTI) processing to be done for the PCA (polymorphism computing architecture) integrated radar-tracker application. GMTI processing of the raw radar data is done to extract targets; target reports are passed on to the tracker part of the integrated radar-tracker application. The GMTI processing described in this report is used to minimize the effects of interference patterns and ground clutter and to recognize and extract targets on the ground. The radar is presumed to be using a narrowband signal. For each data set, adaptive processing is used to null interference patterns and ground clutter noise. These operations incur a high computational cost. Adaptive processing requires the calculation of an adaptive filter (involving a QR decomposition and forward/backsliding) at run time for each data cube, while target parameter estimation incurs a high computation cost as more targets are detected in each data cube.
DTIC
Moving Target Indicators; Radar Tracking

20040036051 Army War Coll., Carlisle Barracks, PA
Interoperability and a Standard Joint Logistics Data Exchange with the Department of Defense
Kirkpatrick, Edward L.; Apr. 7, 2003; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420103; No Copyright; Avail: CASI; A03, Hardcopy

As the Department of Defense (DoD) continues to transform into a more efficient and coordinated fighting force, the elements of logistics support will continue to become more complex and will require more efficient ways of communication. The component Services currently have a myriad of logistics systems available to support their individual Service members. Many of these systems are not interoperable even within the same Service. The DoD has initiated the development of the Global Combat Support System (GCSS) to expand logistical information to operational levels. In recent years, private industry has been using the extensible Mark-up Language (XML) to promote interoperability among related industry partners via common or standard XML-based data exchanges. The Defense Information Systems Agency (DISA) also has recently selected the XML registry for the Defense Information Infrastructure (DII) Common Operating Environment (COE). The development of this registry provides a platform for enabling the standardization of DoD logistics data elements. If the DoD could develop a standard XML-based data exchange for logistics support, all of those systems that are currently in use could be mapped to the new standard exchange to provide an exchange of information between computer systems that currently do not have that capability. The standard logistics data definitions within GCSS could be used as a starting point to augment existing data element definitions in the DISA XML registry. By cross-referencing and augmenting the existing logistics data definitions in the DISA XML registry with the standard definitions within GCSS, the DoD could begin to manage the myriad of logistics data definitions and move forward in developing a standard joint logistics data exchange. (3 figures, 24 refs.)
DTIC
Data Management; Defense Program

20040036307 Air Force Research Lab., Wright-Patterson AFB, OH
An Examination of Complex Human-Machine System Performance under Multiple Levels and Stages of Automation
Galster, Scott M.; Oct. 2003; 206 pp.; In English
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A420328; AFRL-HE-WP-TR-2003-0149; No Copyright; Avail: CASI; A10, Hardcopy

The introduction of automation into highly complex systems has occurred under several guiding principles. The application of these principles has often resulted in tenuous interactions with regard to human performance within complex systems. With advances in technology increasing, it is no longer applicable to look at single automated tools but rather at how several automated tools fit together and affect system performance. A common framework utilizing a model of human interaction with automation based on simple human information- processing stages was used in the design and analysis of 4 experiments. The first 3 experiments utilized a visual search paradigm and varied the stage the automation was present and the reliability of the automation that was used. For these studies, the automation that helped the operator locate the potential target demonstrated a clear advantage over automation that recommended a course of action when the automation was perfectly reliable. The 4th study examined all of the possible combinations of manual and automated aiding for the 4 stages in an air-to-ground search and destroy mission that was carried out in a high fidelity combat flight simulator. By utilizing separate stage metrics, it was demonstrated that the automation in 1 stage influenced performance in subsequent stages and throughout the entire mission.
DTIC
Complex Systems; Man Machine Systems

20040036469 Naval Postgraduate School, Monterey, CA
Underwater Multimode Directional Transducer Evaluation
Sineiro, Guilherme d.; Dec. 2003; 69 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420449; No Copyright; Avail: CASI; A04, Hardcopy

The work described in the present thesis is intended to establish a procedure for analyzing directional transducers for future underwater wireless networks, as well as to carry out the performance evaluation of a multimode transducer prototype with respect to its main operational requirements. Measurement techniques were designed for application in the presence of physical limitations of the available facilities and the prototype development stage of the test unit.
DTIC
Communication Networks; Underwater Acoustics; Underwater Communication

20040036491 Office of Naval Research, Boston, MA
Realising Adaptive Distributed Internet Operations on Active Networks
Kirstein, Peter; Jan. 30, 2004; 11 pp.; In English
Contract(s)/Grant(s): MDA972-99-1-0009; ARPA ORDER H718; Proj-H718
Report No.(s): AD-A420468; No Copyright; Avail: CASI; A03, Hardcopy

This is the final report for the DARPA funded Radioactive Project, covering the period July 1999 - December 2003. There were three objective of the project. The principal one was to demonstrate use of IPv6-enabled Active Services at natural boundaries between network technologies; this was to be Application level Active Network (ALAN), as distinct from the other Active Networking technologies under the DARPA programme. The second objective was to investigate various technologies - in particular mechanisms for providing Quality of Service (QoS). The third was to support the International Collaboration Board (ICB), of which Prof Kirstein has been the Chair throughout the period of this project%; in this context considerable work was done in providing IPv6-enabled VPNs in a manner suitable for deployment in the ICB environment. Each of these is considered in turn. As part of the DARPA Active Networks programme, the contractors were encouraged to collaborate with others on the programme to make joint demonstrations. The principal demonstration pursued under the first of the above objectives was for demonstrating IPv6- enabled interactive multicast, wide-area, multimedia conferencing over the Xbone as developed by Joe Touch in the Dynabone project. This was demonstrated at the DANCE meeting between intercontinental-separated sites.
DTIC
Computer Networks

20040036539 MacKenzie (L. A.) Consultant, Ithaca, NY
A Digital Audio Storage and Web Access System
Bradbury, Jack W.; Feb. 24, 2004; 5 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0620
Report No.(s): AD-A420505; No Copyright; Avail: CASI; A01, Hardcopy

The goal of this project was to assemble an integrated system of digital audio archival and retrieval with which the Macaulay Library at Cornell University could preserve the large body of marine animal sounds collected by researchers

funded by the US Navy, NOAA, and other government funding agencies over the last three decades, and make this collection available to a wide spectrum of users over the Internet. This system has been successfully assembled and as of this report, a total of 307 hours (1870 specimens) of original recordings covering 31 species of cetaceans, 9 pinnipeds, and 202 species of fish have been digitized and prepared in formats suitable for Internet distribution. The Internet distribution hardware is also now in place and public availability awaits only the completion of the relevant search and delivery software. The latter is currently being written with concurrent funding from NOPP and NSF awards. Internet access to the digital marine sound collection is scheduled for Spring 2005.
DTIC
Digital Systems

20040036559 Naval Postgraduate School, Monterey, CA
Therminator: Configuring the Underlying Statistical Mechanics Model
Ettlich, Daniel W.; Dec. 2003; 97 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420540; No Copyright; Avail: CASI; A05, Hardcopy

The rapid increase in sophisticated Internet attacks has left the security industry lagging far behind, In an attempt to improve network security, Therminator, a patternless intrusion detection system, was developed in 2001 by NPS in conjunction with NSA. The Therminator model uses statistical mechanics to analyze network traffic as a system of exchanges, Being highly configurable enables Therminator to be adapted for any net-work configuration. Until now, however, no exploration had been conducted on the configuration parameters of the underlying statistical mechanics model. It is important to understand the effects of these parameters to optimize anomaly detection. Thus the current study explored these parameters using HTTP traffic generated in a controlled test environment. Results were as follows: equations were developed for state counting to determine bucket state space sizes; bucket state space size was found to be symmetrical about the midpoint of the boundary conditions; proper display period was based on traffic rate; and lastly, the more orthogonal anomalous traffic was to the normal traffic, the larger the perturbation was in the state graph. These results provide needed insight into properly configuring Therminator for optimal anomaly detection, ultimately affording the Department of Defense greater network security,
DTIC
Intrusion Detection (Computers); Statistical Mechanics

20040036569 Naval Postgraduate School, Monterey, CA
FORCEnet Engagement Packs: Operationalizing FORCEnet to Deliver Tomorrow's Naval Network-Centric Combat Reach Capabilities ... Today
Hesser, Robert W.; Rieken, Danny M.; Dec. 2003; 435 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420550; No Copyright; Avail: CASI; A19, Hardcopy

In response to the CNO's tasking to examine Sea Supremacy within the context of SEA POWER 21, SSG XXII proposed the concept of FORCEnet Engagement Packs (FnEPs). The FnEPs concept represents the operational construct for FORCEnet and demonstrates the power of FORCEnet by integrating a specific set of joint sensors, platforms, weapons, warriors, networks and command and control systems, for the purpose of performing mission-specific engagements. Initial pack asset allocation and constitution will be based on a specific threat or mission; however, the capability to dynamically re- configure and re-allocate assets 'on the fly,' to reconstitute a new pack will enable cross-mission engagement capabilities. Integrating the six FORCEnet factors must focus on five critical functions we term 'Combat Reach Capabilities (CRCs)'. These include: Integrated Fire Control (IFC), Automated Battle Management Aids (ABMAs), Composite Tracking (CT), Composite Combat Identification (CCID), and Common/ Single Integrated Pictures (CP). FnEPs achieves tully integrated joint capabilities focused on the engagement chain, and represents a revolutionary transformation in Naval operations complimentary to FORCEnet, SEA POWER 21, and Sea Supremacy. This thesis has two goals. First, we will conduct analysis to better understand the FnEPs Concept including the myriad of technical, organizational I, and programmatic requirements for its implementation. Second, we will propose a roadmap for the continued development and institutionalization' of the FnEPs Concept.
DTIC
Command and Control; Communication Networks; Military Operations

20040036583 Naval Postgraduate School, Monterey, CA
DoD Supply Chain Implications of Radio Frequency Identification (RFID) Use Within Air Mobility Command (AMC)
Hozven, Marcelo; Clark, George W.; Dec. 2003; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420561; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of this MBA project is to identity the existing and potential value of Radio Frequency Identification (RFID) use in the operations of Headquarters Air Mobility Command (HQAMC) and its worldwide network of aerial ports. The project seeks to determine how the applications of RFID within AMC can add value to AMC's operations and the operations of other DoD supply chain members. In doing so the project describes the technical attributive of DoD's RFID tags and infrastructure, AMC's legacy Automated Information System (AIS) known as Global Air Transportation Execution System (GATES), and AMC's role within its supply chain. The project includes a discussion of potential AMC and DoD supply chain RFID applications and resulting potential value. Ultimately, the project offers a process for creating a robust RFID infrastructure.
DTIC
Communication Networks; Radio Equipment; Radio Frequencies

20040040049 Nippon Telegraph and Telephone Public Corp., Tokyo, Japan
NTT Technical Review, Volume 1, No. 6
September 2003; ISSN 1348-3447; 99 pp.; In English; See also 20040040050 - 20040040064; Copyright; Avail: Other Sources

This issue of NTT Technical Review covers optical access systems, collaboration between NTT and MIT, Resonant Communication Network Architecture (RENA), personal information circulation technology, smart card management systems, optical path design software, IP networks, a managed security system, quality management for the telecommunications industry, and digital watermarks.
CASI
Communication Networks; Computer Security; Computer Networks; Architecture (Computers)

20040040054 Nippon Telegraph and Telephone Public Corp., Musahino, Japan
Location Handling System for Mobile Computing
Balakrishnan, Hari; Nakamura, Tetsuya; Matsuo, Masato; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 21-28; In English; See also 20040040049; Copyright; Avail: Other Sources

To provide adaptive networking services to users in the future ubiquitous network, it is important to handle the user's context including his or her location. This paper describes the design and implementation of Cricket, a location-support system for in-building, mobile, location-aware applications, which was developed at MIT LCS (Massachusetts Institute of Technology Laboratory for Computer Science) as a topic within the framework of the NTT-MIT collaboration. We also describe CHANSE, developed at NTT, which supplies location information to applications by flexibly assigning data sources while hiding the details of the monitoring devices such as an RFID (radio frequency identification) tag system and GPS (global positioning system). This paper gives an overview of these systems.
Author
Position (Location); Mobile Communication Systems; Wireless Communication

20040040057 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Personal Information Circulation Technology Based on Policy Control
Sakuma, Minoru; Hamuro, Daisuke; Shiraga, Akinori; Kobayashi, Masayuki; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 62-69; In English; See also 20040040049; Copyright; Avail: Other Sources

With the boom in online shopping, personal information is now frequently circulated on networks, which raises the importance of protecting the privacy of individuals. One well-known privacy protection architecture on the Web is P3P (Platform for Privacy Preferences). It enables privacy information control by comparing the policies of a user and a Web site. But there is a problem: once personal information has been sent to the Web site, the user has lost control of it. Moreover, P3P is focused on the Web and does not support sensor networks such as ones using ID tags, which have become popular. This paper discusses an architecture for the secure circulation of personal information that can solve these problems. It also discusses results for a prototype individual location information circulating system for a wireless LAN. This trial showed that personal information could be circulated in real time by this architecture.
Author
Computer Information Security; Architecture (Computers)

20040040058 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Managed Security System: A Mechanism that Centrally Reconfigures Associated Hosts Based on New Vulnerability Alerts

Tanemo, Fumiyuki; Sakuma, Hideo; Tanabe, Masao; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 87-91; In English; See also 20040040049; Copyright; Avail: Other Sources

To keep the network secure, system administrators must constantly be aware of every new vulnerability alert and manually apply the corresponding countermeasures in their systems. This article presents a managed security system that can simplify such tasks by centrally reconfiguring associated hosts when a new alert is received.

Author

Computer Security; Warning Systems; Computer Networks; Management Systems

20040040062 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

A Multi-Card Architecture for Smart Card Management Systems

Toji, Ryutaro; Wada, Yoshinori; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 70-75; In English; See also 20040040049; Copyright; Avail: Other Sources

Because there are many standards for smart card platforms, multiple types of smart card management systems must be introduced if a card issuer wants to issue and manage smart cards belonging to several platforms. Our network-based IC card environment 'NICE' provides multi-card support that enables smart cards of various card manager (CM) types to be accomodated by a smart card management system by adding CM-dependent modules. It does this by localizing functions that depend on CM differences between platforms and concealing them from the upper-level system.

Author

Cards; Management Systems; Architecture (Computers)

20040040063 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Network Conformance Test System for IP Networks

Takagi, Nobuo; Nagafuchi, Yukio; Morishita, Kouji; Yanagimoto, Kiyoshi; Kuribayashi, Shin-Ichi; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 82-86; In English; See also 20040040049; Copyright; Avail: Other Sources

The use of IP networks has recently been expanding from the simple transfer of data to the handling of voice and video signals and to communication within and between business enterprises. Evaluating the performance of such complex IP networks requires sophisticated expertise to comprehend protocol mechanisms and test results. Moreover, as the scale of a network increases, the effort of analyzing the results will increase exponentially. Here, we introduce a NCT (Network Conformance Test) system that offers test scenarios including sophisticated expertise, so operators do not require these skills. Moreover, this system can perform several kinds of tests automatically, changing network and measurement equipment configurations, generating and measuring traffic, and analyzing test results which greatly reduces the workload on the user.

Author

Internets; Protocol (Computers); Performance Tests

20040040064 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan

CyberSquash: Internet Access Platform using Digital Watermarks - Enables Users to Access Related Information Easily by Reading Printed Images

NTT Technical Review, Volume 1, No. 6; September 2003, pp. 96-97; In English; See also 20040040049; Copyright; Avail: Other Sources

NTT has developed CyberSquash, an Internet access platform that uses digital watermarks developed by NTT Cyber Solutions Laboratories. In the past, watermarks have mainly been used for copyright management. CyberSquash is a platform that automatically guides users to specified Web pages by reading digital watermarks, which are embedded into printed images. We have developed two types of software for reading the watermarks: 'Squash Reader: Active-X version' reads watermarks automatically when you simply point the Web camera of a PC at the target image and 'Squash Reader: i-appli version' reads them when you use a cellular phone equipped with a digital camera. The platform thus supports Internet access from both PCs and cellular phones. As corporate Internet applications become increasingly advanced - for example, with sales promotion campaigns tied into e-commerce and Web pages - we expect this platform to be used in a broad range of fields such as entertainment and as an effective means of guiding users to Web pages. The CyberSquash platform will be provided for approximately six months, starting from July 8, via our 'Cyber Trial' service site (http://www.cybertrial. com/ (in Japanese)). By gathering comments from users who try the trial service, NTT hopes to verify the effectiveness and reliability of this

technology in actual usage environments and feed these comments back into the research and development that will form the foundations of new services.
Author
Internets; Information Retrieval; Websites

20040041372 Defence Science and Technology Organisation, Edinburgh, Australia
Transcription of Multiple Speakers Using Speaker Dependent Speech Recognition
Zschorn, Andrew; Littlefield, Jason S.; Broughton, Michael; Dwyer, Barry; Hashemi-Sakhtsari, Ahmad; September 2003; 29 pp.; In English
Report No.(s): DSTO-TR-1498; DODA-AR-012-901; Copyright; Avail: Other Sources

Speech recognition can potentially aid in producing transcripts of discussions, interviews, meetings, and other collaborative efforts. This report presents a concept demonstrator of an automatic transcription system that produces text and audio records using speaker dependent speech recognition. It is defined and discussed in terms of how it works, how users operate it, and its similarities and differences with other transcription systems.
Author
Speech Recognition; Analogies; Proving; Simulation

20040043714 NASA Ames Research Center, Moffett Field, CA, USA
Architecture and Functionality of the Advanced Life Support On-Line Project Information System (OPIS)
Hogan, John A.; Levri, Julie A.; Morrow, Rich; Cavazzoni, Jim; Rodriquez, Luis F.; Riano, Rebecca; Whitaker, Dawn R.; [2004]; 2 pp.; In English; 34th International Conference on Environmental Systems, 19-22 Jul. 2004, Colorado Springs, CO, USA; Copyright; Avail: Other Sources; Abstract Only

An ongoing effort is underway at NASA Amcs Research Center (ARC) tu develop an On-line Project Information System (OPIS) for the Advanced Life Support (ALS) Program. The objective of this three-year project is to develop, test, revise and deploy OPIS to enhance the quality of decision-making metrics and attainment of Program goals through improved knowledge sharing. OPIS will centrally locate detailed project information solicited from investigators on an annual basis and make it readily accessible by the ALS Community via a web-accessible interface. The data will be stored in an object-oriented relational database (created in MySQL(Trademark) located on a secure server at NASA ARC. OPE will simultaneously serve several functions, including being an R&TD status information hub that can potentially serve as the primary annual reporting mechanism. Using OPIS, ALS managers and element leads will be able to carry out informed research and technology development investment decisions, and allow analysts to perform accurate systems evaluations. Additionally, the range and specificity of information solicited will serve to educate technology developers of programmatic needs. OPIS will collect comprehensive information from all ALS projects as well as highly detailed information specific to technology development in each ALS area (Waste, Water, Air, Biomass, Food, Thermal, and Control). Because the scope of needed information can vary dramatically between areas, element-specific technology information is being compiled with the aid of multiple specialized working groups. This paper presents the current development status in terms of the architecture and functionality of OPIS. Possible implementation approaches for OPIS are also discussed.
Author
Life Support Systems; On-Line Systems; Information Systems; Waste Water

20040043719 NASA Ames Research Center, Moffett Field, CA, USA
Surfer: An Extensible Pull-Based Framework for Resource Selection and Ranking
Zolano, Paul Z.; [2004]; 8 pp.; In English; 4th IEEE/ACM International Symposium on Cluster Computing and the Grid, 19-22 Apr. 2004, Chicago, IL, USA; No Copyright; Avail: CASI; A02, Hardcopy

Grid computing aims to connect large numbers of geographically and organizationally distributed resources to increase computational power; resource utilization, and resource accessibility. In order to effectively utilize grids, users need to be connected to the best available resources at any given time. As grids are in constant flux, users cannot be expected to keep up with the configuration and status of the grid, thus they must be provided with automatic resource brokering for selecting and ranking resources meeting constraints and preferences they specify. This paper presents a new OGSI-compliant resource selection and ranking framework called Surfer that has been implemented as part of NASA's Information Power Grid (IPG) project. Surfer is highly extensible and may be integrated into any grid environment by adding information providers knowledgeable about that environment.
Author
Grid Computing (Computer Networks); NASA Programs; Supercomputers; Architecture (Computers)

20040043761 College of William and Mary, Williamsburg, VA

Type-II Quantum Algorithms for Solitons

Vahala, George; Feb. 2004; 5 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0422

Report No.(s): AD-A420618; AFRL-SR-AR-TR-04-0119; No Copyright; Avail: CASI; A01, Hardcopy

There are many problems of scientific interest that are not tractable on any foreseeable classical computer. Quantum computers have the potential of exploiting non- classical features like quantum entanglement and phase coherence which can exponentially speed-up the computational algorithm. Quantum algorithms have been developed to study the evolution of solitons in the Korteveg-de Vries equation and the Nonlinear Schrodinger equation. These nonlinear equations have known exact analytic solutions to which the quantum algorithm solutions have been compared - with excellent agreement. Vector soliton propagation down birefringment media have also been considered as well as soliton turbulence and the corresponding power spectra. It has been found that two on- site qubits per spatial node is sufficient to model a scalar continuum field. The particular choice and sequence of unitary collision and streaming operators dictate the final continuum form of the partial differential equation.

DTIC

Algorithms; Quantum Theory

20040043798 Air Univ., Maxwell AFB, AL

Plays Well With Others: Enhancing DoD's Role in Protecting the National Information Infrastructure

Durall, William E.; Apr. 2002; 78 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420676; AU/AFFP/QUEENS/2002; No Copyright; Avail: CASI; A05, Hardcopy

The terrorist attacks on the twin trade towers and the Pentagon kindled an immediate, renewed focus on homeland defense, Since then, efforts to combat physical terrorist threats have rightly taken center stage, However, the need to protect our national information infrastructure (NII) from an increasing array of cyber threats is equally urgent, This paper will argue that characteristics of the NII drive DoD to a more active role in its defense, it will then discuss NII protection efforts to date, shortfalls in those efforts, and Canada's emerging NII protection structure as a potential model for the US to adopt, Finally it will argue that DoD should have an expanded and better-defined role in NII defense - not as a playground bully that dominates everything, but as a full-fledged team player in areas where it can best apply its expertise. Virtually everyone agrees that the NII is increasingly important to the operation of all our critical national infrastructures, However, expanded NII use has also opened up a new set of cyber vulnerabilities to both the NII itself and the many users who depend on it, Moreover, the ever- expanding NII presents a challenging set of issues to its defenders, The cyberworld blurs the traditional distinctions among different user communities who all now use the common NII, its compression of time and space blurs the ability to distinguish between crime and acts of war, and compounds the task of determining the source of attack. As a result, lines of responsibility blurred among the law enforcement, military, intelligence, and owner-operator communities. These areas of convergence put a premium on a fully cooperative approach to NII protection.

DTIC

Computer Information Security; Terrorism; Vulnerability

20040043808 Naval Postgraduate School, Monterey, CA

Effective Distribution of High Bandwidth to the Last Mile

Kwok, David V.; Dec. 2003; 123 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420697; No Copyright; Avail: CASI; A06, Hardcopy

Since the mid 1990s, Internet is revolutionizing the way business is conducted around the globe. Bandwidth- intensive graphics, video and audio applications are becoming more popular and the desire for fast access to information places a huge demand on high bandwidth in metro networks. The primary bottleneck in the quest for delivering high bandwidth to the customers is the last mile. The last-mile of today primarily relies on infrastructures that were not designed for the transport of digital data. The current infrastructure of twisted pair is very close to its upper limits As a result, consumers are unable to enjoy the full potential of the Internet and generally do not have access to enhanced services such as enriched multimedia services, converged voice, video, and data services and high-speed Web browsing. This thesis assesses a broad spectrum of wired and wireless last mile technologies available - Optical Fiber Technology, Digital Subscriber Lines, Free Space Optics, Wireless Local Loop, Wireless LAN and Cellular Technology. Besides discussing the basic concepts and principles, it highlights the current limitations of these technologies for last mile implementation. An innovative and state-of-the-art

methodology for linking building with optical fiber to achieve high bandwidth through sewer systems is presented.
DTIC
Bandwidth; Fiber Optics; Internets; Local Area Networks; Technology Assessment; Transmission Lines

20040043910 North Carolina State Univ., Raleigh, NC
Protecting Network Quality of Service Against Denial of Service Attacks
Reeves, Douglas; Wu, Felix; Wurman, Peter; Stevenson, Dan; Wu, Xlaoyong; Dec. 2003; 43 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0540; DARPA ORDER H544; Proj-H544
Report No.(s): AD-A420839; AFRL-IF-RS-TR-2003-285; No Copyright; Avail: CASI; A03, Hardcopy

As quality of Service (QiS) capabilities are added to the Internet, our nation's business and research infrastructure will increasingly depend on their fault tolerance and survivability. Current frameworks and protocols (such as the Resource ReSer Vation Protocol (RSVP), Integrated Services (lntServ), and Differentiated Services (DiffServ)) that provide quality of service to networks are vulnerable to attacks of abuse and denial of service. Once QoS mechanisms are deployed, they will become tempting targets for malicious hackers or adversaries. It is wise to anticipate such attacks and develop effective and practical defenses prior to widespread deployment.
DTIC
Intrusion Detection (Computers)

20040043912 State Univ. of New York, Albany, NY
Biological Approach to System Information Security (BASIS)
Skormin, Victor A.; Dec. 2003; 72 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-1-0509; Proj-OIPG
Report No.(s): AD-A420842; AFRL-IF-RS-TR-2003-286; No Copyright; Avail: CASI; A04, Hardcopy

With the increase of size, interconnectivity and number of points of access, computer networks have become vulnerable to various forms of information attacks, especially to new, sophisticated ones. It should be pointed out that biological organisms are also complex and interconnected systems that have many points of access; these systems are vulnerable to sabotage buy alien microorganisms that, based on the attack mechanisms described in modern immunology, could be viewed as information attacks. During evolution, biological organisms have developed very successful immune systems for detecting, identifying and destroying most alien intruders. This research is aimed at establishing a connection between the basic principles that govern the immune system and potential uses of these principles in the implementation of information security systems (ISS) for computer networks. This is the goal of the proposed Biological Approach to System Information Security (BASIS) that is presented in this report.
DTIC
Computer Networks; Information Systems; Security

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20040035749 Maribor Univ., Maribor, Slovenia
Using HTK, ISIP and Julius Decoders in Slovenian Large Vocabulary Continuous Speech Recognition
Rotovnik, Tomaz; Horvat, Bogomir; Kacic, Zdravko; Electrotechnical Review; 2002; ISSN 0013-5852; Volume 69, No. 5, pp. 253-258; In Slovene; Copyright; Avail: Other Sources

The paper is concerned with Slovenian continuous speech recognition and compares recognition results of different speech decoders (ISIP, HTK and Julius). Slovenian language is, like other Slavic languages, a highly inflectional language. Its rich morphology causes a big problem in Large Vocabulary Continuous Speech Recognition (LVCSR). Experiments have shown that to setup the Slovenian corpus a vocabulary of 600K words is needed, in order to achieve 99% of the training-set coverage in comparison with the English language, where 60K words achieve the same order of coverage. At the moment the most advanced systems for speech recognition can handle from 20K to 60K of words; thus the only possible thing to do in case of inflectional languages is to restrict the vocabulary size. However, the systems had been developed mainly for recognition of the English language, which is a poorly inflectional language. In this paper we will therefore present these

systems in speech recognition based on an example of an inflectional language, the Slovenian. Our experiments were based on new language models (namely morphological models).
Derived from text
Decoders; Speech Recognition; Algorithms; Slovakia; Words (Language)

20040035804 Nova Southeastern Univ., Fort Lauderdale, FL, USA
Application of Artificial Intelligence Techniques in Uninhabitated Aerial Vehicle Flight
Dufrene, Warren R., Jr.; [2003]; 6 pp.; In English; 22nd Digital Avonics System Conference, 12-16 Oct. 2003, Indianapolis, IN, USA; Original contains black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

This paper describes the development of an application of Artificial Intelligence (AI) for Unmanned Aerial Vehicle (UAV) control. The project was done as part of the requirements for a class in AI at NOVA southeastern University and a beginning project at NASA Wallops Flight Facility for a resilient, robust, and intelligent UAV flight control system. A method is outlined which allows a base level application for applying an Artificial Intelligence method, Fuzzy Logic, to aspects of Control Logic for UAV flight. One element of UAV flight, automated altitude hold, has been implemented and preliminary results displayed.
Author
Artificial Intelligence; Control Systems Design; Pilotless Aircraft; Autonomy

20040036061 Naval Research Lab., Washington, DC
A New Framework for Shannon Information Theory
Allwein, Gerard T.; Moskowitz, Ira S.; Chang, LiWu; Jan. 30, 2004; 20 pp.; In English
Report No.(s): AD-A420108; NRL/MR/5540--04-8748; No Copyright; Avail: CASI; A03, Hardcopy

Barwise and Seligman proposed a very general qualitative theory of information flow (in distributed systems) while Shannon proposed a very general quantitative theory for communication flow. The two kinds of flow are not synonymous, with information flow being the more general of the two. We synthesize a new theory from these two theories so that qualitative and quantitative analysis use the same theory structures. The main advantages are (1) Shannon theory gets a more expressive framework within which to operate, (2) Barwise/Seligman theory gets to take advantage of quantitative mechanisms. The resultant theory has direct applications to many areas that use information theory.
DTIC
Information Theory; Radio Equipment

20040036619 Naval Postgraduate School, Monterey, CA
Confronting Cyberterrorism with Cyber Deception
Tan, Kheng L.; Dec. 2003; 87 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420604; No Copyright; Avail: CASI; A05, Hardcopy

This thesis concerns the possibility of deceiving cyberterrorists using defensive deception methods. As cyberspace today is a battleground for myriad cyber attacks and intrusions, it may only be a matter of time before terrorists choose to advance their deadly cause in cyberspace. We explore some of the questions raised regarding the threat of cyberterrorism by examining different perspectives, motivations, actors, targets, and how they may be confronted. One way is to draw from the lessons of deception and apply them against cyberterrorist attacks. Cyber deception applies in cyberspace just as well as deception in military battles. From the different categories of attackers that could perpetrate cyberterrorism, we examine the ways in which they may be deceived. Many of the methods and tools that cyberterrorists would use are similar to those used by other less malicious hackers, so we can plan specific deceptions to use against them in advance.
DTIC
Terrorism; Computer Security; Vulnerability

20040037779 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Intelligent Systems Technologies to Assist in Utilization of Earth Observation Data
Ramapriyan, Hampapuram K.; McConaughy, Gail; Lynnes, Christopher; McDonald, Kenneth; Kempler, Steven; December 30, 2003; 1 pp.; In English; 49th Annual International Symposium on Optical Science and Technology: Earth Observing Systems IX, 2-6 Aug. 2004, Denver, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

With the launch of several Earth observing satellites over the last decade, we are now in a data rich environment. From NASA's Earth Observing System (EOS) satellites alone, we are accumulating more than 3 TB per day of raw data and derived geophysical parameters. The data products are being distributed to a large user community comprising scientific researchers,

educators and operational government agencies. Notable progress has been made in the last decade in facilitating access to data. However, to realize the full potential of the growing archives of valuable scientific data, further progress is necessary in the transformation of data into information, and information into knowledge that can be used in particular applications. Sponsored by NASA s Intelligent Systems Project within the Computing, Information and Communication Technology (CICT) Program, a conceptual architecture study has been conducted to examine ideas to improve data utilization through the addition of intelligence into the archives in the context of an overall knowledge building system. Potential Intelligent Archive concepts include: 1) Mining archived data holdings using Intelligent Data Understanding algorithms to improve metadata to facilitate data access and usability; 2) Building intelligence about transformations on data, information, knowledge, and accompanying services involved in a scientific enterprise; 3) Recognizing the value of results, indexing and formatting them for easy access, and delivering them to concerned individuals; 4) Interacting as a cooperative node in a web of distributed systems to perform knowledge building (i.e., the transformations from data to information to knowledge) instead of just data pipelining; and 5) Being aware of other nodes in the knowledge building system, participating in open systems interfaces and protocols for virtualization, and collaborative interoperability. This paper presents some of these concepts and identifies issues to be addressed by research in future intelligent systems technology.
Author
Earth Observing System (Eos); Artificial Intelligence; NASA Programs; Telecommunication; Technology Utilization

20040040055 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Human-Robot Dynamic Social Interaction
Yamoto, Junji; Brooks, Rodney; Shinozawa, Kazuhiko; Naya, Futoshi; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 37-43; In English; See also 20040040049; Copyright; Avail: Other Sources

To determine whether a physical robot produces a more direct emotional coupling with human beings than a computer-generated graphical image of a similar robot (agent), we performed interactive experiments comparing human-agent and human-robot interactions. We found that robots were better communication partners with humans under some conditions. At the MIT Artificial Intelligence Laboratory, we then constructed a robot that has human-like facial expressions and shoulder and neck gestures. After moving it to NTT Communication Science Laboratories in Kyoto, we measured the responses of human subjects under various conditions. Experiments to measure the effects of eye contact and shared-attention are currently under way.
Author
Human Reactions; Robots; Emotional Factors

20040043899 California Univ., Santa Barbara, CA
A Model-Based Real-Time Intrusion Detection System for Large Scale Heterogeneous Networks
Kemmer, Richard A.; Vigna, Giovanni; Aug. 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-1-0207; DARPA ORDER-F252; Proj-F252
Report No.(s): AD-A420824; AFRL-IF-RS-TR-2003-194; No Copyright; Avail: CASI; A03, Hardcopy

This final report from the University of California Santa Barbara for their grant entitled 'A Model- Based Real-Time Intrusion Detection System for Large Scale Heterogeneous Networks' describes the approach and accomplishments of the research effort. The primary objective for this research was to determine the feasibility of using the State Transition Analysis Technique (STAT) to model and detect Intrusions in large-scale, heterogeneous networks. An additional goal was to develop an extensible framework that supports the development of new STAT-based intrusion detection systems to match new domain and environments. Finally, a goal of this project was to provide a communication and control infrastructure that is able to collect the alerts produced by the sensors, control their configuration, and coordinate their response.
DTIC
Computer Networks; Detection; Heterogeneity; Intrusion Detection (Computers); Real Time Operation; Warning Systems

20040043905 Syracuse Univ., NY
Systems Assurance
Chapin, Steve J.; Dec. 2003; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-1-0508; Proj-OIPG
Report No.(s): AD-A420832; AFRL-IF-RS-TR-2003-287; No Copyright; Avail: CASI; A03, Hardcopy

The Systems Assurance contract supported fundamental security and assurance research at the Center for Systems Assurance at Syracuse University. This research included intrusion detection mechanisms, software resilience, and

steganography. The intrusion detection focused on packet filtering and intrusion sensing using programmable (smart) network interfaces, and buffer overflow detection and prevention. The Computational Resiliency project focused on novel applications of replication, migration, agreement protocols, and group communication to increase the assurance of scientific applications. The Protocol Steganography project defined a new model of information hiding in network flows. The project resulted in four software prototypes and a total of five refereed publications.
DTIC
Intrusion Detection (Computers); Security

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20040027794 Nippon Telegraph and Telephone Public Corp., Tokyo, Japan
Spot Information Navigator
Tanabe, Hiromitsu; Kihara, Tamio; Honishi, Takashi; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 84-88; In English; See also 20040027787; Copyright; Avail: Other Sources

Spot Information Navigator executes actions in spots, but the contents determine whether the action will affect people there or not. Furthermore, because the intentions of the spot or service providers must be expressed in the form of rules, rule creation is a burden for them. We will continue to promote research and development on rule creation mechanisms by developing authoring tools for creating contents that will maximize the effects of Spot Information Navigator and by describing services that can be provided in spots.
Derived from text
Information Systems; Computer Systems Programs; Architecture (Computers); Artificial Intelligence

20040035733 Hiroshima Univ., Japan
Lindelof Theorems for Monotone Sobolev Functions
Futamura, Toshihide; Mizuta, Yoshihiro; Annales Academiae Scientiarum Fennicae: Mathematica; 2003; ISSN 1239-629X; Volume 28, No. 2, pp. 271-277; In English; Copyright; Avail: Other Sources

This paper deals with Lindelof type theorems for monotone functions in weighted Sobolev spaces.
Author
Monotone Functions; Theorems; Sobolev Space

20040035737 Missouri Univ., Columbia, MO, USA
Existence of Big Pieces of Graphs for Parabolic Problems
Hofmann, Steve; Lewis, John L.; Nystroem, Kaj; Annales Academiae Scientiarum Fennicae: Mathematica; 2003; ISSN 1239-629X; Volume 28, No. 2, pp. 355-384; In English; Copyright; Avail: Other Sources

In this paper we define parabolic chord arc domains and generalize, to a parabolic setting, a theorem of Semmes concerning quantitative approximation by graphs with small Lipschitz constants.
Author
Domains; Theorems; Lipschitz Condition

20040035748 Swedish Defence Research Establishment, Linkoeping
Unified Formalism and Two Methods for FDTD: Calculations of Plane Periodic Antenna Arrays
Pettersson, L.; Dec. 2002; In English
Report No.(s): PB2004-101814; FOI-R-0749-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The report describes studies regarding how Finite Difference-Methods in the Time-Domain (FDTD) can be used to calculate the electromagnetic fields of plane periodic antenna arrays. The arrays are excited in such a way that a unit cell analysis can be applied. Two kinds of excitations which render possible such a unit cell analysis are time shift excitations, and argument shift excitations. A basic idea in the report is a definition of the concept unit cell, which is described as a torus space-time with two closed dimensions, and whose properties depend on the excitation of the antenna array. By creating such a space-time, and putting an antenna element in it, we get an equivalent electromagnetic problem to the original case with an argument shift- or shift-excited infinite structure. Considered in this way the problem of finding FDTD-methods for plane

periodic arrays, which are argument shift or time shift excited, is therefore equivalent to finding FDTD-methods for a torus space-time (with an antenna element in it). Such methods are derived in the report, by first expressing the field equations in suitable coordinates of the torus space-time, and then discretizing these equations.
NTIS
Electromagnetic Fields; Antenna Arrays; Finite Difference Theory; Time Domain Analysis; Formalism; Finite Difference Time Domain Method

20040035764 Ljubljana Univ., Ljubljana, Slovenia
An Approximation Error Lower Bound for Integer Polynomial Minimax Approximation
Kodek, Dusan M.; Electrotechnical Review; 2002; ISSN 0013-5852; Volume 69, No. 5, pp. 266-272; In English; Copyright; Avail: Other Sources

The need to solve a polynomial minimax approximation problem appears often in science. It is especially common in signal processing and in particular in filter design. The results presented in this paper originated from a study of the finite wordlength restriction in the FIR digital filter design problem. They are, however, much more general and can be applied to any polynomial minimax approximation problem in which the polynomial coefficients are constrained to a finite set of numbers. The finite set restriction introduces a nonzero lower bound to the approximation error. For any given non-trivial function that is to be approximated there is a nonzero lower bound below which it is not possible to go, no matter how large the polynomial degree n. For practical purposes it is very useful to know this lower bound because it can be used to substantially increase the speed of the branch-and-bound algorithm that gives the optimal integer coefficients. A method for computing such a bound is presented in the paper.
Author
Minimax Technique; Approximation; Integers; Polynomials; Fir Filters

20040036227 Washington Univ., Seattle, WA
Data Processing for Winters 1997 and 1998 Central Labrador Sea
Steffen, Elizabeth L.; D'Asaro, Eric A.; Nov. 2003; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-95-0930; N00014-95-1-0025
Report No.(s): AD-A420258; APL-UW-TM-4-03; No Copyright; Avail: CASI; A03, Hardcopy

This work defines several techniques to process data collected in the Central Labrador Sea during the winters of 1997 and 1998 as part of the Labrador Sea Deep Convection Experiment. Ship-based observations (CTD and intake logs) and float data (profiling isobaric floats and fully Lagrangian floats) are intercalibrated and used to estimate trends in mixed layer properties during the winter of 1998. RAFOS records are used to calculate the horizontal position of fully Lagrangian floats utilizing two methods.
DTIC
Data Processing; Lagrangian Function

20040036235 Defence Science and Technology Organisation, Salisbury
The Algebraic Structure of Quadratic and Bilinear Systems
Faruqi, Farhan A.; Sep. 2003; 59 pp.; In English
Report No.(s): AD-A420269; DSTO-TR-1497; DODA-AR-012-900; No Copyright; Avail: CASI; A04, Hardcopy

A number of important control and estimation problems in the field of aerospace and avionics involve dynamical models that are quadratic and bilinear functions of system states and inputs. In this report, formal definitions of free and forced quadratic/bilinear dynamical systems are given and the algebraic structure of this class of systems is explored with a view to setting up a systematic approach for deriving state and measurement models. Properties of quadratic and bilinear vectors are investigated and relationships between these and linear vectors established. Systematic procedure for constructing quadratic state and bilinear state- input vectors is derived. The quadratic/bilinear vector modeling technique is applied to the formulation of a state- space model for a second order approximation of a general non- linear system.
DTIC
Quadratic Equations

20040036259 Intrinsity, Inc., Austin, TX
An Innovative High-Performance Architecture for Vector and Matrix Math Algorithms
Olson, Tim; Anantha, Veeraraghavan; Harle, Christophe; Yost, George; Sep. 2002; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420286; No Copyright; Avail: CASI; A03, Hardcopy

Briefing charts for presentation on high- performance architectures for vector and matrix math algorithms.
DTIC
Architecture (Computers); Matrices (Mathematics); Signal Processing; Vectors (Mathematics)

20040036327
Pneumatic Muscle Actuator Control
Lilly, John H.; Feb. 2004; 213 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0300
Report No.(s): AD-A420339; G00007FINAL; AFRL-SR-AR-TR-04-0113; No Copyright; Avail: CASI; A10, Hardcopy

This research is concerned with investigating methods for the control of McKibben pneumatic actuators, or pneumatic muscles (PMs). PMs are a novel type of actuator that closely mimic human skeletal muscles in size and power capabilities. PMs are considered by the Air Force for use in exoskeletons to be worn by humans for strength augmentation and for use as actuators in robotic systems. In this research, we investigate adaptive, sliding mode, and soft computing approaches to control of PMs and robotic systems actuated by PMs. The soft computing approaches include neuro-fuzzy modeling of an actual PM in the Human Effectiveness Lab at Wright Patterson Air Force Base, and evolutionary design of a fuzzy PID controller based on this model. We also investigate a type of MIMO fuzzy model predictive control for a planar arm actuated by four PMs. Some of the controllers are tested on the actual PM at WPAFB while others are proven in simulations. A byproduct of this research is an evolutionary fuzzy training algorithm useful for identification of dynamical systems as well as classification problems.
DTIC
Pneumatic Control

20040036451 Naval Postgraduate School, Monterey, CA
Far Field Extrapolation Technique Using CHIEF Enclosing Sphere Deduced Pressures and Velocities
Drake, Robert M.; Dec. 2003; 191 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420435; No Copyright; Avail: CASI; A09, Hardcopy

A Combined Helmholtz Integral Equation Formulation (CHIEF)-defined enclosing sphere placed around an acoustic projector is used to calculate far field response data from near field measurements. Pressure response data at a specified frequency is obtained from a near field linear array. Helmholtz integral relations for the enclosing sphere and integrals of the free-space Green's function and its gradient for defined near field point locations are used along with physical assumptions to form an overdetermined system. The overdetermined system is solved via least squares yielding values of pressure and velocity corresponding to defined locations on the enclosing sphere. The enclosing sphere's values of pressures and velocities are then used with integrals of the free-space Green's function and its gradient to calculate far field response.
DTIC
Far Fields

20040040368 Politecnico di Turin, Turin, Italy
Injection Molding: Mathematical Modelling and Numerical Simulations
Antonelli, D.; Farina, A.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 145-152; In English; See also 20040040360; Copyright; Avail: Other Sources

The considered process is the injection molding of a polymeric melt in a porous pre-form of reinforcing elements. Process simulation is of considerable value in assessing production parameters and in improving the quality of manufactured products. The proposed model is deduced in the framework of deformable porous media. The model consists in a set of partial differential equations, time dependent, defining two coupled problems: mechanical equilibrium and diffusion in a permeable medium. The equations are solved by means of a finite element method.
Author
Mathematical Models; Injection Molding; Finite Element Method; Diffusion; Simulation

20040040383 Instituto Superior Tecnico, Lisbon, Portugal
Finite Element Modelling of the RTM Process
Dimitrovova, Z.; Faria, L.; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 125-135; In English; See also 20040040360; Copyright; Avail: Other Sources

Some new aspects are introduced into the numerical simulation of the mold filling phase of the Resin Transfer Molding

process of composites manufacturing. The problem formulation is based on homogenization techniques. On the microlevel, the well-known analogy is exploited in order to determine the permeability tensor. The suitability of the cell-averaged permeability and of solving the macrolevel problem on two levels is addressed in the case of the double porosity problem. An algorithm allowing the determination of the progression of the resin front on the microlevel is developed. Regarding the macrolevel analysis, a new approach based on an analogous problem is proposed and determination of the resin front position in multiple-layer preforms is presented. Results are obtained by the finite element code ANSYS.
Author
Finite Element Method; Resin Transfer Molding; Manufacturing; Homogenizing

20040040384 Seoul National Univ., Korea, Republic of
Analysis of Three-Dimensional Resin Transfer Mold Filling Process
Lim, Seong Taek; Jung, Bum Jin; Kang, Moon Koo; Lee, Woo Il; Proceedings of the Fifth International Conference on Flow Processes in Composite Materials; July 1999, pp. 137-142; In English; See also 20040040360; Copyright; Avail: Other Sources

Resin Transfer Molding(RTM) is a process in which thermoset resin is injected into a mold cavity pre-loaded with porous fibrous preform. For parts with small thickness, the mold filling process can be modeled as two dimension by neglecting the resin flow in the thickness direction. However, thicker parts require extensive resin flow along the thickness and thus the three dimensional effect in the resin flow must be considered. In this study, numerical simulations of three dimensional mold filling process during resin transfer molding were performed. The location of resin front, pressure, temperature and the degree of cure were calculated as functions of time. Experiments were also performed. To measure the resin front location as a function of time in the preform, optical fiber was used as a sensing element. The agreements between the experimental data and the numerical results were found to be satisfactory. The computer code developed in this study was applied to SCRIMP that is a kind of vacuum assisted RTM with flexible tooling.
Author
Optical Fibers; Resin Transfer Molding; Time Dependence; Porosity

20040043674 NASA Ames Research Center, Moffett Field, CA, USA
Quantum Adiabatic Optimization and Combinatorial Landscapes
Smelyanskiy, V. N.; Knysh, S.; Morris, R. D.; December 16, 2003; 28 pp.; In English
Contract(s)/Grant(s): ARDA-QC-P004-J132-Y03; No Copyright; Avail: CASI; A03, Hardcopy

In this paper we analyze the performance of the Quantum Adiabatic Evolution (QAE) algorithm on a variant of Satisfiability problem for an ensemble of random graphs parametrized by the ratio of clauses to variables, gamma = M / N. We introduce a set of macroscopic parameters (landscapes) and put forward an ansatz of universality for random bit flips. We then formulate the problem of finding the smallest eigenvalue and the excitation gap as a statistical mechanics problem. We use the so-called annealing approximation with a refinement that a finite set of macroscopic variables (verses only energy) is used, and are able to show the existence of a dynamic threshold gamma = gammad, beyond which QAE should take an exponentially long time to find a solution. We compare the results for extended and simplified sets of landscapes and provide numerical evidence in support of our universality ansatz.
Author
Algorithms; Combinatorial Analysis; Optimization; Quantum Mechanics; Adiabatic Equations; Topography

20040043675 NASA Ames Research Center, Moffett Field, CA, USA
Filtering in Hybrid Dynamic Bayesian Networks
Andersen, Morten Nonboe; Andersen, Rasmus Orum; Wheeler, Kevin; [2004]; 4 pp.; In English; International Conference on Acoustics, Speech and Signal Processing, 17-21 May 2004, Montreal, Quebec, USA; Copyright; Avail: CASI; A01, Hardcopy

We demonstrate experimentally that inference in a complex hybrid Dynamic Bayesian Network (DBN) is possible using the 2 - T i e Slice DBN (2T-DBN) from [Koller & Lerner, 20001 to model fault detection in a watertank system. In [Koller & Lerner, 20001 a generic Particle Filter (PF) is used for inference. We extend the experiment and perform approximate inference using The Extended Kalman Filter (EKF) and the Unscented Kalman Filter (UKF). Furthermore, we combine these techniques in a 'non-strict' Rao-Blackwellisation framework and apply it to the watertank system. We show that UKF and UKF in a PF framework outperfom the generic PF, EKF and EKF in a PF framework with respect to accuracy and robustness in terms of estimation RMSE. Especially we demonstrate the superiority of UKF in a PF framework when our beliefs of how data was generated are wrong. We also show that the choice of network structure is very important for the performance of the

generic PF and the EKF algorithms, but not for the UKF algorithms. Furthermore, we investigate the influence of data noise in the water[ank simulation. Theory and implementation is based on the theory presented.
Author
Experimentation; Bayes Theorem; Hybrid Structures; Kalman Filters; Fault Detection

20040043753
Applied Computational Electromagnetics Society Journal. Volume 18, Number 3
Elsherbeni, Atef Z.; Nov. 2003; 94 pp.; In English
Report No.(s): AD-A420578; No Copyright; Avail: CASI; A05, Hardcopy

The Applied Computational Electromagnetics Society (ACES) Journal hereinafter known as the ACES Journal is devoted to the exchange of information in computational electromagnetics, to the advancement of the state-of-the art, and the promotion of related technical activities. A primary objective of the information exchange is the elimination of the need to 'reinvent the wheel' to solve a previously-solved computational problem in electrical engineering, physics, or related fields of study. The technical activities promoted by this publication include code validation, performance analysis, and input/output standardization; code or technique optimization and error minimization; innovations in solution technique or in data input/output; identification of new applications for electromagnetics modeling codes and techniques; integration of computational electromagnetics techniques with new computer architectures; and correlation of computational parameters with physical mechanisms.
DTIC
Computational Electromagnetics; Electromagnetic Fields; Numerical Analysis

20040043882 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Generalized Residual Multiple Model Adaptive Estimation of Parameters and States
Ormsby, Charles D.; Oct. 2, 2003; 147 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420799; AFIT/DS/ENG/03-08; No Copyright; Avail: CASI; A07, Hardcopy

This dissertation develops a modification to the standard Multiple Model Adaptive Estimator (MMAE) which allows the use of a new 'generalized residual' in the hypothesis conditional probability calculation. The generalized residual is a linear combination of traditional Kalman filter residuals and 'post-fit' Kalman filter residuals which are calculated after measurement incorporation. This modified MMAE is termed a Generalized Residual Multiple Model Adaptive Estimator (GRMMAE). The dissertation provides a derivation of the hypothesis conditional probability formula which the GRMMAE uses to calculate probabilities that each elemental filter in the GRMMAE contains the correct parameter value. Through appropriate choice of a single scalar GRMMAE design parameter, the GRMMAE can be designed to be equivalent to a traditional MMAE, a post-fit residual modified MMAE, or any number of yet unused MMAEs. The original GRMMAE design goal was to choose the GRMMAE design parameter that caused the fastest GRMMAE convergence to the correct hypothesis. However, this dissertation demonstrates that the GRMMAE design parameter can lead to beta-dominance, a negative performance effect in the GRMMAE. This is a key contribution of this research as other researchers have previously suggested that the use of post-fit residuals may be advantageous in certain MMAE applications. This dissertation directly addresses the use of post-fit residuals by those researchers and demonstrates that, for their application, equivalent performance is achieved using a traditional MMAE. (10 tables, 27 figures, 47 refs.)
DTIC
Adaptive Filters; Global Positioning System; Inertial Navigation; Kalman Filters

20040043935 Air Force Inst. of Tech., Wright-Patterson AFB, OH
An Analysis of Multiple Layered Networks
Kennedy, Kevin T.; Mar. 2003; 73 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420865; AFIT/GOR/ENS/03-14; No Copyright; Avail: CASI; A04, Hardcopy

Current infrastructure network models of single functionality do not typically account for the interdependent nature of infrastructure networks. Infrastructure networks are generally modeled individually, as an isolated network or with minimal recognition of interactions. This research develops a methodology to model the individual infrastructure network types while explicitly modeling their interconnected effects. The result is a formulation built with two sets of variables (the original set to model infrastructure characteristics and an additional set representing cuts of interdependent elements). This formulation is decomposed by variable type using Benders Partitioning and solved to optimality using a Benders Partitioning algorithm. Current infrastructure network models of single functionality do not typically account for the interdependent nature of

infrastructure networks, Infrastructure networks are generally modeled individually, as an isolated network or with minimal recognition of interactions, This research develops a methodology to model the individual infrastructure network types while explicitly modeling their interconnected effects, The result is a formulation built with two sets of variables (the original set to model infrastructure characteristics and an additional set representing cuts of interdependent elements) This formulation is decomposed by variable type using Benders' Partitioning and solved to optimality using a Benders' Partitioning algorithm. DTIC

Mathematical Models

20040045154 NASA Ames Research Center, Moffett Field, CA, USA

High Order Filter Methods for the Non-ideal Compressible MHD Equations

Yee, H. C.; Sjoegreen, Bjoern; December 1, 2003; 1 pp.; In English; 10th International Conference on Hyperbolic Problems: Theory, Numerics, Applications (HYP2004), 13-17 Sep. 2004, Osaka, Japan; No Copyright; Avail: Other Sources; Abstract Only

The generalization of a class of low-dissipative high order filter finite difference methods for long time wave propagation of shock/turbulence/combustion compressible viscous gas dynamic flows to compressible MHD equations for structured curvilinear grids has been achieved. The new scheme is shown to provide a natural and efficient way for the minimization of the divergence of the magnetic field numerical error. Standard divergence cleaning is not required by the present filter approach. For certain non-ideal MHD test cases, divergence free preservation of the magnetic fields has been achieved. Author

Magnetohydrodynamics; Compressible Flow; Wave Propagation; Finite Difference Theory; Viscous Flow; Dissipation

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20040035913 Helsinki Univ. of Technology, Espoo, Finland

Using Visualization, Variable Selection and Feature Extraction to Learn from Industrial Data

Laine, S.; 2003; 138 pp.

Report No.(s): PB2004-102807; REPT-A69; Copyright; Avail: National Technical Information Service (NTIS)

Although the engineers of industry have access to process data, they seldom use advanced statistical tools to solve process control problems. The author believes the reason for this reluctance is in the history of the development of statistical tools, which were developed in the era of rigorous mathematical modeling, manual computation and small data sets. This created sophisticated tools. The engineers do not understand the requirements of these algorithms related, for example, to pre-processing of data. If algorithms are fed with unsuitable data, or parameterized poorly, they produce unreliable results, which may lead an engineer to turn down statistical analysis in general. This thesis looks for algorithms that probably do not impress the champions of statistics, but serve process engineers. This thesis advocates three properties in an algorithm: supervised operation, robustness and understandability.

NTIS

Pattern Recognition; Algorithms; Data Processing; Process Control (Industry)

20040040111 Sverdrup Technology, Inc., Huntsville, AL, USA

Schedule Risk Assessment

Smith, Greg; December 05, 2003; 24 pp.; In English; 8th International Performance Management Symposium, 18-20 Feb. 2004, Canberra,, Australia

Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: CASI; A03, Hardcopy

Schedule Risk Assessment needs to determine the probability of finishing on or before a given point in time. Task in a schedule should reflect the 'most likely' duration for each task. IN reality, each task is different and has a varying degree of probability of finishing within or after the duration specified. Schedule risk assessment attempt to quantify these probabilities by assigning values to each task. Bridges the gap between CPM scheduling and the project's need to know the likelihood of 'when'

Derived from text

Schedules; Risk; Assessments

20040043950 Air Force Research Lab., Rome, NY
Restoration of Wavelet-Compressed Images and Motion Imagery
Robertson, Mark A.; Jan. 2004; 68 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-558B
Report No.(s): AD-A420892; AFRL-IF-RS-TR-2004-5; No Copyright; Avail: CASI; A04, Hardcopy

This technical report investigates the characteristics of compression noise in images and motion imagery compressed by scalar quantization of the data's two- or three-dimensional wavelet transform coefficients. Such quantization noise is both experimentally and theoretically shown to be spatially varying in the pixel domain, with statistical correlations between the errors at the pixel locations. A quantization noise covariance matrix is presented that can find use in general restoration scenarios where the observed image or images have been compressed by scalar quantization of the data's wavelet coefficients. Several restoration examples, including de-blurring for the single- image case and temporal filtering for the motion-imagery case, are provided to demonstrate the quantization noise model's advantage over the common assumption of independent and identically distributed noise. (7 tables, 19 figures, 29 refs.)
DTIC
Errors; Imagery; Random Noise; Restoration; Wavelet Analysis

20040045166 Old Dominion Univ., Norfolk, VA, USA, NASA Langley Research Center, Hampton, VA, USA
A Most Probable Point-Based Method for Reliability Analysis, Sensitivity Analysis and Design Optimization
Hou, Gene J.-W; Newman, Perry A., Technical Monitor; March 2004; 33 pp.; In English
Contract(s)/Grant(s): WBS-762-20-61-01
Report No.(s): NASA/CR-2004-213002; L-18606; No Copyright; Avail: CASI; A03, Hardcopy

A major step in a most probable point (MPP)-based method for reliability analysis is to determine the MPP. This is usually accomplished by using an optimization search algorithm. The minimum distance associated with the MPP provides a measurement of safety probability, which can be obtained by approximate probability integration methods such as FORM or SORM. The reliability sensitivity equations are derived first in this paper, based on the derivatives of the optimal solution. Examples are provided later to demonstrate the use of these derivatives for better reliability analysis and reliability-based design optimization (RBDO).
Author
Design Optimization; Probability Theory; Reliability Analysis; Sensitivity Analysis; Algorithms

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20040035771 Nuklearni Inst. Jozef Stefan, Ljubljana, Slovenia
The Specifics of Production Scheduling in Process Manufacturing
Jovan, Vladimir; Electrotechnical Review; 2002; ISSN 0013-5852; Volume 69, No. 5, pp. 305-310; In English; Copyright; Avail: Other Sources

Process manufacturing has some characteristics that make it different from other types of industry. They are reflected in the design of a process factory management system. This paper addresses some features of process manufacturing that have to be taken into account during the implementation of a production scheduling system.
Author
Management Systems; Manufacturing; Scheduling; Computer Aided Manufacturing

20040035923 CH2M Hill Hanford Group, Inc., Richland, WA, Richland, WA, USA, Ares Corp., Arlington, VA, Arlington, VA, USA
Managing Electrochemical Noise Data by Exception: Application of an On-Line EN Data Analysis Technique to Data From a High Level Nuclear Waste Tank
Nov. 13, 2003; 18 pp.; In English
Report No.(s): DE2003-819806; RPP-18584-FP; No Copyright; Avail: Department of Energy Information Bridge

Electrochemical noise has been used a t the Hanford Site for a number of years to monitor in real time for pitting corrosion and stress corrosion cracking (SCC) mechanisms in high level nuclear waste tanks. Currently the monitoring technique has only been implemented on three of the 177 underground storage tanks on the site. Widespread implementation of the technique

has been held back for of a number of reasons, including issues around managing the large volume of data associated with electrochemical noise and the complexity of data analysis. Expert review of raw current and potential measurements is the primary form of data analysis currently used at the Hanford site. This paper demonstrates the application of an on-line data filtering and analysis technique that could allow data from field applications of electrochemical noise to be managed by exception, transforming electrochemical noise data into a process parameter and focusing data analysis efforts on the important data. Results of the analysis demonstrate a data compression rate of 95%; that is, only 5% of the data would require expert analysis if such a technique were implemented. It is also demonstrated that this technique is capable of identifying key periods where localized corrosion activity is apparent.
NTIS
Radioactive Wastes; Storage Tanks; Underground Storage; Stress Corrosion Cracking; Corrosion; Electrochemistry

20040040159 Old Dominion Univ., VA, USA
A Framework for Categorizing Important Project Variables
Parsons, Vickie S.; [2003]; 6 pp.; In English; American Society for Engineering Management 24th National Conference, 15-18 Oct. 2003, Saint Louis, MO, USA; No Copyright; Avail: CASI; A02, Hardcopy

While substantial research has led to theories concerning the variables that affect project success, no universal set of such variables has been acknowledged as the standard. The identification of a specific set of controllable variables is needed to minimize project failure. Much has been hypothesized about the need to match project controls and management processes to individual projects in order to increase the chance for success. However, an accepted taxonomy for facilitating this matching process does not exist. This paper surveyed existing literature on classification of project variables. After an analysis of those proposals, a simplified categorization is offered to encourage further research.
Author
Project Management; Classifications; Research and Development

20040043744 Military Academy, West Point, NY
A Process to Improve the Efficiency of Stop Decisions in Group Experimental Testing
Glen, Andrew G.; Foote, Bobbie L.; Feb. 2004; 49 pp.; In English
Report No.(s): AD-A419601; DSE-TR-03-05; No Copyright; Avail: CASI; A03, Hardcopy

This report documents work done for Air Warrior to make simultaneous testing more efficient. If N items are on test, then after r items a decision can be made as failure time are reported. We show that at times r <.2N. This allows items to be reused if the test is non-destructive. This test is ostensibly for electronic items, but is versatile and offers great advantages for Army research testing the effectiveness of medications, vaccines, and other new medications. It is possible to reject a drug or accept it with high power very quickly. It can also be used to check if a deployment was especially dangerous and give warning to pay special attentions to veterans of certain theaters.
DTIC
Decision Making; Performance

20040043894 Baylor Univ., Houston, TX
Variation in Quarters Dispositions A Force Protection and Readiness Issue Explanations and Control Method
McGilvra, Troy; Aug. 1999; 57 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420815; 34-99; No Copyright; Avail: CASI; A04, Hardcopy

This paper attempts to quantify the extent and magnitude of the portions of variation linked to the provider's behavior, population characteristics and nonhealth factors. A method to monitor and control for unnatural variation is detailed using a control chart system. A retrospective analysis of a year's worth of data for 12 medical facilities was conducted using a Chi-Square method, adjusted by a Multiple Admission Factor, to test the overall hypothesis that there is a variance in quarters rates among medical facilities. A correlation analysis and multiple regression model were conducted using the quarters rate as the dependent variable and demographic data as independent variables was used to examine the relationship between a MTF's quarters utilization rate and demographic factors. There is a greater than threefold variation among the 12 medical facilities under study. The strongest nonhealth factor impacting the quarters rate was if the medical facility had beds or not. Indicating a supply side driver in use of hospital beds, available beds are used rather than sending patients to quarters. Other significant factors include beds per thousand and percentage of population that are black. Statistical control charts used to monitor facility quarters rates will aid in the monitoring of over/under utilization and further aid in the early identification of

negative health trends. Additionally, a 10% change in quarters use will save 830 admissions and regain 913 2,740 lost duty days.
DTIC
Health; Medical Services; Protection

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20040041350 Helsinki Univ., Helsinki, Finland
Diamonds on Large Cardinals
Hellsten, Alex; Annales Academie Scientiarum Fennicae: Mathematica; January 2003; ISSN 1239-6303; Volume 134; 52 pp.; In English; Copyright; Avail: Other Sources

Let kappa be a weakly compact cardinal. Consider the sets of the form {a < kappa : (V(sub a), epsilon, U intersected with V(sub a)) |= phi}, where U is a subset of V(sub kappa) and phi is a Pi(sup 1)(sub 1) sentence such that (V(sub kappa), epsilon, U) |= phi. This collection of sets generates a normal ideal over kappa, a proper extension of the nonstationary ideal over kappa. Sets of positive measure with respect to this ideal are called weakly compact. Thus every weakly compact subset of kappa is stationary but not vice versa. The following combinatorial principle was defined by Sun and independently by Shelah: There exists a sequence (A(sub alpha) : alpha < kappa) such that {a < kappa : A intersects with alpha = A(sub alpha)} is weakly compact for every set A. This strengthening of the classical diamond principle can be referred to as the weakly compact diamond. It is applied where Shelah and Vaananen show that weakly compact diamond together with the assumption 2(sup kappa) = K(sup +) implies that the logic L(sub kappa kappa) has no strongest extension with certain Lowenheim-Skolem and compactness properties. It was stated without proof that weakly compact diamond holds for every measurable cardinal, holds in the constructible universe for every weakly compact cardinal, and can be obtained through forcing. After providing proofs of these three claims we discovered that Sun had independently proved the first two claims. Indeed in both proofs of the first claim, measurability is replaced with ineffability, a considerably weaker assumption. However this work initiated a broader study of normal ideals over regular cardinals and related diamond principles with the main focus on weak compactness.
Author (revised)
Set Theory; Combinatorial Analysis

20040043811 Air Univ., Maxwell AFB, AL
'Complex' Targeting: A Complexity-Based Theory of Targeting and Its Application to Radical Islamic Terrorism
Glenn, Kevin B.; Jun. 2002; 169 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420704; No Copyright; Avail: CASI; A08, Hardcopy

This thesis attempts to answer the following research questions: 'What are the concepts and principles of a targeting theory based on Complexity theory?' 'What are the principles and concepts of Complexity theory?' 'What insights does Complexity theory provide for the military strategist?' Finally it asks, 'What are the targeting implications for the war on terrorism using a Complexity-based targeting theory?' To answer these questions the study reviewed the literature of Systems, Chaos and Complexity theory that traces the broad historical sequence of systems theoretical thought and development. Information gained in this review was used to describe and explain each theory's main terms, concepts and principles and to establish a foundation for the targeting theory and its application to radical Islamic terrorism. This information was also used to explore the impact of nonlinear system theory as applied to conceptual thinking about warfare.
DTIC
Radicals; Terrorism

20040043911 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Linear Dynamic Equations on Time Scales
Messer, Kirsten R.; May 2003; 107 pp.; In English
Report No.(s): AD-A420841; CI-04-135; No Copyright; Avail: CASI; A06, Hardcopy

The theory of time scales was introduced by Stefan Hilger in his 1988 PhD dissertation. Scholars in the fields of differential equations and difference equations have long been aware of the startling similarities and intriguing differences between the two fields. The study of dynamic equations on time scales unifies and extends the fields of differential and

difference equations, highlighting the similarities and providing insight into some of the differences.
DTIC
Differential Equations; Linear Equations

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20040035721 Lawrence Livermore National Lab., Livermore, CA
Progress in Heavy Ion Driven Inertial Fusion Energy: From Scaled Experiments to the Integrated Research Experiment
Jul. 2001; 12 pp.; In English
Report No.(s): DE2003-15005981; UCRL-JC-142345; No Copyright; Avail: Department of Energy Information Bridge

The promise of inertial fusion energy driven by heavy ion beams requires the development of accelerators that produce ion currents (approx 100's Amperes/beam) and ion energies ((approx) 1 - 10 GeV) that have not been achieved simultaneously in any existing accelerator. The high currents imply high generalized perveances, large tun depressions, and high space charge potentials of the beam center relative to the beam pipe. Many of the scientific issues associated with ion beams of high perveance and large tune depression have been addressed over the last two decades on scaled experiments at Lawrence Berkeley and Lawrence Livermore National Laboratories, the University of Maryland, and elsewhere. The additional requirement of high space charge potential (or equivalently high line charge density) gives rise to effects (particularly the role of electrons in beam transport) which must be understood before proceeding to a large scale accelerator. The first phase of a new series of experiments in the Heavy Ion Fusion Virtual National Laboratory (HIF VNL), the High Current Experiments (HCX), is now beginning at LBNL. The mission of the HCX is to transport beams with driver line charge density so as to investigate the physics of this regime, including constraints on the maximum radial filling factor of the beam through the pipe. This factor is important for determining both cost and reliability of a driver scale accelerator. The HCX will provide data for design of the next steps in the sequence of experiments leading to an inertial fusion energy power plant. The focus of the program after the HCX will be on integration of all of the manipulations required for a driver. In the near term following HCX, an Integrated Beam Experiment (IBX) of the same general scale as the HCX is envisioned. The step which bridges the gap between the IBX and an engineering test facility for fusion has been designated the Integrated Research Experiment (IRE). The IRE (like the IBX) will provide an integrated test of the beam physics necessary for a driver, but in addition will provide target and chamber data. This paper will review the experimental and theoretical progress in heavy ion accelerator driver research from the scaled experiments through the present experiments and will discuss plans for the IRE.
NTIS
Inertial Fusion (Reactor); Ion Accelerators; Research and Development

20040035723 Swedish Defence Research Establishment, Linkoeping
Measurement Methods for Bistatic Ground Reflectivity: A Pilot Study
Zdansky, E.; Gustafsson, M.; Gustafsson, N.; Nilsson, S.; Rahm, J.; Sep. 2002; In Swedish
Report No.(s): PB2004-101802; FOI-R-0575-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The effective radar signature of ground or sea objects is determined not only by its free-space radar cross section by also by its interaction with the environment through multiple scattering. In order to predict this interaction data on bistatic scattering properties of the ground (sea) surface is required. It is customary to make a distinction between specular and diffuse ground scattering. This study is focused on the measurement of the latter, for which bistatic data is still scarce. Compared to regular monostatic measurements of object cross sections additional aspects need to be considered i.e. the geometry is bistatic and the ground surface is, in principle, infinite. Due to this antenna tapering corrections are always needed and the radar needs to be moved around. Starting from potentially relevant ground scattering geometries the study concentrates on identifying the special requirements for measurements of this kind and on finding possible solutions. The problems mentioned may for example be partly circumvented by using an auxiliary reflector. Finally the pros and cons of some plausible measurement setups are investigated.
NTIS
Radar Signatures; Scattering

20040035756 Lawrence Livermore National Lab., Livermore, CA
Axions from Wall Decay
Change, S.; Hagmann, C.; Sikivie, P.; Jun. 11, 2001; 12 pp.; In English
Report No.(s): DE2003-15005769; UCRL-JC-142108; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Bosons; Walls; Decay

20040035758 Fermi National Accelerator Lab., Batavia, IL, USA
Neutrino Physics, Superbeams, and the Neutrino Factory
Kayser, B.; Oct. 2003; 14 pp.; In English
Report No.(s): DE2003-816251; FERMILAB-CONF-03/272; No Copyright; Avail: Department of Energy Information Bridge
We summarize what has been learned about the neutrino mass spectrum and neutrino mixing, identify interesting open questions that can be answered by accelerator neutrino facilities of the future, and discuss the importance and physics of answering them.
NTIS
Industrial Plants; Mass Spectra; Neutrinos

20040035762 Stanford Linear Accelerator Center, Stanford, CA, USA
Study of the Decays B (sup -) (yields) D*(sup +) (pi) (sup -) (pi) (sup -)
Cochran, J. H.; Aug. 11, 2003; 22 pp.; In English
Report No.(s): DE2003-815253; SLAC-PUB-10107; No Copyright; Avail: Department of Energy Information Bridge
We report on analyses of B(sup -) mesons decaying into D*(sup+)(pi)(sup -)(pi)(sup -) and D(sup+)(pi)(sup -)(pi)(sup -) final states using 89 million B(sup -) decays collected by the BABAR detector at the PEP-II asymmetric-energy B Factory. Preliminary measurements are given for the inclusive branching fractions for B(sup -)(yields) D*(sup+)(pi)(sup -)(pi)(sup -) and B(sup -)(yields) D*(sup+)(pi)(sup -)(pi)(sup -), and for the exclusive branching fractions for B(sup -)(yields) D(sub 1)(2420)(sup 0)(pi)(sup -) and B(sup -)(yields) D*(sub 2)(2460)(sup 0)(pi)(sup -), where D(sub 1)(2420)(sup 0) and D*(sub 2)(2460)(sup 0) are the two narrow c(bar u) P-wave states. The ratio(Beta)(B(sup -)(yields) D*(sub 2)(2460)(sup 0)(pi)(sup -))/(Beta)(B(sup -)(yields) D(sub 1)(2420)(sup 0)(pi)(sup -)) is measured to be 0.80(+-) 0.07(+-) 0.16.
NTIS
Industrial Plants; Mesons; P Waves; Asymmetry; Decay

20040035763 Fermi National Accelerator Lab., Batavia, IL, USA
Accelerator Improvement Option for NuMI Proton Intensity
Choudhary, B.; Fields, T.; Foster, G. W.; Griffin, J.; Lucas, P.; 2002; 36 pp.; In English
Report No.(s): DE2003-815671; No Copyright; Avail: Department of Energy Information Bridge
In order to meet the needs for protons for MINOS and other experiments, substantial improvements will be necessary in the Booster and Main Injector. They have evaluated a number of improvements which would yield an increase in the number of protons on target for NuMI and Mini-BooNE in the years 2005-2008. They outline a possible program of improvements in the Booster and Main Injector which can be implemented in steps over a five year period and which could result in an increase in proton intensity through the Main Injector which is approximately four times what is currently possible. They provide a list of specific improvements and suggest a possible schedule for the implementation.
NTIS
Particle Accelerators; Protons

20040035811 Lawrence Livermore National Lab., Livermore, CA
Design and Testing of a Fast, 50 kV Solid-State Kicker Pulser
Cook, E. G.; Hickman, B. C.; Lee, B. S.; Hawkins, S. A.; Gower, E. J.; Jun. 24, 2002; 10 pp.; In English
Report No.(s): DE2003-15004798; UCRL-JC-147012; No Copyright; Avail: Department of Energy Information Bridge
The ability to extract particle beam bunches from a ring accelerator in arbitrary order can greatly extend an accelerator's capabilities and applications. A prototype solid-state kicker pulser capable of generating asynchronous bursts of 50 kV pulses has been designed and tested into a 50L2 load. The pulser features fast rise and fall times and is capable of generating an arbitrary pattern of pulses with a maximum burst frequency exceeding 5 MHz If required, the pulse-width of each pulse in the burst is independently adjustable. This kicker modulator uses multiple solid-state modules stacked in an inductive-adder

configuration where the energy is switched into each section of the adder by a parallel array of MOSFETs. Test data, capabilities, and limitations of the prototype pulser are described.
NTIS
Field Effect Transistors; Pulse Generators; Solid State; Fabrication; Magnets

20040035813 Lawrence Livermore National Lab., Livermore, CA
Coalescence of Multiple Plasmoids as a Means of Efficient Spheromak Formation
Woodruff, S.; McLean, H. S.; Stallard, B. W.; Feb. 28, 2002; 12 pp.; In English
Report No.(s): DE2003-15004799; UCRL-JC-147442; No Copyright; Avail: Department of Energy Information Bridge

We have produced single bursts of helicity from the source in the SSPX spheromak in order to study the efficiency of the simplest example of helicity injection. We find that the helicity injection rate can be written in terms of the injected current and an inductance, and that a simple circuit analogue demonstrates unambiguously the relationship of helicity to energy: helicity injection is the addition of inductive loops. While helicity balance points to the conservation of helicity, the electrical efficiency is around 15%. However, in the expulsion of the loop, electrical energy is converted to directional motion, which may be recoverable usefully as heat by collisions, thus the efficiency of the injection process is arguably quite high. Integral to this notion of helicity injection is the idea that reconnection is necessary: without disconnection from the source by a reconnection event, the spheromak fields are just proportional to the injected current. Sometimes the multiple bursts occur spontaneously and cause a step- wise increase in the field (and helicity). However, in all instances when the current remains above the ejection threshold for tgreater than 50ps, the n=l mode initiates and builds field, although with much reduced efficiency, and to a level which is symptomatic of no reconnection.
NTIS
Coalescing; Plasmas (Physics); Spheromaks; Mathematical Models

20040035821 Fermi National Accelerator Lab., Batavia, IL, USA
Neutrino Physics: Where Do We Stand, and Where Are We Going. The Theoretical-Phenomenological Perspective
Kayser, B.; Oct. 2003; 18 pp.; In English
Report No.(s): DE2003-816257; FERMILAB-CONF-03/273; No Copyright; Avail: Department of Energy Information Bridge

The discoveries and open questions in neutrino physics, as reported at Neutrino 2002 and more recently, are reviewed from a theoretical perspective.
NTIS
Phenomenology; Neutrinos

20040035826 Fermi National Accelerator Lab., Batavia, IL, USA
Charm Physics at CDF II
Furic, I. K.; Oct. 2003; 12 pp.; In English
Report No.(s): DE2003-816585; FERMILAB-CONF-03/169-E; No Copyright; Avail: Department of Energy Information Bridge

The CDF II detector has the capability of triggering on displaced tracks. Because of this ability, CDF II has accrued large samples of charged meson decays to fully hadronic final states in 64 pb(sup -1)of p(bar p)collision data gathered at(radical)s= 1.96 TeV. Using initial Run II data samples, the production cross sections for J/(psi), D(sup 0), D(sup+), D*(sup+)and D(sub s)(sup+)mesons have been measured. Ratios of branching ratios for Cabibbo suppressed final states and CP asymmetries in D(sup 0)meson decays have been studied. A measurement of the mass difference m(D(sub s)(sup+)) -m(D(sup+)) has been done, and a limit for the branching fraction of the FCNC D(sup 0)(yields)(mu)(sup+)(mu)(sup -)decays has been set.
NTIS
Asymmetry; Hadrons; Mesons; Particle Decay

20040035828 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Recent Results from JLab on Nucleon Responses
de Jager, K.; 2003; 12 pp.; In English
Report No.(s): DE2003-815756; No Copyright; Avail: Department of Energy Information Bridge

Highlights of recent data from Jefferson Lab on the nucleon response to an electro-magnetic probe are presented. Recent technological advances in polarized beams and either polarized targets or nucleon recoil polarimeters have yielded a

significant improvement on the precision of the data. An outlook is presented of planned experiments.
NTIS
Nucleons; Polarimeters; Precision; Targets

20040035829 Iowa State Univ. of Science and Technology, Ames, IA
Development of Modeling and Simulation for Magnetic Particle Inspection using Finite Elements
Lee, J. Y.; 2003; 108 pp.; In English
Report No.(s): DE2003-815753; No Copyright; Avail: Department of Energy Information Bridge

Magnetic particle inspection (MPI) is a widely used nondestructive inspection method for aerospace applications essentially limited to experiment-based approaches. The analysis of MPI characteristics that affect sensitivity and reliability contributes not only reductions in inspection design cost and time but also improvement of analysis of experimental data. Magnetic particles are easily attracted toward a high magnetic field gradient. Selection of a magnetic field source, which produces a magnetic field gradient large enough to detect a defect in a test sample or component, is an important factor in magnetic particle inspection.
NTIS
Aerospace Engineering; Design to Cost; Finite Element Method; Magnetic Fields; Models

20040035835 Argonne National Lab., IL, USA
Introduction to the Measurement of Noise with Application to Particle Accelerator Beam Stabilization
Decker, G.; Dec. 1998; 16 pp.; In English
Report No.(s): DE2003-816762; LS-273; No Copyright; Avail: Department of Energy Information Bridge

One of the most important figures of merit for a synchrotron radiation source, once specified beam intensity and energy have been achieved, is charged particle beam stability. While a significant effort has been expended at the Advanced Photon Source (APS) to reduce or eliminate undesirable sources of beam motion, it will be necessary to employ active feedback to stabilize the user photon beams to the very stringent levels required. This becomes especially important when one considers that transverse beam stability is generally quoted as a fraction of beam dimensions. Since source brightness tends to be inversely proportional to these transverse dimensions, it should be evident that x-ray beamline users in general will support any and all efforts to reduce the transverse charged particle beam dimensions.
NTIS
Charged Particles; Noise Measurement; Particle Accelerators; Particle Beams

20040035845 Lawrence Livermore National Lab., Livermore, CA
Void Swelling as a Stochastic, Evolutionary Process
Surth, M. P.; Wolfer, W. G.; May 01, 2001; 10 pp.; In English
Report No.(s): DE2003-15004783; UCRL-JC-143888; No Copyright; Avail: Department of Energy Information Bridge

Past theories of radiation swelling have mostly dealt with the effect of void growth on the steady-state rather than of void nucleation on the incubation of swelling. However, new analysis indicates that incubation and its dependence on dose rate, impurity concentrations. and temperature dramatically influences the cumulative experimental swelling. We present rate theory calculations of this void nucleation and growth that include the timedependent coupling and evolution of point defect concentrations, void size distribution, and dislocation density. A transient, swelling-free period originates in the exponential sensitivity of nucleation to the temperature and point defect supersaturations and the dependence of the defect concentrations on the dose rate, temperature, and aggregate sink strengths. Specifically. simulations representing cold worked pure metals show delayed swelling that is governed by dislocation evolution towards a reduced. steady-state density. Impurity atoms are expected to affect the incubation period through the initial dislocation density and subsequent rate of evolution. We conclude that appreciable void swelling requires a sufficiently low concentration of network dislocation and dislocation loop sinks, and that incubation is the time required to achieve this state.
NTIS
Swelling; Voids; Nucleation; Radiation

20040035851 Lawrence Livermore National Lab., Livermore, CA
Analog Amplitude Modulation of a High Voltage, Solid State Inductive Adder, Pulse Generator Using MOSFETS
Gower, E. J.; Sullivan, J. S.; Jun. 24, 2002; 10 pp.; In English
Report No.(s): DE2003-15004797; UCRL-JC-147009; No Copyright; Avail: Department of Energy Information Bridge

High voltage, solid state, inductive adder, pulse generators have found increasing application as fast kicker pulse modulators for charged particle beams. The solid state, inductive adder, pulse generator is similar in operation to the linear induction accelerator. The main difference is that the solid state, adder couples energy by transformer action from multiple primaries to a voltage summing stalk, instead of an electron beam. Ideally, the inductive adder produces a rectangular voltage pulse at the load. In reality, there is usually some voltage variation at the load due to droop on primary circuit storage capacitors, or, temporal variations in the load impedance. Power MOSFET circuits have been developed to provide analog modulation of the output voltage amplitude of a solid state, inductive adder, pulse generator. The modulation is achieved by including MOSFET based, variable subtraction circuits in the multiple primary stack. The subtraction circuits can be used to compensate for voltage droop, or, to tailor the output pulse amplitude to provide a desired effect in the load. Power MOSFET subtraction circuits have been developed to modulate short, temporal (60 - 400 ns), voltage and current pulses. MOSFET devices have been tested up to 20 amps and 800 Volts with a band pass of 50 MHz. An analog modulation cell has been tested in a five cell high, voltage adder stack.
NTIS
Pulse Generators; Amplitude Modulation; Loads (Forces)

20040035853 Lawrence Livermore National Lab., Livermore, CA
Low-Emittance Monoenergetic Electron and Ion Beams from Ultra-Intense Laser-Solid Interactions
Cowan, T. E.; Roth, M.; Allen, M. M.; Johnson, J.; Hatchett, S. P.; Mar. 03, 2000; 28 pp.; In English
Report No.(s): DE2003-15005453; UCRL-JC-138049; No Copyright; Avail: Department of Energy Information Bridge
Recent experiments at the LLNL Petawatt Laser have demonstrated the generation of intense, high energy beams of electrons and ions from the interaction of ultra-intense laser light with solid targets. Focused laser intensities as high as 6 x 10(sup 20) W/cm(sup 2) are achieved, at which point the quiver energies of the target electrons extend to (approx.)10 MeV. In this new, fully relativistic regime of laser-plasma interactions, nuclear processes become important and nuclear techniques are required to diagnose the high-energy particle production.
NTIS
Electron Beams; Ion Beams; Lasers

20040035860 Fermi National Accelerator Lab., Batavia, IL, Batavia, IL, USA
Testing of the TriP Chip Running at 132 nsec Using a Modified AFE Board
Estrade, J.; Garcia, C.; Hoeneisenn, B.; Rubinov, P.; 2003; 10 pp.; In English
Report No.(s): DE2004-820409; FERMILAB-TM-2227; No Copyright; Avail: Department of Energy Information Bridge
In this note we describe the first set of tests done with a sample of TriP chips that were mounted on a modified AFE board. The modifications consisted of different firmware and the replacement of one power supply switch. The board used was a standard AFEIc board (red type) on which new MCMs (MCMIIs) were mounted. The new MCMs were designed to support the TriP and emulate the SVX for readout when mounted on an AFEIc board. The TriP and the MCMs are described.
NTIS
Coupling; Performance Tests; Chips; Switches; Analogs

20040035867 Columbia Univ., New York, New York, NY, USA, Cincinnati Univ., OH, OH, USA, , Batavia, IL, USA
NuTeV Cross Section and Structure Function Measurements
Naples, D.; Adams, T.; Alton, A.; Avvakumov, S.; de Barbaro, L.; Dec. 2003; 10 pp.; In English
Report No.(s): DE2004-820017; FERMILAB-CONF-03/259-E; No Copyright; Avail: Department of Energy Information Bridge
The NuTeV experiment has obtained a unique high statistics sample of neutrino and antineutrino interactions using its high-energy sign-selected beam. Charged-current(nu) and(bar(nu)) differential cross sections are extracted. Neutrino-Iron structure functions, F(sub 2)(x, Q(sup 2)) and xF(sub 3)(x, Q(sup 2)), are determined by fitting the y-dependence of the differential cross sections. NuTeV has precise understanding of its hadron and muon energy scales, which improves the systematic precision of this measurement.
NTIS
Neutrinos; Tellurium; Vanadium; Scattering Cross Sections

20040035927 Swedish Defence Research Establishment, Tumba
Continuing Numerical Simulations of the Flow in a Closed Electrothermal-Chemical Bomb
Berglund, M.; Larsson, A.; Jun. 2003; 20 pp.; In English
Report No.(s): PB2004-102634; FOI-R-0891-SE; Copyright; Avail: National Technical Information Service (NTIS)

In the present report continuing numerical simulations of the flow in a closed electrothermal-chemical bomb has been conducted. The work has been concentrated on numerical stabilization of the computational code, local mesh refinement, and on the implementation of a 'booster charge emulator.' A first set of routines to handle deposition of electric energy has also been implemented.
NTIS
Numerical Analysis; Bombs (Ordnance); Interior Ballistics; Chemical Warfare; Flow Distribution

20040035928 Fermi National Accelerator Lab., Batavia, IL, Batavia, IL, USA
DO Silicon Trackers
Cooper, W. E.; Dec. 2003; 10 pp.; In English
Report No.(s): DE2003-820408; FERMILBA-CONF-03/383-E; No Copyright; Avail: Department of Energy Information Bridge

The present Fermilab DO silicon microstrip tracker, the silicon microstrip tracker which was designed to replace it, and plans for upgrading the present silicon tracker are described.
NTIS
Silicon; Semiconductor Devices

20040036191 Naval Research Lab., Bay Saint Louis, MS
Chapter 2: Frequency Domain Wave Models in the Nearshore and Surf Zones
Kaihatu, James M.; Jan. 2003; 31 pp.; In English
Report No.(s): AD-A420223; NRL/BC/7320/02/0001; No Copyright; Avail: CASI; A03, Hardcopy

In deep water (kh) 1, where k is the wave number and h the water depth), second-order wave nonlinearity can be described as a small correction to the underlying linear wave. Perturbation expansions in wave steepness E = ka, where a is the wave amplitude, are used (Phillips, 1960), and at second- order only non-resonant (bound) waves are possible among triads of wave frequencies. Thus the interacting waves with the frequency-vector wave number combination (cot, k1) and (c02, k2) excite secondary waves at (cot + co2, k1 + k2), but these secondary wave amplitudes always remain small relative to the primary amplitudes. At the next order, resonant interaction occurs between quartets of waves, with the resultant slow energy exchange between the interacting waves.
DTIC
Mathematical Models; Ocean Models; Wave Propagation

20040036233 Texas A&M Univ., College Station, TX
Dynamic Fracture in Brittle Materials
Walton, Jay R.; Dec. 2003; 9 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0003
Report No.(s): AD-A420265; No Copyright; Avail: CASI; A02, Hardcopy

Substantial progress has made in three of the proposed problem areas as described below. Moreover, the P.I's research evolved to other areas not in the proposal but relevant to the same material application areas. These contributions are also discussed below: Dynamic Crack Growth in Functionally Graded Material: The P.I. and his Ph.D. student, David Zeigler (degree conferred August 2001), considered the problem of dynamic crack growth along an interface in a functionally graded composite material. In such a material, the constitutive properties vary smoothly away front a bi-material interface. Such composite material systems are of increasing importance in technological applications since they offer the prospect of creating laminated composite materials that are not susceptible to the debonding failure occuring at traditional bi-material interfaces due to the mismatch in material properties.
DTIC
Brittle Materials; Crack Propagation

20040036443 TRICARE Management Activity, Falls Church, VA
An Analysis and Validation of the Proposed Standard Metric Set Created at the TRICARE Management Activity
Lopez-Duke, Alejandro; Apr. 13, 2001; 227 pp.; In English
Report No.(s): AD-A420428; AMDCS-30-01; No Copyright; Avail: CASI; A11, Hardcopy

The services within the military Healthcare System have pursued metric set development to measure established goals and perceived information requirements. The Assistant Secretary of Defense for Health Affairs charged the TMA to streamline

metric sets within the MHS and create a standard metric set. This study was initiated to validate the proposed standard metric set and solicit input from the field. In addition, the set was compared to performance measurement tools used in healthcare organizations in the private sector. A three art questionnaire submitted to respondents within the MHS exhibited no significant differences in opinion as to general strategic concepts and the utility of the standard set between services, professions, and levels of command. Of the 47 measures proposed, only six exhibited any significant difference in opinion. The differences were mainly between professions and levels of command. More interestingly were the similarities of opinion among the respondents. Satisfaction measures were highly rated with little variation. A factor Analysis compared TMA's assigned domains for each measure to the underlying constructs exhibited in the completed questionnaires. The results portrayed opportunities for perverse incentives, unintended behavior changes, and improper categorization. A comparison with the private sector demonstrated issues pertaining to domains and possible metric additions. Also, metric sets at health plans were the most similar to the MHS. A high level of agreement exists among the respondents as to the need to streamline the metric set system and the proposed set's ability to meet the decision-making requirements of the MHS's healthcare leaders.
DTIC
Data Processing; International System of Units; Military Operations

20040037734 Colorado School of Mines, Golden, CO
Nanostructure of a-Si:H and Related Alloys by Small-Angle Scattering of Neutrons and X-Rays. Final Technical Progrss Report 22 May 1998-15 October 2001
Williamson, D. L.; Mar. 2002; 84 pp.; In English
Report No.(s): DE2004-15000387; NREL/SR-520-31908; No Copyright; Avail: Department of Energy Information Bridge
This final report presents results and conclusions of Phases 1, 2, and 3 research performed from May 22, 1998 to October 15, 2001 under a cost-reimbursable subcontract from the National Renewable Energy Laboratory (NREL, a national laboratory of the U.S. Department of Energy operated by Midwest Research Institute) to the Colorado School of Mines (subcontract number XAK-8-17619-31 to the prime contract DE-AC36-83CH10093). Due to a contract extension, this report covers the above period of more than three calendar years. The research was carried out under the direction of Don L. Williamson, Professor of Physics. Materials characterization, including small-angle x-ray scattering and x-ray diffraction, was carried out in the Physics Department of the Colorado School of Mines (CSM). In addition, small-angle neutron scattering (SANS) was carried out at the NIST Center for Neutron Research and anomalous small-angle x-ray scattering (ASAXS) was performed by a collaborator (G. Goerigk) at the German synchrotron, DESY.
NTIS
Alloys; Neutrons; Neutron Scattering; Energy Technology; Amorphous Silicon

20040037738 Fermi National Accelerator Lab., Batavia, IL, Batavia, IL, USA
Beauty and Charm Production at Fixed-Target Experiments
Gottschalk, E. E.; Dec. 2003; 10 pp.; In English
Report No.(s): DE2003-820030; FERMILAB-CONF-03/375-E; No Copyright; Avail: Department of Energy Information Bridge
Fixed-target experiments continue to provide insights into the physics of particle production in strong interactions. The experiments are performed with different types of beam particles of varying energies, and many different target materials. Studies of beauty and charm production are of particular interest, since experimental results can be compared to perturbative QCD calculations. It is in this context that recent results from fixed-target experiments on beauty and charm production will be reviewed.
NTIS
Charm (Particle Physics); Quantum Chromodynamics

20040037739 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Efficient Cooling Loop for Connecting Cryocooler to a Helium Reservoir
Taylor, C. E.; Abbott, C. S. R.; Leitner, D.; Leitner, M.; Lyneis, C. M.; 2003; 12 pp.; In English
Report No.(s): DE2003-819968; No Copyright; Avail: Department of Energy Information Bridge
The magnet system of the VENUS ECR Ion Source at LBNL has two 1.5-watt cryocoolers suspended in the cryostat vacuum. Helium vapor from the liquid reservoir is admitted to a finned condenser bolted to the cryocooler 2nd stage and returns as liquid via gravity. Small-diameter flexible tubes allow the cryocoolers to be located remotely from the reservoir.

With 3.1 watts load, the helium reservoir is maintained at 4.35 K, 0. 05K above the cryocooler temperature. Design, analysis, and performance are presented
NTIS
Cryogenics; Cryostats; Cryogenic Cooling; Cyclotron Resonance; Ion Sources

20040037746 Argonne National Lab., IL, Duke Univ., Durham, NC, USA
Nuclear Shell Structure and beta-Decay: I. Odd a Nuclei II. Even a Nuclei
Mayer, M. G.; Moszkowski, S. A.; Nordheim, L. W.; May 1951; 56 pp.; In English
Report No.(s): DE2004-4420949; ANL-4626; No Copyright; Avail: Department of Energy Information Bridge

A systematics is given of all transitions for odd A nuclei for which sufficiently reliable data are available. The allowed or forbidden characters of the transitions are correlated with the positions of the initial and final odd nucleon groups in the nuclear shell scheme. The nuclear shells show definite characteristics with respect to parity of the ground states. The latter is the same as the one obtained from known spins and magnetic moments in a one-particle interpretation.
NTIS
Decay; Nucleons; Nuclear Structure; Forbidden Transitions; Beta Factor

20040037749 Fermi National Accelerator Lab., Batavia, IL, USA
Firmware-Only Implementation of Time-to-Digital Converter (TDC) in Field-Programmable Gate Array (FPGA)
Wu, J.; Shi, Z.; Wang, I. Y.; Nov. 2003; 10 pp.; In English
Report No.(s): DE2003-817308; FERMILAB-CONF-03/358-E; No Copyright; Avail: Department of Energy Information Bridge

A Time-to-Digital Converter (TDC) implemented in general purpose field-programmable gate array (FPGA) for the Fermilab CKM experiment will be presented. The TDC uses a delay chain and register array structure to produce lower bits in addition to higher bits from a clock counter. Lacking the direct controls custom chips, the FPGA implementation of the delay chain and register array structure had to address two major problems: (1) the logic elements used for the delay chain and register array structure must be placed and routed by the FPGA compiler in a predictable manner, to assure uniformity of the TDC binning and short-term stability. (2) The delay variation due to temperature and power supply voltage must be compensated for to assure long-term stability. They used the chain structures in the existing FPGAs that the venders designed for general purpose such as carry algorithm or logic expansion to solve the first problem. To compensate for delay variations, they studied several digital compensation strategies that can be implemented in the same FPGA device. Some bench-top test results will also be presented in this document.
NTIS
Field-Programmable Gate Arrays; Molecular Structure; Particle Acceleration

20040037769 Fermi National Accelerator Lab., Batavia, IL, USA
Time-of-Flight Measurement in the DZero Central Fiber Tracker
Estrada, J.; Carcia, C.; Hoeneisen, B.; Rubinov, P.; Jul. 20, 2003; 20 pp.; In English
Report No.(s): DE2004-820413; FERMILAB-TM-2228; No Copyright; Avail: Department of Energy Information Bridge

We continue evaluation of the new electronics developed for the Central Fiber Tracker and Preshower detectors. With the custom TriP chip and MCM II we have measured the position of the hits along the fiber by comparing the time of arrival of the photons at the VLPC with the expected timming relative to the beam. The measured rms resolution at the center of the fibers is 46cm for hits with more than 8 photo-electrons and is dominated by the statistics of photon arrival time. The corresponding resolution near the ends of the fibers (where more photoelectrons are collected) is calculated to be of order 27cm. With a second submission of the TriP chip to add the time-of-flight measuring capability we will effectively double the number of channels in the central fiber tracker.
NTIS
Chips; Photoelectrons; Time Measurement

20040037770 Fermi National Accelerator Lab., Batavia, IL, USA
Acceleration and Storage of Radioactive Ions for a Neutrino Factory
Autin, B.; Benedikt, M.; Hancock, S.; Haseroth, H.; Jansson, A.; Dec. 2003; 16 pp.; In English
Report No.(s): DE2004-820516; FERMILAB-CONF-02-391; No Copyright; Avail: Department of Energy Information Bridge

The term beta-beam has been coined for the production of a pure beam of electron neutrinos or their antiparticles through

the decay of radioactive ions circulating in a storage ring. This concept requires radioactive ions to be accelerated to a Lorentz gamma of 150 for (sup 6)He and 60 for (sup 18)Ne. The neutrino source itself consists of a storage ring for this energy range, with long straight sections in line with the experiment(s). Such a decay ring does not exist at CERN today, nor does a high-intensity proton source for the production of the radioactive ions. Nevertheless, the existing CERN accelerator infrastructure could be used as this would still represent an important saving for a beta-beam facility. This paper outlines the first study, while some of the more speculative ideas will need further investigations.
NTIS
Antiparticles; Storage Rings (Particle Accelerators); Radioactivity; Circulation

20040041299 California Univ., Berkeley, CA, USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, National Nuclear Security Administration, Las Vegas, NV, USA
Neutron Capture Experiments on Unstable Nuclei. Annual Technical Report for Period November 2002-November 2003
Schwantes, J. M.; Sudowe, R.; Nitsche, H.; Hoffman, D. C.; Dec. 2003; 50 pp.; In English
Report No.(s): DE2004-820513; No Copyright; Avail: Department of Energy Information Bridge

A primary objective of this project is to study neutron capture cross sections for various stable and unstable isotopes that will contribute to the Science Based Stockpile Stewardship (SBSS) program by providing improved data for modeling and interpretation of nuclear device performance. The information obtained will also be important in astrophysical modeling of nucleosynthesis. During this reporting period, the emphasis has been on preparing a radioactive target of l55Eu (half- life= 4.7 years), and several stable targets, including isotopically separated 154Sm, 151Eu, and 153Eu. Measurements of their neutron capture cross sections will be conducted in collaboration with researchers at the Los Alamos Neutron Science Center (LANSCE) facility using the Detector for Advanced Neutron Capture Experiments (DANCE).
NTIS
Isotopes; Capture Effect; Absorption Cross Sections; Neutrons; Stability

20040041306 Fermi National Accelerator Lab., Batavia, IL, USA
Heavy-Flavor Production Overview
Appel, J. A.; Nov. 19, 2003; 12 pp.; In English
Report No.(s): DE2004-820026; FERMILAB-CONF-03/372-E; No Copyright; Avail: Department of Energy Information Bridge

This talk serves as an introduction to the Heavy-Flavor session of the XXXIII International Symposium on Multiparticle Dynamics. A major focus of this session is on the production of heavy quarks. The talks which follow review the latest results on heavy quark production in strong, electromagnetic, and weak interactions, as well as some of the physics of the heavy quarks themselves. This talk emphasizes what we can learn from the production measurements, both about underlying QCD theory and the partonic nature of the hadrons which we see in the laboratory.
NTIS
Quantum Chromodynamics; Hadrons

20040041315 Lawrence Livermore National Lab., Livermore, CA
History of the APS Topical Group on Shock Compression of Condensed Matter
Forbes, J. W.; Oct. 19, 2001; 16 pp.; In English
Report No.(s): DE2003-15005394; UCRL-JC-145953; No Copyright; Avail: Department of Energy Information Bridge

In order to provide broader scientific recognition and to advance the science of shock compressed condensed matter, a group of American Physical Society (APS) members worked within the Society to make this field an active part of the APS. Individual papers were presented at APS meetings starting in the 1940s and shock wave sessions were organized starting with the 1967 Pasadena meeting. Shock wave topical conferences began in 1979 in Pullman, WA. Signatures were obtained on a petition in 1984 from a balanced cross-section of the shock wave community to form an APS Topical Group (TG). The APS Council officially accepted the formation of the Shock Compression of Condensed Matter (SCCM) TG at its October 1984 meeting. This action firmly aligned the shock wave field with a major physical science organization. Most early topical conferences were sanctioned by the APS while those held after 1992 were official APS meetings. The topical group organizes a shock wave topical conference in odd numbered years while participating in shock wavehigh pressure sessions at APS general meetings in even numbered years.
NTIS
Shock Waves; Shock Loads; Condensed Matter Physics

20040041316 Lawrence Livermore National Lab., Livermore, CA

Hohlraum-Driven Ignition-Like Double-Shell Implosion Experiments on Omega: Analysis and Interpretation

Amednt, P.; Robey, H. F.; Park, H. S.; Turner, R. E.; Tipton, R. E.; Aug. 22, 2003; 12 pp.; In English

Report No.(s): DE2003-15005402; UCRL-JC-151998; No Copyright; Avail: Department of Energy Information Bridge

An experimental campaign to study hohlraum-driven ignition-like double-shell target performance using the Omega laser facility has begun. These targets are intended to incorporate as many ignition-like properties of the proposed National Ignition Facility (NIF) double-shell ignition design(1,2) as possible, given the energy constraints of the Omega laser. In particular, this latest generation of Omega double-shells is nominally predicted to produce over 99% of the (clean) DD neutron yield from the compressional or stagnation phase of the implosion as required in the NIF ignition design. By contrast, previous double-shell experience on Omega(3) was restricted to cases where a significant fraction of the observed neutron yield was produced during the earlier shock convergence phase where the effects of mix are deemed negligibly small. These new targets are specifically designed to have optimized fall-line behavior for mitigating the effects of pusher-fuel mix after deceleration onset and, thereby, providing maximum neutron yield from the stagnation phase. Experimental results from this recent Omega ignition-like double-shell implosion campaign show favorable agreement with two-dimensional integrated hohlraum simulation studies when enhanced (gold) hohlraum M-band (2-5 keV) radiation is included at a level consistent with observations.

NTIS

Ignition; Implosions; Deceleration; Hohlraums

20040041320 Lawrence Livermore National Lab., Livermore, CA

Development of Nuclear Magnetic Resonance Pulse Sequences and Probes to Study Biomacromolecules

Krishnan, V. V.; Maxwell, R.; Feb. 26, 2001; 20 pp.; In English

Report No.(s): DE2003-15005390; UCRL-ID-143261; No Copyright; Avail: Department of Energy Information Bridge

In the recent development of high voltage solid state pulsed power systems, the ability to monitor low voltage signals in a high voltage environment has been a problem. The amplitude of any ground bounce from the high voltage pulse can make the interpretation of low voltage diagnostic signals difficult with industry standard probes. The paper explains the development of a fiber optic voltage probe for the oscilloscope. Included are explanations of the probe's design, fabrication, limitations, and performance when compared with standard probes in a high voltage pulsed power environment.

NTIS

Nuclear Magnetic Resonance; Resonance Probes; Fiber Optics; Electric Potential

20040041323 Lawrence Livermore National Lab., Livermore, CA

Scrape-Off Layer Features of the QH-Mode

Lasnier, C. J.; Burrell, K. H.; deGrassie, J. S.; Leonard, A. W.; Moyer, R. A.; May 2002; 20 pp.; In English

Report No.(s): DE2003-15005358; UCRL-JC-148433; No Copyright; Avail: Department of Energy Information Bridge

The quiescent high confinement (QH-mode) and quiescent double barrier (QDB) modes in DIII-D have long-duration H-mode confinement without ELMs, possibly an alternative operating mode in future tokamaks for avoiding damage by ELMS. Instead of ELMs, there is an edge harmonic oscillation (EHO), which is a continuous electromagnetic mode with associated density fluctuations. The edge pedestal is similar to ELMing H-mode, but at very low density to date. We see C to the sixth ion temperatures of 3-7 keV in scrape-off layer (SOL), 100 kV/m radial electric fields just inside the separatrix, and a hot area on the divertor baffle whose heating correlates with the presence of the EHO. We attribute the baffle heating to perturbation of trapped ion orbits by the EHO, allowing particles to strike the baffle. The outboard scrape-off layer is wider than the inboard, probably due to lack of trapped ions on the inside.

NTIS

Tokamak Devices; Plasmas (Physics); Harmonic Oscillation

20040041325 Lawrence Livermore National Lab., Livermore, CA

Direct Numerical Simulation of a Shocked Helium Jet

Cloutman, L. D.; Feb. 2002; 38 pp.; In English

Report No.(s): DE2003-15005357; UCRL-ID-147761; No Copyright; Avail: Department of Energy Information Bridge

Turbulent mixing plays a fundamental role in a wide variety of applications, yet the details of how chemical inhomogeneities get damped or even eliminated are not well understood. One approach to gaining insight into this process is to study highly simplified and idealized situations that are amenable to detailed experimental and numerical studies. One such

experiment involves subjecting laminar cylindrical jets of helium and sulfur hexafluoride in air to weak shock waves in a shock tube and watching the distortion and breakup of the jets. This report describes a preliminary direct numerical simulation (DNS) of the helium-jet case using the COYOTE computational fluid dynamics program.
NTIS
Shock Tubes; Numerical Analysis; Direct Numerical Simulation; Sulfur Hexafluoride

20040041332 Lawrence Livermore National Lab., Livermore, CA
Fiber Optic Oscilloscope Probe
Lee, B.; Jun. 11, 2001; 10 pp.; In English
Report No.(s): DE2003-15005474; UCRL-JC-141929; No Copyright; Avail: Department of Energy Information Bridge
In the recent development of high voltage solid state pulsed power systems, the ability to monitor low voltage signals in a high voltage environment has been a problem. The amplitude of any ground bounce from the high voltage pulse can make the interpretation of low voltage diagnostic signals difficult with industry standard probes. The paper explains the development of a fiber optic voltage probe for the oscilloscope. Included are explanations of the probe's design, fabrication, limitations, and performance when compared with standard probes in a high voltage pulsed power environment.
NTIS
Fiber Optics; Probes; Oscilloscopes; High Voltages

20040041333
Limits on D0 - anti-D0 Mixing and CP Violation from the Ratio of Lifetimes for Decay to K- pi+, K- K+, and pi- pi+
Aubert, B.; Barate, R.; Boutigny, J.; Gaillard, J. M.; Hicheur, A.; 2003; 12 pp.; In English
Report No.(s): DE2003-813190; SLAC-PUB-9888; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
CP Violation; Decay; Mesons

20040041334 Stanford Linear Accelerator Center, Stanford, CA, USA
Measurement of Branching Fractions and CP-Violating Asymmetries in B -> rho+/-h-/+
Aubert, B.; Barate, R.; Boutigny, J.; Gaillard, J. M.; Hicheur, A.; 2003; 12 pp.; In English
Report No.(s): DE2003-813209; SLAC-PUB-9923; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Decay; Branching (Mathematics); Asymmetry

20040041335 Fermi National Accelerator Lab., Batavia, IL, USA, Rochester Univ., NY, Academy of Sciences (USSR), Novosibirsk, USSR
Field Measurements in the FERMILAB Electron Cooling Solenoid Prototype
Crawford, A. C.; Nagaitsev, S.; Shemyakin, A.; Seletsky, S.; Tupikov, V.; 2003; 32 pp.; In English
Report No.(s): DE2003-815973; No Copyright; Avail: Department of Energy Information Bridge
To increase the Tevatron luminosity, Fermilab is developing a high-energy electron cooling system to cool 8.9-GeV/c antiprotons in the Recycler ring. Cooling of antiprotons requires a round electron beam with a small angular spread propagating through a cooling section with a kinetic energy of 4.3 MeV. To confine the electron beam tightly and to keep its transverse angles below 10 - 4 rad, the cooling section will be immersed into a solenoidal field of 50-150 G. As part of the R&D effort, a cooling section prototype consisting of 9 modules (90% of the total length of a future section) was assembled and measured. This paper describes the technique of measuring and adjusting the magnetic field quality in the cooling section and presents preliminary results of solenoid prototype field measurements. shielding efficiency. An algorithm of field adjustments for providing lowest possible electron trajectory perturbations is proposed; also, the results of our first attempts of implementing the algorithm are shown.
NTIS
Magnetic Fields; Electron Energy; Cooling; Synchrotrons; Acceleration (Physics); Measurement; Charts

20040041337 Tel-Aviv Univ., Ramat-Aviv, Tel-Aviv, Israel, McGill Univ., Montreal, Quebec, Canada, Stanford Linear Accelerator Center, Stanford, CA, USA
Prediction for the 4-Loop B Function in QCD
Ellis, J.; Karliner, M.; Samuel, M. A.; 2003; 16 pp.; In English
Report No.(s): DE2003-813118; SLAC-PUB-9826; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Quantum Chromodynamics; Computation

20040041338
Search for Non-Resonant B+ -> h+h-h+ Decays
2003; 14 pp.; In English
Report No.(s): DE2003-813128; SLAC-PUB-9845; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Decay; Branching (Physics); Resonance

20040041339 Stanford Linear Accelerator Center, Stanford, CA, USA
Observation of Two Excited Charmed Baryons Decaying into lambda(c)+pi+-
2003; 16 pp.; In English
Report No.(s): DE2003-813132; SLAC-PUB-9851; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Baryons; Charm (Particle Physics); Decay

20040041341
Lambda anti-lambda Production in Two-Photon Interactions at CLEO
2003; 14 pp.; In English
Report No.(s): DE2003-813097; SLAC-PUB-9800; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Photons; Storage Rings (Particle Accelerators)

20040041342 Cincinnati Univ., OH, USA, Stanford Linear Accelerator Center, Stanford, CA, USA
Hints for Enhanced b -> sg from Charm and Kaon Counting
Kagan, A. L.; Rathsman, J.; 2003; 28 pp.; In English
Report No.(s): DE2003-813098; SLAC-PUB-9801; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Counting; Kaons; Quarks; Decay; Charm (Particle Physics)

20040041343
Search for Neutrinoless tau Decays: tau -> e gamma and tau -> mu gamma
2003; 16 pp.; In English
Report No.(s): DE2003-813113; SLAC-PUB-9821; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Decay; Neutrinos; Particles

20040041347 Lawrence Livermore National Lab., Livermore, CA
Carbon Resistor Pressure Gauge Calibration at Low Stresses
Cunningham, B.; Vandersall, K. S.; Niles, A. M.; Greenwood, D. W.; Jun. 22, 2001; 10 pp.; In English
Report No.(s): DE2003-15005428; UCRL-JC-141835; No Copyright; Avail: Department of Energy Information Bridge
The 470 Ohm carbon resistor gauge has been used in the stress range up to approximately 4-5 GPa for highly heterogeneous materials and/or divergent flow experiments. The attractiveness of the gauge is due to its rugged nature, simple construction, low cost, reproducibility, and survivability in dynamic events. The associated drawbacks are a long time response to pressure equilibration and gauge resistance hysteresis. In the range below 0.4 GPa, the gauge calibration has been mainly extrapolated into this regime. Because of the need for calibration data within this low stress regime, calibration experiments were performed using a split-Hopkinson bar, drop tower apparatus, and a gas pressure chamber. Since the performance of the

gauge at elevated temperatures is a concern, the change in resistance due to heating at atmospheric pressure was also investigated. Details of the various calibration arrangements and the results will be discussed and compared a calibration curve fit to previously published calibration data.
NTIS
Pressure Measurement; Stresses; Resistors; Calibrating

20040041351 Swedish Defence Research Establishment, Linkoeping, Sweden
Parabolic Equation Technique for Vegetation
Holm, P.; Eriksson, G.; Dec. 2002; In English
Report No.(s): PB2004-102112; FOI-R-0637-SE; No Copyright; Avail: National Technical Information Service (NTIS)
Vegetation can have a major influence on wave propagation and thus on received signal strength. This makes, of course, wave propagation models that consider vegetation effects very interesting. Vegetation models that compute field strength exist but all these models are, more or less, for radar applications, i.e. backscattering of a signal from a surface covered by forest, for instance. No good wave propagation model over terrain exists that considers the effect of the vegetation. In this report, a model is presented that to some extent is able to do that and which is based on parabolic equation technique. The developed model is new and has not been published anywhere else. It assumes, however, that a vegetation area, such as a forest, can be approximated by a homogenous dielectric slab. If such an approximation is possible, the model should give a good result. The performed and presented comparison between theory and experiments shows also a good result. However, the resolution in the experimental data is not sufficient to state that the model works for all types of terrain with vegetation.
NTIS
Vegetation; Wave Propagation

20040042352 Lawrence Livermore National Lab., Livermore, CA
Design and Testing of the 1.5 T Superconducting Solenoid for the BaBar Detector at PEP-II in SLAC
OConner, T. G.; Shen, S.; Fabbricatore, P.; Farinon, S.; Musenich, R.; Jan. 26, 2001; 12 pp.; In English
Report No.(s): DE2003-15005482; UCRL-JC-142285; No Copyright; Avail: Department of Energy Information Bridge
This paper summarizes the culmination of a 3 year design, fabrication and testing program of the BABAR superconducting solenoid. The work was completed by an international collaboration between Ansaldo, INFN, LLNL, and SLAC. Critical current measurements of the superconducting strand, cable and conductor, cool-down, operation with the thermo-siphon cooling, fast and slow discharges, and magnetic forces are discussed in detail.
NTIS
Solenoids; Superconductivity

20040042353 Lawrence Livermore National Lab., Livermore, CA
B1 Magnet Harmonics
Barnes, P.; May 2000; 46 pp.; In English
Report No.(s): DE2003-15005727; UCRL-ID-139414; No Copyright; Avail: Department of Energy Information Bridge
During the BO Overpass construction for the CDF detector at Fermilab, 33 B 1 magnets were measured using a bucked tangential coil. Measurements were made on the midplane, at the centerline and at plus or minus 1 inch horizontal displacement. Since the coil was only 62 inches long, measurements were made at four longitudinal positions. Because of the design of the Main Ring, it was sufficient to combine data from all positions and report the harmonic spectrum for the magnet as a whole. For modeling the Scrounge-atron, it is more useful to treat each measurement position separately. I report here an analysis of the harmonic spectra at each probe position, based on the original data.
NTIS
Harmonics; Magnets; Displacement

20040042366 Stanford Linear Accelerator Center, CA, Stanford, CA, USA
Observation of the Decay D(sub s)(sup+)(yields)(omega)(pi)(sup+)
2003; 14 pp.; In English
Report No.(s): DE2003-813083; SLAC-PUB-9782; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Data Collection Platforms; Data Processing; Annihilation Reactions

20040042375 Stanford Linear Accelerator Center, CA, Stanford, CA, USA
Search for the Decays B0 -> D(*)+ D(*)-
2003; 16 pp.; In English
Report No.(s): DE2003-813087; SLAC-PUB-9789; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Data Collection Platforms; Data Systems; Data Processing

20040042382 Stanford Linear Accelerator Center, CA, Stanford, CA, USA
Studies of the Cabibbo-Suppressed Decays D+ -> pi0 lepton+ neutrino and D+ -> eta e+ electron-neutrino
2003; 14 pp.; In English
Report No.(s): DE2003-813090; SLAC-PUB-9793; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Leptons; Charm (Particle Physics)

20040043776 Air Force Research Lab., Brooks AFB, TX
Radio Frequency Dosimetry at the Air Force Research Laboratory
Hurt, William; Johnson, Leland; Kuhnel, Charles; Jan. 2004; 31 pp.; In English
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A420638; AFRL-HE-BR-TR-2003-0162; No Copyright; Avail: CASI; A03, Hardcopy
Knowledge of internal E- and H-fields, induced current densities, and SARs is of basic interest in the assessment of biological effects and medical applications of electromagnetic fields. Dosimetry is an important part of any scientific effort to assess the effects of EMF on biological organisms. Experimental dosimetry is essential in determining the internal fields and the whole body or localized SAR values in experiments with phantoms or animals. Carefully performed experiments are crucial in verification of theoretical predictions. In the last few years, considerable progress has been achieved in experimental and numerical dosimetry. Today a broad range of tools for dosimetric analysis for the wide frequency range is available. Because of the heterogeneity of the tissues and the nonuniformity of the incident fields, closed form analytical solutions are impossible and computer methods are needed to obtain the internally coupled fields. In theoretical dosimetry, FDTD is currently the most acceptable choice if digital anatomical models of man and animals are to be analyzed. The main contribution of our research efforts to the discipline of theoretical dosimetry is identification of the dependence of predicted SAR in relation to the variability in permittivity values for different tissue types when using different numerical anatomical models.
DTIC
Dosimeters; Electromagnetic Fields; Radio Frequencies

20040043793 Michigan Univ., Ann Arbor, MI
Establishment of a Hall Thruster Cluster
Gallimore, Alec D.; Feb. 2004; 23 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0294
Report No.(s): AD-A420670; AFRL-SR-AR-TR-04-0139; No Copyright; Avail: CASI; A03, Hardcopy
DURIP funds were used to develop a Hall thruster cluster test facility centered around the University of Michigan Large Vacuum Test Facility and a 2x2 cluster of BUSEK 600 W BHT-600 Hall thrusters. This capability will facilitate our three-year program to address the issue of high-power CDT operation and to provide insight on how chamber effects influence CDT engine/cluster characteristics.
DTIC
Electric Propulsion; Hall Thrusters

20040043895 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Electron Paramagnetic Resonance Spectroscopy and Hall Effect Studies of the Effects of Low Energy Electron Irradiation on Gallium Nitride
Greene, Kevin D.; Sep. 2003; 186 pp.; In English
Report No.(s): AD-A420816; AFIT/DSP/ENP/03-02; No Copyright; Avail: CASI; A09, Hardcopy
The nature of native donors in GaN, types and interactions of radiation-induced defects, and damage creation coefficients for 1.0 MeV electron irradiation have been ascertained by the concerted application of electron paramagnetic resonance

spectroscopy and Hall effect measurements to virgin and electron-irradiated GaN epilayers. Samples produced via molecular beam epitaxy and hydride vapor phase epitaxy, both silicon doped and nominally undoped, were subjected to Van de Graff generator produced monoenergtic electron beams with total fluences of 10^16- 10^18 electrons/cm^2. Nitrogen vacancies are rejected as a possible cause of n-type conductivity in nominally undoped GaN due to the decrease of shallow donor populations following irradiation. Damage constants for a donor-defect complex formation or defect compensation are found to be approximately 0.15 cm^-1. Identification by resolved hyperfine splitting is accomplished for radiation-induced Ga interstitial complexes.
DTIC
Electron Energy; Electron Irradiation; Electron Paramagnetic Resonance; Electron Spectroscopy; Gallium Nitrides; Hall Effect; Spectroscopy

71
ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20040035743 Swedish Defence Research Establishment, Stockholm, Sweden
First Study of Flow Induced Noise Around Naval Vehicles
Fureby, C.; Ivansson, S.; Karasalo, I.; Otto, K.; Svennberg, U.; 2003; In English
Report No.(s): PB2004-101811; FOI-R-0519-SE; No Copyright; Avail: National Technical Information Service (NTIS)
Surface ships and submarines emit noise. An important component of this noise is flow induced and consists of noise from the propulsor, boundary layer and vortices. The computer capacity of today and computational fluid dynamic codes can be used to compute the flow field (boundary layer and vortices) around vehicles with acceptable accuracy in model scale, but the resolution is not yet sufficient for reliable results in full scale. Methods for computation of the acoustic far field from a known acoustic source exist, but to compute the acoustic source term fluid dynamic simulations is not easy as we cannot afford to compute all details of the flow field. The acoustic source term has traditionally been based on empirical models. Within the framework of this project, a source model has been derived from analysis of the fluid dynamic equations. By means of different assumptions during the derivation, different models for the acoustic source term can be obtained. FOI is neither first nor alone to do this, during the past few years other groups have done this, but this is the first source modeling from fluid dynamic computations coupled to acoustic propagation at FOI. Since this project attempts to combine the knowledge from two different areas, computational fluid dynamics and acoustics, this report comprises results, as well as a presentation of basic theories in both areas. This is done to provide non-experts with a basic understanding for the issues in these areas.
NTIS
Underwater Acoustics; Ships

20040035945 Bolt, Beranek, and Newman, Inc., Arlington, VA
Progress Report on Comparisons of East China Sea Bottom Scattering Strengths at Low Frequency
Cable, P. G.; Dorfman, Y.; Gibson, R.; Yudichak, T. W.; Knobles, D. P.; Oct. 2002; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419786; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs on presentation of comparisons of bottom scattering strengths at low frequency as observed in the East China Sea.
DTIC
Acoustic Scattering; Low Frequencies

20040035947 Texas Univ., Austin, TX
A Progress Report on the Estimation of Geoacoustic Parameters from Measured Time Series Taken During the East China Sea Component of ASIAEX
Knobles, D. P.; Yudichak, T. W.; Cable, P. G.; Dorfman, Y.; Oct. 2002; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419845; No Copyright; Avail: CASI; A03, Hardcopy

Viewgraphs from a progress report on the estimation of geoacoustic parameters from measured time series taken during the East China Sea component of ASIAEX.
DTIC
Acoustic Scattering; Time Series Analysis

20040035979 Washington Univ., Seattle, WA
Subcritical Detection of Targets Buried Under a Rippled Interface: Calibrated Levels and Effects of Large Roughness
Lopes, J. L.; Nesbitt, C. L.; Lim, R.; Williams, K. L.; Thorsos, E. I.; Sep. 2003; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-1-0008
Report No.(s): AD-A420050; No Copyright; Avail: CASI; A02, Hardcopy

This paper describes results of an ongoing modeling and measurement effort investigating shallow grazing angle acoustic detection of targets buried in sand. The measurements were performed in a 13.7-meter deep, 110-meter long, 80-meter wide test pool with a 1.5-meter layer of sand on the bottom. A silicone-oil-filled target sphere was buried under a rippled surface with contours formed by raking the sand with a machined rake. Broadband (10 to 50 kHz) transducers were placed onto the shaft of a tilting motor, which in turn was attached to an elevated rail that enabled this assembly to be translated horizontally, permitting acquired data to be processed using synthetic aperture sonar (SAS) techniques. Acoustic backscatter data were acquired at subcritical grazing angles for various ripple wavelengths and heights. Also, the backscattered signals from a free-field sphere and the transmitted signals received with a free-field hydrophone were recorded. For each bottom configuration, the seabed roughness over the buried target was measured to determine the ripple parameters and to estimate the small- scale roughness spectrum. This roughness information is used in scattering models to calculate the backscattered signal levels from the target and bottom. In previous work, measured signal-to-reverberation ratios were found to compare well with model predictions, demonstrating the accuracy of first-order perturbation theory (for the ripple heights used in those experiments) for frequencies up to 30 kHz. By taking advantage of the backscattered data and the transmitted data, comparisons more stringent than in previous work were made between predicted and measured buried target backscatter levels. Results of a second series of measurements using larger ripple heights to investigate the impact of higher- order scattering effects on buried target detection are presented. (1 table, 9 figures, 10 refs.)
DTIC
Sound Detecting and Ranging; Surface Roughness; Target Acquisition

20040036201 Washington Univ., Seattle, WA
Spatial Coherence of Signals Forward Scattered from Sea Surface and Seabed in the East China Sea
Dahl, Peter; Eggen, Chris; Light, Russ; Oct. 2002; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420236; No Copyright; Avail: CASI; A03, Hardcopy

No abstract available
Acoustic Scattering; Ocean Surface; Underwater Acoustics

20040036203
The Modal-Vertical-Beam (MVB) Transmission Loss Analysis
Zhao, H. F.; Ge, H. L.; Gong, X. Y.; Oct. 2002; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420237; No Copyright; Avail: CASI; A03, Hardcopy

No abstract available
Transmission Loss; Underwater Acoustics

20040036263 Academia Sinica, Beijing
Matched Field Inversion of Explosive Signals from the ASIAEX ECS
Yan, Jin; Li, Zhenglin; Zhang, Renhe; Oct. 2002; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420291; No Copyright; Avail: CASI; A03, Hardcopy

Presentation of results of analysis of bomb signal propagation experiments held in the East China Sea using matched field inversion techniques.
DTIC
European Communications Satellite; Underwater Acoustics

20040036265 Academia Sinica, Beijing
Broadband Matched-field Source Localization in the East China Sea
Zhang, Renhe; Li, Zhenglin; Yan, Jin; Peng, Zhaohui; Li, Fenghua; Oct. 2002; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420293; No Copyright; Avail: CASI; A03, Hardcopy
Presentation of broadband matched-field source localization in the East China Sea.
DTIC
Position (Location); Signal Processing; Underwater Acoustics

20040036267
Bottom Reflection Phase Shift Parameter Estimation From ASIAEX Data
Ge, Huiliang; Zhao, Hanfang; Gong, Xian Yi; Shang, E. C.; Oct. 2002; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420296; No Copyright; Avail: CASI; A03, Hardcopy
Presentation of bottom reflection phase shift parameter estimation from ASIAEX data.
DTIC
Ocean Bottom; Phase Shift

20040036269 Academia Sinica, Beijing
Horizontal Coherence of Acoustic Field in the East China Sea
Xiao, Ling; Gong, Zaixiao; Li, Zhenglin; Oct. 2002; 41 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420297; No Copyright; Avail: CASI; A03, Hardcopy
Presentation of preliminary results of horizontal coherence of acoustic fields in the East China Sea.
DTIC
Signal Processing; Sound Fields

20040036281 Naval Postgraduate School, Monterey, CA
Construction and Testing of Low Noise Hydrophones
Juarez, Miguel A.; Dec. 2003; 66 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420311; No Copyright; Avail: CASI; A04, Hardcopy
Several hydrophones have been constructed exploiting the advantages of the MiniCan design. One of them is unamplified and two are amplified. Comparison in sensitivity, self-noise, size and price with known and reliable commercial hydrophones yield the following results, The unamplified MiniCan has sensitivity 22 dB re 1 V/microPa higher than a Bruel & Kjaer type 8103 up to 20 KHz and the amplified MiniCans are compared to their similar and relatively expensive commercial hydrophones. The self-noise level of the amplified MiniCans is significantly lower than those of the B&K 8106 and Reson TC4032. The size of these preamplified MiniCan units is at least 18 times smaller in volume than the largest of the aforementioned. Moreover, the cost of the piezoceramic material and electronics components is around $30 USD, compared to purchase prices of $3095 and $2500 USD for the B&K 8106 and Reson TC4032 respectively. The is shows a relatively cheap hydrophone that is more sensitive than a typical hydrophone and better self-noise than the least noisy commercial hydrophone in the market while being smaller and much cheaper.
DTIC
Low Noise

20040036397
The Effect of Scale on Propeller Tip-Vortex Cavitation Noise
Shen, Young T.; Strasberg, Murray; Dec. 2003; 26 pp.; In English
Report No.(s): AD-A420392; NSWCCD-50-TR-2003/057; No Copyright; Avail: CASI; A03, Hardcopy
Measurements made long ago of the underwater noise associated with propeller tip-vortex cavitation on a submerged WWII submarine underway at sea, combined with measurements of the noise from a geometrically scaled model of the same submarine running submerged and self propelled in our towing basin, are used to calculate the value of the exponent in McCormick's equation, (sigma (sub rho)/sigma (sub MU))=(Re(sub rho)/Re(sub MU))(exp n) , relating the ratio of full-scale to model cavitations numbers at cavitation inception to the ratio of the Reynolds numbers. The value of n is calculated to be

0. 28, which is smaller than the usually assumed values ranging from 0.3 to 0.4. This provides evidence that n is not a constant, but decreases with increasing Reynolds number.
DTIC
Cavitation Flow; Marine Propulsion; Noise (Sound)

20040036497 Office of Naval Research, Arlington, VA
Robust ABF for Large Passive Broadband Sonar Arrays
Owsley, Norman L.; Tague, John A.; Mar. 2003; 47 pp.; In English
Report No.(s): AD-A420471; No Copyright; Avail: CASI; A03, Hardcopy
Presentation of robust adaptive beamforming for large, passive broadband sonar arrays.
DTIC
Signal Processing

20040040193 NASA Langley Research Center, Hampton, VA, USA
Evaluation of a Mobile Phone for Aircraft GPS Interference
Nguyen, Truong X.; March 2004; 18 pp.; In English
Contract(s)/Grant(s): DFTA03-96-X-90001; WU 23-728-30-10
Report No.(s): NASA/TM-2004-213001; L-18364; No Copyright; Avail: CASI; A03, Hardcopy
Measurements of spurious emissions from a mobile phone are conducted in a reverberation chamber for the Global Positioning System (GPS) radio frequency band. This phone model was previously determined to have caused interference to several aircraft GPS receivers. Interference path loss (IPL) factors are applied to the emission data, and the outcome compared against GPS receiver susceptibility. The resulting negative safety margins indicate there are risks to aircraft GPS systems. The maximum emission level from the phone is also shown to be comparable with some laptop computer's emissions, implying that laptop computers can provide similar risks to aircraft GPS receivers.
Author
Global Positioning System; Reverberation Chambers; Telephones; Radio Frequencies

20040041331 Helsinki Univ. of Technology, Espoo, Finland
Electroacoustic Transducers and DSP. Seminar in Acoustics, Spring 2001
Karjalainen, M.; 2003; 178 pp.
Report No.(s): PB2004-102869; REPT-64; Copyright; Avail: National Technical Information Service (NTIS)
The topic of acoustics seminar of spring 2001 at Helsinki University of Technology, Laboratory of Acoustics and Audio Signal Processing was selected to be 'Electroacoustic transducers and DSP.' An important motivation to this was that professor Mark Kahrs from Rutgers University was a visiting and lecturing researcher to the laboratory. His knowledge in both subtopics was an excellent starting point for the seminar.
NTIS
Acoustics; Sound Waves; Electroacoustic Transducers

20040043759 Naval Postgraduate School, Monterey, CA
Source/Receiver Motion-Induced Doppler Influence on the Bandwidth of Sinusoidal Signals
Pistacchio, David J.; Dec. 2003; 155 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420613; No Copyright; Avail: CASI; A08, Hardcopy
Most self-propelled vessels moving on, or under, the ocean surface, contain rotating machinery that radiate finite bandwidth signals into the water. Empirical evidence suggests that the signal bandwidth estimated with a far field receiver is often greater than expected. This thesis investigates the use of an acoustic propagation model to predict the received bandwidth of sinusoidal signals when both the source and the receiver are in motion. The bandwidth parameter is calculated from the multi-frequency transmission loss (TL) predicted with a re-written version of K. Smith's Monterey-Miami Parabolic Equation (MMPE) model, including both receiver and source motion. The results for various propagation environments allow exploration of the characteristics of received bandwidth, predicted from sources on the surface or at depth. The dependency of aggregate bandwidth upon conditional parameters such as range, depth, and normalized pressure are also evaluated. In addition to modeling results, this thesis documents a new implementation of the MMPE model for narrowband signals using only the MATLAB programming language. A MATLAB version has the inherent advantages of increased flexibility and

portability. A MATLAB implementation of a range dependent ray trace function based upon a Runge-Kutta integration of the eikonal equations is also presented.
DTIC
Bandwidth; Receivers; Sine Waves; Sound Transmission

20040043823 Utah State Univ., Logan, UT
Computational Scattering Models for Elastic and Electromagnetic Waves in Particulate Media
Doyle, Timothy Edwin; Jan. 2003; 222 pp.; In English
Report No.(s): AD-A420723; AFRL-PR-ED-TP-2004-008; No Copyright; Avail: CASI; A10, Hardcopy

Numerical models were developed to simulate the propagation of elastic and electromagnetic waves in an arbitrary, dense dispersion of spherical particles. The scattering interactions were modeled with vector multipole fields using pure-orbital vector spherical harmonics, and solved using the full vector form of the boundary conditions. Multiple scattering was simulated by translating the scattered wave fields from one particle to another with the use of translational addition theorems, summing the multiple scattering contributions, and recalculating the scattering in an iterative fashion to a convergent solution. The addition theorems were rederived in this work using an integral method, and were shown to be numerically equivalent to previously published theorems. Both ordered and disordered collections of up to 5,000 spherical particles were used to demonstrate the ability of the scattering models to predict the spatial and frequency distributions of the transmitted waves. The results of the models show that they are qualitatively correct for many particle configurations and material properties, displaying predictable phenomena such as refractive focusing, mode conversion, and photonic band gaps. However, the elastic wave models failed to converge for specific frequency regions, possibly due to resonance effects. Additionally, comparison of the multiple scattering simulations with those using only single particle scattering showed that the multiple scattering computations are quantitatively inaccurate. The inaccuracies arise from nonconvergence of the translational addition theorems, introducing errors into the translated fields which minimize the multiple scattering contributions and bias the field amplitudes towards single scattering contributions. The addition theorems are shown to converge very slowly, and to exhibit plateaus in convergence behavior that can lead to false indications of convergence.
DTIC
Elastic Waves; Electromagnetic Radiation; Electromagnetic Wave Transmission; Mathematical Models; Particulates; Scattering

20040044169 Department of the Navy, Washington, DC
Gaseous Cavity for Forward-Looking Sonar Quieting
Kuklinski, Robert, Inventor; Oct. 6, 2003; 13 pp.; In English
Patent Info.: Filed 6 Oct. 2003; US-Patent-Appl-SN-10679676
Report No.(s): AD-D020128; No Copyright; Avail: Defense Technical Information Center (DTIC)

This patent application discloses a sonar quieting system for a forward-looking sonar array. The sonar quieting system includes a cavitator for forming an envelope; a strut for supporting the cavitator to a marine platform, such as a ship; a forward-looking sonar array mounted to a forward face of the cavitator; and a ventilation system for pumping a gas, such as air, into the envelope to create a gas cavity that envelops the supporting strut and equipment downstream of and during a forward movement of the cavitator. (2 figures)
DTIC
Cavitation Flow; Cavities; Noise (Sound); Noise Reduction; Patent Applications; Sonar

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

20040036599
The Colloquium on High Resolution Molecular Spectroscopy (18th), DIJON 2003, Dijon, France on 8-12 September 2003
Berger, Hubert; Sep. 2003; 513 pp.; In English
Contract(s)/Grant(s): F61775-02-W-F075
Report No.(s): AD-A420580; EOARD-CSP-02-5075; No Copyright; Avail: CASI; A22, Hardcopy

The Book of Abstracts for 18th International Colloquium on High Resolution Molecular Spectroscopy, 8 September 2003 - 12 September 2003. This is an interdisciplinary conference. The program covers the following fundamental and applied spectroscopic themes: Rotational, Infrared, Electronic, Dynamics, Atmospheric, Astrophysics, Theory, Novel techniques and Diagnostics.
DTIC
High Resolution; Molecular Spectroscopy

20040036617 Naval Postgraduate School, Monterey, CA
Determination of Young's Modulus of Carbon Nanotube Using Molecular Dynamics (MDSS) Simulation
Oh, Jung J.; Dec. 2003; 75 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420602; No Copyright; Avail: CASI; A04, Hardcopy

Molecular dynamics simulations were performed to determine the Young's modulus of the single-walled carbon nanotubes (SWNT) and bamboo structural carbon nanotubes (BSNT) models generated from the basic structure characteristics of graphite. The empirical Tersoff-Brenner potential and freestanding thermal vibration methods proposed by Krishnan et al were used to determine interatomic forces and rms displacements of carbon atoms at room temperature 300 K. The calculated average Young's modulus of SWNT and BSNT model were <Y> = 1,424 and 0,604 TPa, respectively. In particular, the calculated Y value of the SWNT model is in good agreement with the previous measurements. Although, the evaluated Y value of the BSNT model, which represents heterogeneous nanotubes, was less than the pure the SWNT model, it still has strong and stiff mechanical properties comparing with other general bulk materials such as hardened steel (210 GPa). CNTs hold a promising future for the variety of potential applications in the nanotechnology field.
DTIC
Carbon Nanotubes; Modulus of Elasticity; Molecular Dynamics

20040043791 Maryland Univ., College Park, MD
Experimental and Theoretical Investigation of Light-Atom Doped Clusters and Solids
Alexander, Millard H.; Dagdigian, Paul J.; Dec. 2003; 16 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0163
Report No.(s): AD-A420667; AFRL-SR-AR-TR-04-0129; No Copyright; Avail: CASI; A03, Hardcopy

A closely coordinated theoretical and experimental investigation of the non-bonded interactions between B, Al, and other atoms with the hydrogen molecule and other partners has been carried out. Fluorescence excitation and depletion spectra of weakly bound atom - molecule complexes, prepared in supersonic molecular beams, have been recorded and analyzed to derive information on the relevant interaction potentials involving the ground and excited electronic states of the atoms. Particular emphasis was placed on the study of the complex of an Al atom with molecular hydrogen. Global potential energy surfaces, for this system and others, have been computed through electronic structure calculations. These interaction potentials have been employed to calculate the energetics and structure of the binary complexes, as well as to investigate the properties of Al and B atoms doped in solid hydrogen. Through path integral molecular dynamics calculations employing these interaction potentials, the equilibrium properties of an Al atom trapped in solid para- hydrogen has been investigated. A new theory was developed to describe interactions between open-shell atoms mediated by the presence of spherical ligands and was applied to model the recombination of two Al atoms in doped solid hydrogen.
DTIC
Atoms; Clusters; Doped Crystals; Hydrogen; Solids

20040043946 California Univ., San Diego, La Jolla, CA
Intrinsic Left-Handed Metamaterials Research
Schultz, Sheldon; Smith, David R.; Schurig, David; Rosenbluth, Marshall; Jan. 2003; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0404
Report No.(s): AD-A420880; 27322A; AFRL-SR-AR-TR-04-0084; No Copyright; Avail: CASI; A03, Hardcopy

In this Final Report we present results for both areas of research and potential applications for the novel Left-Handed MetaMaterials (LFIM) which our group has previously discovered. In Section 1, we report advances made in our laboratory in instrumentation and simulations that focused on the utilization of LHM that can serve as backplanes for antennas with improved radiative properties. In Section II we discuss preliminary measurements on the incorporation of regions of paramagnetic spins into the LHM structure so as to permit magnetic field modulation of the Split Ring Resonators which

provide the negative permeativity of the sample. 110 Section III we report on our efforts to create a cooperative program with a suggested industrial manufacturer for utilization of high Tc superconducting components in LHM of interest.
DTIC
Paramagnetism; Resonators; Superconducting Devices

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20040036423 Youngstown State Univ., OH
Study of Triggering of Electromagnetic Pulses from Isomeric Materials
Carroll, James J.; Feb. 18, 2004; 20 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0263
Report No.(s): AD-A420412; GC01-01C-1; AFRL-SR-AR-TR-04-0122; No Copyright; Avail: CASI; A03, Hardcopy

Nuclear isomers can store tremendous amounts of energy for long times and the prospects for a controlled 'clean' release of this energy for applications have motivated considerable research. Significant insight into nuclear structure also results from studies of reactions that may cause a triggered energy release. The primary emphasis has been on reactions induced by externally-produced photons. These studies comprise a very narrow sub-field of nuclear physics that has often been poorly connected with the broader results of traditional investigations. This report details efforts under this grant to provide improved measurements of trigger processes for several isomers and to enhance the basic foundation of knowledge connecting triggering studies with the body of nuclear physics. The significance of the work is reflected by fifteen publications, including a result recognized by the American Physical Society as a top story in physics during 2000.
DTIC
Electromagnetic Pulses; X Ray Apparatus

20040040113 NASA Marshall Space Flight Center, Huntsville, AL, USA
Stacking Multiple Ion Captures in The High Performance Antiproton Trap (HiPAT)
Martin, James J.; Lewis, Raymond A.; Sims, William H.; Chakrabarti, Suman; Pearson, Boise; Fant, Wallace E.; [2004]; 1 pp.; In English; STAIF 2004 Conference, 8-12 Feb. 2004, Albuquerque, NM, USA; No Copyright; Avail: Other Sources; Abstract Only

The High performance Antiproton Trap (HiPAT) research project was initiated by the Marshall Space Flight Center's propulsion Research Center to examining the fundamental behavior of low energy antiprotons. Stored antiproton would ultimately be used for experimental demonstration of basic propulsive concepts. Matter-antimatter annihilation produces approximately 10(exp 8) MJ/g nearly 10 orders of magnitude more energy per unit mass than chemical based combustion, hence NASA's interest. To achieve containment, HiPAT utilizes a type of electromagnetic bottle know as a Penning trap positioned within an ultrahigh vacuum test section. Recently, the HiPAT hardware configuration has been enhanced to facilitate the capture of multiple normal matter ion burst. This endeavor is often referred to as 'stacking' and used to increasing the number of captured particles. A prior normal matter experimental effort, successfully demonstrated the effectiveness of single burst capture. The stacking process is accomplished by manipulating the electric field generated by the confinement electrodes i.e. adjusting the well potential depth. These potential well values are initially configured to maximize the quantity of captured ions per burst; shallow wells with a depth of 100 volt or less (referenced to the incoming ion beam energy) are typically selected. Once captured, a cooling interval is required to reduce the energy of trapped particles below the lower extent of the 'trap door' (or leading electrode) ion emitting potential. This is necessary such that a new burst of hot ions can be introduced while preventing those already inside from escaping. The cooling time is driven by a combination of mechanisms such as synchrotron radiation, background gas scattering, and resistive damping in a time scale on the order of minutes. A potential for reducing this hold period is to actively manipulate the electric field shape, using the power supply control system, to produce a deeper potential well. The trapped ions ride down the morphing well to a lower potential energy, leaving margin to once again cycle the 'trap door' capturing a new burst while limiting the number of escaping ions. By adjusting the magnitude and timing of the potential well shaping, subsequent shots from the ion beam can be captured on a time scale shorter then that dictated by the standard inject, capture and cool technique. Currently, experimental tests are under way

examining the functionally of this system for stacking multiple ions bursts within the HiPAT system.
Author
Antiprotons; Electric Fields; Ions; Particle Energy; Trapped Particles

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OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20040035732 Lawrence Livermore National Lab., Livermore, CA
Enabling Technology for Fabrication of Meter-Scale Gratings for High-Energy Petawatt Lasers
Britten, J. A.; Jones, L. M.; Carlson, T. C.; Bryan, S. J.; Hoaglan, C. R.; Aug. 21, 2003; 10 pp.; In English
Report No.(s): DE2003-15005084; UCRL-JC-153261; No Copyright; Avail: Department of Energy Information Bridge

We report on the construction, commissioning and characterization of a reactive ion mill capable of submicron pattern transfer into hard dielectric materials on optical substrates as large as 2 x 1 m. for application to fielding high-Energy Petawatt (HEP) capability on the National Ignition Facility (NIF) laser. Scanning Faraday cup current probe measurements have been used to optimize the ion beam spatial uniformity, Using process parameters obtained from this study, an 81 cm round optic was etched, and etch depth uniformity of +/- 3.1% absolute was demonstrated. Unformity of multilayer dielectric gratings of designs employing an etch-stop layer will have etch depth uniformities of approximately a factor of 10 better than this. We also report on initial results of etching multilayer dielectric gratings.
NTIS
Dielectrics; Fabrication; Ignition; Lasers; Gratings (Spectra); Technology Utilization

20040035751 Swedish Defence Research Establishment, Linkoeping
Laser Based 3-D Imaging New Capabilities for Optical Sensing. Technical Overview and Research Problems
Steinvall, O.; Carlsson, T.; Groenwall, C.; Larsson, H.; Andersson, P.; Apr. 2003; In English
Report No.(s): PB2004-101834; FOI-R-0856-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The ultimate solution for laser imaging might be a one-shot full 3D solution using a focal plane array with intensity and range (time) sensitive pixels. This report will discuss the technical status of 3 D focal plane arrays (3 D FPA) and other approaches and discuss applications for them, especially for long-range target identification and for terminal guidance. We describe the technology as found in open sources but also give examples of 3 D imaging and related activities at FOI. Hopefully we will convince the reader about the importance of this area. Some recommendations for further plans are given.
NTIS
Three Dimensional Models; Optics

20040035792 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Characterization and Prediction of the SPI Background
Teegarden, B. J.; Jean, P.; Knodlseder, J.; Skinner, G. K.; Weidenspointer, G.; December 31, 2003; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

The INTEGRAL Spectrometer, like most gamma-ray instruments, is background dominated. Signal-to-background ratios of a few percent are typical. The background is primarily due to interactions of cosmic rays in the instrument and spacecraft. It characteristically varies by +/- 5% on time scales of days. This variation is caused mainly by fluctuations in the interplanetary magnetic field that modulates the cosmic ray intensity. To achieve the maximum performance from SPI it is essential to have a high quality model of this background that can predict its value to a fraction of a percent. In this poster we characterize the background and its variability, explore various models, and evaluate the accuracy of their predictions.
Author
Spectrometers; Cosmic Rays; Background Radiation

20040035815 Lawrence Livermore National Lab., Livermore, CA
Employing Thin HPGe Detectors for Gamma-Ray Imaging
Vetter, K.; Milhailescu, L.; Ziock, K.; Burks, M.; Hull, E.; May 02, 2002; 12 pp.; In English
Report No.(s): DE2003-15005448; UCRL-JC-147466-REV-1; No Copyright; Avail: Department of Energy Information Bridge

We have evaluated a collimator-less gamma-ray imaging system, which is based on thin layers of double-sided strip HPGe detectors. The positions of individual gamma-ray interactions will be deduced by the strip addresses and the Ge layers which fired. Therefore, high bandwidth pulse processing is not required as in thick Ge detectors. While the drawback of such a device is the increased number of electronics channels to be read out and processed, there are several advantages, which are particularly important for remote applications: the operational voltage can be greatly reduced to fully deplete the detector and no high bandwidth signal processing electronics is required to determine positions. Only a charge sensitive preamplifier, a slow pulse shaping amplifier, and a fast discriminator are required on a per channel basis in order to determine photon energy and interaction position in three dimensions. Therefore, the power consumption and circuit board real estate can be minimized. More importantly, since the high bandwidth signal shapes are not used to determine the depth position, lower energy signals can be processed. The processing of these lower energy signals increases the efficiency for the recovery of small angle scattering. Currently, we are studying systems consisting of up to ten 2mm thick Ge layers with 2mm pitch size. The required electronics of the few hundred channels can be integrated to reduce space and power. We envision applications in nuclear non-proliferation and gamma-ray astronomy where ease of operation and low power consumption, and reliability, are crucial.
NTIS
Gamma Ray Astronomy; Imaging Techniques; Germanium; Thin Films

20040035819 Lawrence Livermore National Lab., Livermore, CA
Sputter Deposition of Silicon-Oxide Optical Coatings
Jankowski, A. F.; Hayes, J. P.; Felter, T. E.; Evans, C.; Nelson, A. J.; Mar. 22, 2002; 16 pp.; In English
Report No.(s): DE2003-15004805; UCRL-JC-147814; No Copyright; Avail: Department of Energy Information Bridge
Fused silica and Si-O, coatings are of interest for use under high flux conditions of laser light. Si-0, coatings are sputter deposited from silicon and fused quartz targets using planar magnetrons operated in the rf mode with a variable working-gas mixture of Argon-Oxygen. A series of coatings are prepared on optically flat, fused quartz substrates. Analysis of surface curvature reveals the deposition process conditions that minimize residual stress. Compressive stress levels that exceed 1.5 GPa can be reduced to less than 0.4 GPa for an optimum working gas pressure. Characterization using Rutherford backscattering and x-ray photoelectron spectroscopy indicates that both the fused quartz and silicon targets can be used to sputter deposit coatings with the chemical bonding features of the fused-quartz substrate material.
NTIS
Silicon Oxides; Sputtering; Antireflection Coatings; Lasers; Backscattering

20040035820 National Defence Research Establishment, Linkoeping, Sweden
Bullets of Light: Overview of Applications and Technology for Laser Weapons
Steinvall, O.; Sjoeqvist, L.; Jun. 2003; In Swedish
Report No.(s): PB2004-101836; FOI-R-1000-SE; No Copyright; Avail: National Technical Information Service (NTIS)
The report describes the status of laser weapons with emphasis on the development in USA. There are also descriptions of basic phenomena and limitations, technology, modeling and simulation as well as an overview of other potential applications for high energy lasers. Development of laser weapons is costly and their new capabilities must be evaluated in relation to conventional weapons. It is therefore recommended that the Swedish Armed Forces follow this area in order to evaluate both the threat and capability sides of the coin. It is therefore reasonable that we maintain and expand the competence in relevant laser areas such as laser radar and DIRCM to include potential upgrade of these systems to high energy levels and to be able to recommend proper protection for high energy lasers.
NTIS
Laser Weapons; Laser Applications; General Overviews; Technology Utilization

20040035825 Lawrence Livermore National Lab., Livermore, CA
Ultrasonic Technology for Characterizing Laser Damage in Optics
Thomas, G.; Martin, L. P.; Chambers, D.; Apr. 30, 2002; 12 pp.; In English
Report No.(s): DE2003-15005444; UCRL-JC-146151; No Copyright; Avail: Department of Energy Information Bridge
An ultrasonic technique was developed to detect and characterize laser damage in critical optics. During normal usage, sub critical flaws induced by high laser fluence can grow to critical size and potentially can cause unanticipated failure of the optics, This ultrasonic technique monitors the optic in situ and provides a quick, reliable way to quantify the location, number and, ultimately, the size of defects that may initiate and grow during firing of the laser. The feasibility of detecting and sizing laser-induced damage with an ultrasonic technology was theoretically and experimentally demonstrated. An experiment was

conducted whereby ultrasonic data was acquired in situ on an optic as it was damaged by a laser. This monitoring of laser induced damage clearly demonstrated the potential for ultrasonic monitoring of critical optics for laser-induced damage.
NTIS
Laser Damage; Optics; Ultrasonics; Technologies

20040035895 Michigan State Univ., East Lansing. Dept. of Chemistry, East Lansing, MI, USA
Fiber Optical Micro-Detectors for Oxygen Sensing in Power Plants
Baker, G. L.; Ghosh, R. N.; Osborn, D. J.; Jan. 2003; 18 pp.; In English
Report No.(s): DE2003-816714; No Copyright; Avail: Department of Energy Information Bridge

In this report, initial results pertaining to the synthesis molybdenum clusters and characterization using absorption, optical microscopy, and x-ray powder diffraction are discussed. The synthesis was performed according to literature, but results from x-ray powder diffraction indicate that the synthesis did not give the desired compound. The absorption and optical microscopy indicate that the compound synthesized has properties similar to the desired Mo(sub 6)Cl(sub 12) clusters, so it is unclear as of yet what happened. The sample cell for performing high temperature spectroscopy on thin films of the molybdenum clusters at elevated temperature in a controlled gas environment was designed and an initial prototype was built.
NTIS
Optical Fibers; Optical Measuring Instruments; Controlled Atmospheres

20040035933 Lawrence Livermore National Lab., Livermore, CA
Defects Induced in Fused Silica by High Power UV Laser Pulses at 355 nm
Stevens-Kalceff, M. A.; Stesmans, A.; Wong, J.; Mar. 23, 2001; 16 pp.; In English
Report No.(s): DE2003-15004775; UCRL-JC-143210; No Copyright; Avail: Department of Energy Information Bridge

Point defects induced in high quality optical-grade based silica by high power (gt30 J/cm(sup 2)) 355 nm laser pulses have been investigated to elucidate the nature of laser damage in transparent optics designed for use at the National Ignition Facility (NIF). Six defects have been identified: the NBOHC (non-bridging oxygen hole center), a STE (self-trapped exciton), an ODC (oxygen-deficient center), interstitial oxygen, the E'(sub(gamma)), and E'(sub 74). The former four defects were identified and spatially resolved in the damage craters using cathodoluminescence (CL) microanalysis (spectroscopy and microscopy). The latter two defects were identified using ESR spectroscopy at cryogenic temperatures. These defects are unlikely to be a prime factor in damage growth by subsequent laser pulses. Their concentration is too low to effect a high enough temperature rise by a volume absorption mechanism.
NTIS
Lasers; Defects; Ultraviolet Lasers; Silicon Dioxide; Ignition

20040036195 George Mason Univ., Fairfax, VA
Advanced Optical Limiter Materials
Roberts, Gerald; Maya, Eva; Snow, Arthur; Shirk, James; Feb. 16, 2004; 42 pp.; In English
Contract(s)/Grant(s): N00014-99-1-0914
Report No.(s): AD-A420228; No Copyright; Avail: CASI; A03, Hardcopy

This final report summarizes research on the synthesis, characterization and evaluation of phthalocyanine and phenanthralocyanine compounds with peripheral siloxane substitution. These materials are intrinsic liquids, have very low degrees of dye aggregation and significant merit for the optical limiting application. The phthalocyanine is better qualified than the phenanthralocyanine for this application.
DTIC
Optical Materials

20040036347 Naval Postgraduate School, Monterey, CA
Wireless IR Image Transfer System for Autonomous Vehicles
Ata, Ali; Dec. 2003; 49 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420351; No Copyright; Avail: CASI; A03, Hardcopy

A wireless IR image transfer mechanism was developed and tested for eventual employment on the NPS autonomous ground vehicle. Tests were conducted inside a building as a rough simulation of an urban environment. Two common ISM frequency bands were explored. Experiments results proved that the 915 MHz band was best suited for this effort. Data revealed that minimal signal loss occurs at Line of Site out to several hundred meters. Signal loss through obstructions:

Cement wood and metal proved significant on the order of 10 -15 dB per obstruction. But the image transfer was successful through multiple obstructions at range of 400 meters. Further work includes integration into the autonomous vehicle and testing of the performance.
DTIC
Image Processing; Infrared Imagery; Infrared Radiation; Wireless Communication

20040036365 Naval Postgraduate School, Monterey, CA
Testing and Performance Characterization of the Split-Field Polarimeter in the 3-5 Micrometers Waveband
Tung, Yan Foo; Dec. 2003; 101 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420370; No Copyright; Avail: CASI; A06, Hardcopy

The infrared (IR) radiation emitted or reflected in an off-normal direction from a smooth surface is partially polarized. This principle can be used for enhanced discrimination of targets from backgrounds in marine environment. It has been shown that (man-made) targets do not demonstrate a pronounced polarization effect when observed at near normal existence whereas the sea background radiation has a significant degree of polarization in slant observation directions. The NPS split-field polarimeter was previously designed and constructed to provide simultaneous image pairs in a single frame, differing only in the direction of linear polarization. The system can operate in both long wavelength (8-12 micrometers) and the mid wavelength (3-5 micrometers) with interchangeable polarizing splitter plates. In this thesis, tests were conducted to visually compare the polarizing effect on objects in the 3-5 micrometers waveband using the polarimeter and with the external polarizer. The image recorded in the laboratory with the horizontal and vertical polarizations depicts a contrast enhancement differing with varied aspect of the target. With the successful demonstration of the polarimeter operability, the performance of the thermal imager operated with and without the polarimeter was characterized by measuring its Minimum Resolvable Temperature Difference (MRTD) as a function of different spatial frequency. The measured performance was then compared against the same thermal imager using an external polarizer. The measured MRTD curve is used to model the system detection and recognition range using the Johnson criteria.
DTIC
Infrared Radiation; Marine Environments; Target Acquisition; Polarimeters; Spatial Distribution

20040036519 Johns Hopkins Univ., Laurel, MD
Nonclassical Effects in Quantum Optics
Franson, J. D.; Feb. 26, 2004; 8 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0180
Report No.(s): AD-A420491; No Copyright; Avail: CASI; A02, Hardcopy

Several experimental and theoretical investigations in quantum optics were performed under this grant, with potential applications for improved gyroscope performance, more accurate clock synchronization, and quantum communications and information processing. A controlled-NOT quantum logic gate for single photons was experimentally demonstrated for the first time. Several methods for generating nonclassical states of light as needed for various applications were investigated theoretically. Methods for improved single-photon detection efficiency were demonstrated experimentally and investigated theoretically.
DTIC
Quantum Optics

20040036537 Missouri Univ., Saint Louis, MO
International van der Ziel Symposium on Quantum 1/f, 1/f Noise and Other Low Frequency Fluctuations, Mainly in GaN, Quantum or Nanometric Devices (9th) Held in Richmond, Virginia on August 2-4, 2002
Handel, Peter H.; Feb. 10, 2004; 12 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0373
Report No.(s): AD-A420504; 5-34218; AFRL-SR-AR-TR-04-0126; No Copyright; Avail: CASI; A03, Hardcopy

The '19th International van der Ziel Symposium on Quantum l/fl/f Noise and Other Low Frequency Fluctuations, mainly in GaN, Quantum or Nanometric Devices' has brought substantial progress both in fundamental quantum l/f noise theory, and in the application to GaN devices and oscillators. The new developments were obtained in the US, in Japan and in Europe, with the top specialists in this new quantum l/f field participating from 3 continents, with their students. They have further refined and improved a unique tool for the optimization of high-tech devices and systems, based on the quantum l/f theory.

Finally, they have contributed to the education of a new generation of specialists that can optimize high-tech devices and nano-devices with the quantum l/f formulas.
DTIC
Gallium Nitrides; Low Frequencies; Low Noise; Quantum Theory

20040037755 National Inst. of Standards and Technology, Boulder, CO, USA
High-Accuracy Laser Power and Energy Meter Calibration Service
Livigni, D.; Aug. 2003; 156 pp.
Report No.(s): PB2004-103365; NIST/SP-250-62; No Copyright; Avail: CASI; A08, Hardcopy

We have built a calibration system to meet the industry's need for very high accuracy measurements of laser power and energy, of various (selected) wavelengths. The system employs a commercial cryogenic radiometer as the primary standard. This commercial radiometer is referred to as the Laser Optimized Cryogenic Radiometer (LOCR) and is one of several NIST cryogenic radiometers that are used as primary standards for various types of high-accuracy optical measurements. The calibration system provides measurements of detector responsivity as a function of laser power with an expanded uncertainty of typically 0. 03% or less (with a coverage of k=2) and provides traceability to SI units with reduced uncertainty for customers requiring the highest level of accuracy. The new calibration system and the procedures for detector calibration based on the LOCR are described within this document.
NTIS
Lasers; Optical Measurement; Radiometers

20040037778 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Independent Testing of JWST Detector Prototypes
Figer, D. F.; Rauscher, B. J.; Regan, M. W.; Balleza, J.; Bergeron, L.; Morse, E.; Stockman, H. S.; [2003]; 1 pp.; In English; SPIE Conference, 3-8 Aug. 2003, San Diego, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Independent Detector Testing Laboratory (IDTL) is jointly operated by the Space Telescope Science Institute (STScI) and the Johns Hopkins University (MU), and is assisting the James Webb Space Telescope (JWST) mission in choosing and operating the best near-infrared detectors under a NASA Grant. The JWST is the centerpiece of the NASA Office of Space Science theme, the Astronomical Search for Origins, and the highest priority astronomy project for the next decade, according to the National Academy of Science. JWST will need to have the sensitivity to see the first light in the Universe to determine how galaxies formed in the web of dark matter that existed when the Universe was in its infancy (z approx. 10 - 20). To achieve this goal, the JWST Project must pursue an aggressive technology program and advance infrared detectors to performance levels beyond what is now possible. As part of this program, NASA has selected the IDTL to verify comparative performance between prototype JWST detectors developed by Rockwell Scientific (HgCdTe) and Raytheon (InSb). The IDTL is charged with obtaining an independent assessment of the ability of these two competing technologies to achieve the demanding specifications of the JWST program within the 0.6 - 5 approx. mum bandpass and in an ultra-low background (less than 0.01 e'/s/pixel) environment. We describe results from the JWST Detector Characterization Project that is being performed in the IDTL. In this project, we are measuring first-order detector parameters, i.e. dark current, read noise, QE, intra-pixel sensitivity, linearity, as functions of temperature, well size, and operational mode.
Author
Infrared Detectors; Performance Tests; Dark Current; Dark Matter; Galaxies

20040040124 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Novel Inter Core-Cladding Lithium Niobate Thin Film Coated Fiber Modulator/Sensor
Jamison, Tracee L.; Komriech, Phillip; Yu, Chung; [2004]; 8 pp.; In English; Micromaching Technology for Microoptic and Nanooptics II, 24-30 Jan. 2004, San Jose, CA, USA; Copyright; Avail: CASI; A02, Hardcopy

A fiber modulator/sensor has been fabricated by depositing a lithium niobate sol-gel thin film between the core and cladding of a fiber preform. The preform is then drawn into 125 micron fiber. The proposed design of lithium niobate cylinder fibers can enhance the existing methodology for detecting sound waves under water utilizing the acoustooptic properties of lithium niobate. Upon application of a stress or strain, light propagating inside the core, according to the principle of total internal reflection, escapes, into the cladding because of the photoelastic boundary layer of lithium niobate. Test results of the lithium niobate fiber reveal a reduction in the 1550 nm, 4mW source with applied tension. The source power from an ordinary

quartz fiber under the same stress condition remained invariant to applied tension.
Author
Acousto-Optics; Cladding; Lithium Niobates; Thin Films; Coatings; Modulators

20040040144 Smart Fibres Ltd., Bracknell, UK
Application of Optical Fibre Sensors for Marine Structural Monitoring
Doyle, Crispin; Staveley, Chris; Proceedings of the ACMC/SAMPE Conference on Marine Composites; [2003], pp. 107-115; In English; See also 20040040136; Original contains black and white illustrations
Contract(s)/Grant(s): EPSRC-YAG/08/02/1054; Copyright; Avail: Other Sources

This paper addresses issues relating to structural monitoring in composite-hulled craft using optical fibre sensors. Fibre optic sensors are attractive for a wide range of structural load monitoring applications. Due to their small size, they can be readily embedded into composite materials. Other advantages include their multiplexing capability and immunity to electro-magnetic interference. Results from an installation of fibre-optic sensors in a 38 m free-standing composite yacht mast are presented, demonstrating the potential of this technology in a maritime environment.
Author
Composite Materials; Monitors; Bragg Gratings

20040040149 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The 94 GHz Cloud Radar System on a NASA ER-2 Aircraft
Li, Lihua; Heymsfield, Gerald M.; Racette, Paul E.; Tian, Lin; Zenker, Ed; [6 October 2003]; 32 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

The 94-GHz (W-band) Cloud Radar System (CRS) has been developed and flown on a NASA ER-2 high-altitude (20 km) aircraft. The CRS is a fully coherent, polarimeteric Doppler radar that is capable of detecting clouds and precipitation from the surface up to the aircraft altitude in the lower stratosphere. The radar is especially well suited for cirrus cloud studies because of its high sensitivity and fine spatial resolution. This paper describes the CRS motivation, instrument design, specifications, calibration, and preliminary data &om NASA s Cirrus Regional Study of Tropical Anvils and Cirrus Layers - Florida Area Cirrus Experiment (CRYSTAL-FACE) field campaign. The unique combination of CRS with other sensors on the ER-2 provides an unprecedented opportunity to study cloud radiative effects on the global energy budget. CRS observations are being used to improve our knowledge of atmospheric scattering and attenuation characteristics at 94 GHz, and to provide datasets for algorithm implementation and validation for the upcoming NASA CloudSat mission that will use a 94-GHz spaceborne cloud radar to provide the first direct global survey of the vertical structure of cloud systems.
Author
Clouds (Meteorology); Radar Equipment; Design Analysis; Precipitation (Meteorology); Specifications; Calibrating; Data Management

20040041326 Helsinki Univ. of Technology, Espoo, Finland
Helsinki University of Technology Metrology Research Institute Report Annual Report 2002
Kaerhae, P.; 2003; 60 pp.
Report No.(s): PB2004-103317; MRI-21/2003; Copyright; Avail: National Technical Information Service (NTIS)

The Metrology Research Institute is one of the units at the Department of Electrical and Communications Engineering of HUT. The research work of the Institute consists of optical radiation measurements, laser applications, fiber optics and micro technologies. In 2002, significant achievements were made in super continuum generation in photonic crystal fibers and tapered fibers. The super continuum can be applied to construct an optical frequency comb generator on which subject an extensive new project was started. The comb generator will eventually allow direct absolute measurement of the optical frequencies of laser lines. One interesting application of optical radiation measurements is spectrophotometric determination of the parameters of thin-film optical coatings which are important for various optical components.
NTIS
Metrology; Electrical Engineering; Laser Applications

20040041336 Swedish Defence Research Establishment, Linkoeping
Aero-Optical and Plume Effects in Airborne Laser Coutermeasure Applications
Sjoeqvist, L.; Steinvall, O.; Dec. 2002; In English
Report No.(s): PB2004-102193; FOI-R-0700-SE; Copyright; Avail: National Technical Information Service (NTIS)

In airborne laser countermeasure applications (DIRCM) several sources of perturbations, which affect the performance of the system, need to be considered. The main task of a DIRCM system is to optimize the laser irradiance at the target (missile) for a certain time until break-lock can be verified. Perturbations such as: platform-induced jitter, aero-optical effects, jet engine exhaust plumes and strong turbulence may severely degrade the performance. In this report, strong perturbations relevant for DIRCM applications have been reviewed. The most important aero-optical effects include turbulent boundary and shear layers, in viscid flow and shocks. Contributions from these effects to the laser beam quality have been estimated using simple models and experimental data. Experimental data and models available on plume effects, relevant for fast jet installations, have been reviewed. Calculations aiming to estimate the tracking performance and beam optimization in different situations are presented.
NTIS
Plumes; Countermeasures; Airborne Lasers

20040045160 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Alignment and Performance of the Infrared Multi-Object Spectrometer
Connelly, Joseph A.; Ohl, Raymond G.; Mentzell, J. Eric; Madison, Timothy J.; Hylan, Jason E.; Mink, Ronald G.; Saha, Timo T.; Tveekrem, June L.; Sparr, Leroy M.; Chambers, V. John; Fitzgerald, Danetter; Greenhouse, Matthew A.; MacKenty, John W.; [2004]; 11 pp.; In English; SPIE - Optical Science & Technology Annual Meeting, 3-8 Aug. 2003, San Diego, CA; Copyright; Avail: CASI; A03, Hardcopy

The Infrared Multi-Object Spectrometer (IRMOS) is a principle investigator class instrument for the Kitt Peak National Observatory 4 and 2.1 meter telescopes. IRMOS is a near-IR (0.8 - 2.5 micron) spectrometer with low-to mid-resolving power (R = 300 - 3000). IRMOS produces simultaneous spectra of approximately 100 objects in its 2.8 x 2.0 arc-min field of view (4 m telescope) using a commercial Micro Electro-Mechanical Systems (MEMS) micro-mirror array (MMA) from Texas Instruments. The IRMOS optical design consists of two imaging subsystems. The focal reducer images the focal plane of the telescope onto the MMA field stop, and the spectrograph images the MMA onto the detector. We describe ambient breadboard subsystem alignment and imaging performance of each stage independently, and ambient imaging performance of the fully assembled instrument. Interferometric measurements of subsystem wavefront error serve as a qualitative alignment guide, and are accomplished using a commercial, modified Twyman-Green laser unequal path interferometer. Image testing provides verification of the optomechanical alignment method and a measurement of near-angle scattered light due to mirror small-scale surface error. Image testing is performed at multiple field points. A mercury-argon pencil lamp provides a spectral line at 546.1 nanometers, a blackbody source provides a line at 1550 nanometers, and a CCD camera and IR camera are used as detectors. We use commercial optical modeling software to predict the point-spread function and its effect on instrument slit transmission and resolution. Our breadboard and instrument level test results validate this prediction. We conclude with an instrument performance prediction for cryogenic operation and first light in late 2003.
Author
Alignment; Performance Prediction; Infrared Spectrometers; Telescopes; Microelectromechanical Systems; Mechanical Engineering

20040045198 Syracuse Univ., NY, USA
LiNbO3 Cylinder Fiber
Kornreich, Philip; [2004]; 5 pp.; In English
Contract(s)/Grant(s): NAG5-12391; No Copyright; Avail: CASI; A01, Hardcopy

We have successfully fabricate optical fiber with a thin layer of LiNbO3 at the boundary of the glass core and clear glass cladding. The construction of this fiber is based on our successful Semiconductor Cylinder Fibers (SCF). A schematic representation of a LiN bo, Cylinder Fiber. These fibers can be used as light modulators, sonar detectors and in other applications. The core diameter of the fiber is sufficiently small compared to the light wavelength and the indices of refraction of the core and cladding glasses are sufficiently close in value so that there is sufficient light at the core cladding boundary to interact with the LiNbO3 layer. This fiber functions best when just a single light mode propagates through the fiber. The idea for a LiNbO3 Cylinder Fiber came from Dr. Tracee Jamison of NASA. The optical properties of LiNbO3 can be changed with strain or the application of an electric field. Thus these fibers can be used as acoustic sensors as for example in a sonar. They can also be used as electric field operated light modulators. However, for this application the fibers would be made with a cross section in the form of a 'D'. The core with its surrounding LiNbO, layer would be close to the flat portion of the 'D' shaped fiber. Two metal contacts would be deposited on the flat portion of the fiber on either side of the core. A voltage applied across these contacts will result in an electric field in the core region that can be used for modulating the optical properties

of the LiNbO3 layer. To our knowledge this is the first ever LiNbO3 Cylinder Fiber made.
Derived from text
Fabrication; Lithium Niobates; Light Modulators; Optical Fibers; Thin Films; Glass; Electric Potential

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20040035767 Fermi National Accelerator Lab., Batavia, IL, USA
Revision Control in the Grid Era-the Unmet Challenge
Kreymer, A.; Oct. 2003; 10 pp.; In English
Report No.(s): DE2003-815750; FERMILAB-CONF-03/274; No Copyright; Avail: Department of Energy Information Bridge
As we move to distribute High Energy Physics computing tasks throughout the global Grid, they are encountering ever more severe difficulties installing and selecting appropriate versions of the supporting products. Problems show up at every level: the base operating systems and tools, general purpose utilities like root, and specific releases of application code. The author discusses some specific examples, including what we've learned in commissioning the SAM software for use by CDF. The author also shows why revision control can be a truly difficult problem, and will discuss what we've been doing to measure and control the situation.
NTIS
High Energy Interactions; Utilities

20040035862 Princeton Univ., NJ
Temperature Gradient in Hall Thrusters
Staack, D.; Raitses, Y.; Fisch, N. J.; Nov. 2003; 18 pp.; In English
Report No.(s): DE2004-820206; PPPL-3905; No Copyright; Avail: Department of Energy Information Bridge
Plasma potentials and electron temperatures were deduced from emissive and cold floating probe measurements in a 2 kW Hall thruster, operated in the discharge voltage range of 200-400 V. An almost linear dependence of the electron temperature on the plasma potential was observed in the acceleration region of the thruster both inside and outside the thruster. This result calls into question whether secondary electron emission from the ceramic channel walls plays a significant role in electron energy balance. The proportionality factor between the axial electron temperature gradient and the electric field is significantly smaller than might be expected by models employing Ohmic heating of electrons.
NTIS
Temperature Gradients; Thrustors; Electric Potential; Electron Energy

20040035937 Princeton Univ., NJ
Collisional Drift Waves in Stellarator Plasmas
Lewandowski, J. L. V.; Oct. 2003; 42 pp.; In English
Report No.(s): DE2003-820080; PPPL-3877; No Copyright; Avail: Department of Energy Information Bridge
A computational study of resistive drift waves in the edge plasma of a stellarator with an helical magnetic axis is presented. Three coupled field equations, describing the collisional drift wave dynamics in the linear approximation, are solved as an initial-value problem along the magnetic field line. The magnetohydrodynamic equilibrium is obtained from a three-dimensional local equilibrium model. The use of a local magnetohydrodynamic equilibrium model allows for a computationally efficient systematic study of the impact of the magnetic field structure on drift wave stability.
NTIS
Stellarators; Plasmas (Physics); Magnetohydrodynamics

20040043755 Ohio State Univ., Columbus, OH
Breakthrough to Optimized Pulsed Plasma Thrusters
York, Thomas M.; Feb. 12, 2004; 69 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0032; Proj-2308
Report No.(s): AD-A420608; AFRL-SR-AR-TR-04-0096; No Copyright; Avail: CASI; A04, Hardcopy
Analytic models predict the possibility of extending the range of performance parameters of Pulsed Plasma Thrusters

(PPT) by using propellants other than the traditionally used Teflon. A theoretical and experimental effort was initiated at The Ohio State University to investigate the use of alternative propellants for PPT. Analytical and numerical calculations (MACH2) indeed indicate a significant broadening of the obtainable range of specific impulse and thrust-to-power ratios when alternative propellants such as lithium or water are utilized. Consequently, in an effort to investigate changes in physical phenomena and thruster performance experimentally, a hybrid thruster was designed and built, facilitating the use of alternatively water or Teflon. The thruster design includes a unique water propellant feed system, allowing the supply of the water propellant without detrimentally affecting the inherent simplicity of the PPT system. The thruster operation and performance was investigated by several different diagnostic methods, including current and voltage measurements, Langmuir probes, and magnetic field probes. Furthermore, impact pressure measurements in the plume of the thruster allowed new insight into the plume structure and the accurate evaluation of impulse bits. Employment of the diagnostic methods for Teflon and water propellant enabled the unambiguous identification of propellant related effects such as reduced electron temperature and higher exhaust velocities in the case of water propellant.
DTIC
Plasma Engines; Propellants; Pulsed Plasma Thrusters

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SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20040035769 Ljubljana Univ., Ljubljana, Slovenia
Power Conductor Magnetic Field Mitigation Using Passive Loops
Istenic, Marko; Kokelj, Peter; Zunko, Peter; Electrotechnical Review; 2002; ISSN 0013-5852; Volume 69, No. 5, pp. 291-297; In Slovene; Copyright; Avail: Other Sources

Feasible applications of passive loops for magnetic field mitigation near load carrying conductors are analysed. The analysis was made in the environment of short power conductors (i.e. transformer low voltage cables, busbar connections, power cables), and existing Slovene power lines, especially with regard to the arrangement of passive loop for the optimal magnetic field mitigation around the source conductors. For this purpose, a simple analytical method defining the interaction between the original field of the source currents and that caused by currents in the passive pools was introduced. To determine the validity of the formulae that defined the induced current to the passive loop, a laboratory experiment of a low voltage three phase cable system with a phase current of 100 A was made. Then the theoretical formula was applied to several conductor geometries of overhead transmission power lines and underground cable system to assess the effectiveness of the optimal arrangements of the passive loop conductors.
Author
Conductors; Loops; Magnetic Fields

20040035822 Institute of Electron Technology, Warsaw, Poland, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Engineering ZnO/GaN Interfaces for Tunneling Ohmic Contacts to GaN
Kaminska, E.; Piotrowska, A.; Golaszewska, K.; Kruszka, R.; Kuchuk, A.; 2003; 10 pp.; In English
Report No.(s): DE2003-816553; No Copyright; Avail: Department of Energy Information Bridge

We have investigated two approaches for the fabrication of thin ZnO films: sputter deposition from the ZnO target and thermal oxidation of vacuum deposited Zn. The microstructure and electronic properties after consecutive steps of the formation of n-ZnO/p- GaN contacts have been studied using electron transmission microscopy and x-ray photoelectron spectrometry. We have achieved ohmic contacts by Zn oxidation and explain their ohmic behavior in terms of a tunnel n+-ZnO - p-GaN junction.
NTIS
Electrical Properties; Interfaces; Photoelectrons; X Ray Spectroscopy; Zinc Oxides; Gallium Nitrides

20040037783 NASA Goddard Space Flight Center, Greenbelt, MD, USA
NIEL for Heavy Ions: An Analytical Approach
Messenger, S. R.; Burke, E. A.; Xapsos, M. A.; Summers, G. P.; Walters, R. J.; Jun, I.; Jordan, T.; [2004]; 5 pp.; In English; Nuclear and Space Radiation Effects Conference, 21-25 Jul. 2003, Monterey, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy

We describe an analytical model for calculating NIEL for heavy ions based upon screened Coulomb potentials. The model applies to any incident ion on any target material in the Coulombic limit.
Author
Heavy Ions; Mathematical Models; Silicon

20040042358 Lawrence Livermore National Lab., Livermore, CA
Nuclear Fusion Driven by Coulomb Explosions of Deuterium Clusters
Zweiback, J.; Smith, R. A.; Cowan, T. E.; Hays, G.; Hartley, J.; Jun. 2000; 12 pp.; In English
Report No.(s): DE2003-15005959; UCRL-JC-139332; No Copyright; Avail: Department of Energy Information Bridge
We have examined the interaction of deuterium clusters with high intensity, ultrafast laser radiation. Upon irradiation a hot plasma is created with a sufficient temperature to produce nuclear fusion. We have seen that larger clusters produce more fusion neutrons than smaller clusters, consistent with a Coulomb explosion model. Fusion yield is currently limited by propagation effects. Using inter ferometric imaging we have examined the laser propagation and found that the laser energy is absorbed before it penetrates to the center (highest density region) of the gas jet.
NTIS
Nuclear Fusion; Deuterium; Irradiation; Laser Beams

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

20040035779 Pittsburgh Univ., Pittsburgh, PA, USA
Peripheral Social Awareness Information in Collaborative Work
Spring, Michael B.; Vathanophas, Vichita; Journal of the American Society for Information Science and Technology, Volume 54, No. 11; September 2003, pp. 1006-1013; In English; See also 20040035777; Copyright; Avail: Other Sources
People working in physical proximity have access to information about one another. Much of this information is unavailable when people collaborate remotely using groupware. Being aware of other members of a team in a collaborative environment involves knowing both what people are doing and what is happening to the shared information space or artifact. Increasing the amount of information about the group in a computer-mediated system may increase the group s ability to complete the task. This article reports on a study that examined group performance on a task that was computer mediated with and without awareness information. In particular, the study examined how an awareness tool impacts the quality of the work effort and the communications between group members in the completion of a collaborative authoring task.
Author
Group Dynamics; Information Dissemination

20040040162 NASA Langley Research Center, Hampton, VA, USA, Hampton Univ., VA, USA
2002 NASA-HU Faculty Fellowship Program
DePriest, Douglas J., Compiler; Murray, Deborah B., Compiler; Berg, Jennifer J., Compiler; January 2004; 96 pp.; In English
Contract(s)/Grant(s): NCC1-02015; WU 23-772-30-HA
Report No.(s): NASA/CR-2004-212687; No Copyright; Avail: CASI; A05, Hardcopy
Since 1964, NASA has supported a program of summer faculty fellowships for engineering and science educators. In a series of collaborations between NASA research and development centers and nearby universities, engineering and science faculty members spend 10 weeks working with professional peers on research. NASA HQs and the American Society for Engineering Education supervise the program. Objectives: (1) To further the professional knowledge of qualified engineering and science faculty members; (2) To stimulate an exchange of ideas between participants and NASA; (3) To enrich and refresh the research and teaching activities of the participants' institutions; (4) To contribute to the research objectives of the NASA Center. Program Description: College or university faculty members will be appointed as Research Fellows to spend 10 weeks in cooperative research and study at the NASA Langley Research Center. The Fellow will devote approximately 90 percent of the time to a research problem and the remaining time to a study program consisting of lectures and seminars relevant to the Fellows' research.
Author
Education; NASA Programs; Engineering; Science

20040045203 USA Information Agency, Washington, DC, USA
World Opinion and the Soviet Satellite: A Preliminary Evaluation
October 17, 1957; 7 pp.; In English
Report No.(s): P-94-57; No Copyright; Avail: CASI; A02, Hardcopy

Less than two weeks after the launch of Sputnik I, the USA Information Agency conducted an informal analysis of public opinion on this subject. The analysis yielded four clear conclusions: (1) Soviet claims of scientific and technological superiority were widely accepted in the USA; (2) U.S. allies were concerned about a shift in the balance of military power; (3) the overall credibility of Soviet propaganda was greatly strengthened; and (4) American prestige was dealt a severe blow. The report also concluded that the near-hysteria in the USA in turn increased the level of concern in countries friendly to the USA. An evaluation is presented.
Author
United States; Public Relations; Surveys

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20040035790 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Managing a Product Development Team
Lehtonen, Kenneth E.; Barrett, Larry; October 2003; 10 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

Orbiting 380 miles above the earth, NASA s Hubble Space Telescope (HST) has returned a wealth of scientific data about our universe and galaxies beyond highlighted by spectacular images of the birth and death of stars, colliding galaxies, and other extra-worldly events. Despite its tremendous success for almost two decades, the HST ground support system experienced down-to-earth problems prior to the turn of the century, namely budgetary ones. To keep HST operating efficiently to 201 2 and beyond, the Vision 2000 project was conceived with the primary goal of substantially reducing the costs of operating and maintaining the spacecraft ground systems. Taking advantage of this atypical management opportunity, a set of Product Development Teams (PDTs) were established, whose charter was to re-engineer the ground system, and in doing so, reduce the remaining life-of-mission operating and maintenance costs, while providing improved reliability and increased capabilities.
Derived from text
Operating Costs; Product Development; Cost Reduction; Hubble Space Telescope

20040040059 Nippon Telegraph and Telephone Public Corp., Chiyoda, Japan
Trends Toward Globalization of the TL 9000 Quality Management System for the Telecommunications Industry
Okuno, Satoshi; Okuda, Minoru; NTT Technical Review, Volume 1, No. 6; September 2003, pp. 92-95; In English; See also 20040040049; Copyright; Avail: Other Sources

As the broadband age continues to expand, there has been a shift in the products procured by NTT from mainly telephone network infrastructure products to IP-related products, such as routers and servers, based on commercial off-the-shelf products. For these products, there is a growing need for a quality management system. In this article, we describe TL 9000, a new quality management system that has been attracting attention, and its emergence as a global standard.
Author
Telecommunication; Management Systems; Quality Control; Standards

20040045178 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
US Astronomers Access to SIMBAD in Strasbourg
Oliversen, Ronald, Technical Monitor; Eichhorn, Guenther; March 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-8413; No Copyright; Avail: CASI; A01, Hardcopy

During the last year the US SIMBAD Gateway Project continued to provide services like user registration to the US users of the SIMBAD database in France. Currently there are over 4500 US users registered. We also provided user support by answering questions from users and handling requests for lost passwords when still necessary. Even though almost all users now access SIMBAD without a password, based on hostnames/IP addresses, there are still some users that need individual passwords. We continued to maintain the mirror copy of the SIMBAD database on a server at SAO. This allows much faster access for the US users. During the past year we again moved this mirror to a faster server to improve access for the US users.

We again supported a demonstration of the SIMBAD database at the meeting of the American Astronomical Society in January. We provided support for the demonstration activities at the SIMBAD booth. We paid part of the fee for the SIMBAD demonstration. We continued to improve the cross-linking between the SIMBAD project and the Astrophysics Data System. This cross-linking between these systems is very much appreciated by the users of both the SIMBAD database and the ADS Abstract Service. The mirror of the SIMBAD database at SA0 makes this connection faster for the US astronomers. We exchange information between the ADS and SIMBAD on a daily basis. During the last year we also installed a mirror copy of the Vizier system from the CDS, in addition to the SIMBAD mirror.
Author
Data Bases; Management Information Systems; Computer Information Security; Astrophysics

20040045182 Nebraska Univ., Omaha, NE, USA
Fifteen Years of Collaborative Innovation and Achievement: NASA Nebraska Space Grant Consortium 15-Year Program Performance and Results Report
Schaaf, Michaela M., Editor; Bowen, Brent D.; Fink, Mary M.; Nickerson, Jocelyn S.; Avery Shelly; Calamaio, Caprice; Carstenson, Larry; Dugan, James; Farr, Lynne; Farritor, Shane, et al.; October 2003; 36 pp.; In English
Contract(s)/Grant(s): NAG5-572
Report No.(s): UNOAI -Rept-03-3; Copyright; Avail: CASI; A03, Hardcopy

This 15-year evaluation serves as a summary document highlighting the numerous and complete successes of the Nebraska Space Grant Program. Innovation has been highlighted through significant new endeavors during this 5-year period, such as placement of students and faculty at NASA Centers and the expansion of NSGC Native American Outreach Programs. While the last national program evaluation resulted in Nebraska s ranking as the top Capability Enhancement Consortium, and 5th best overall, Nebraska felt there was room for significant growth and development. This has been validated through the recent competitive attainment of Designated Grant status and has allowed for the exploration of new initiatives, as well as the expansion of already successful programs. A comprehensive strategic planning effort has involved all Nebraska representative entities and has guided Nebraska Space Grant through the evaluation period, providing a basis for continual advancement. Nebraska rigorously employs evaluation techniques to ensure that stated outcomes and metrics are achieved and that weaknesses are identified and corrected. With this coordinated approach, Nebraska expects that the next 5 years will yield new opportunities for significant achievement. Nebraska Space Grant will embrace new national endeavors, including the integration of Pender Public Schools -Nebraska s NASA Explorer School, geospatial initiatives, and the National Student Satellite Program.
Derived from text
Space Programs; Students; Management Planning

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20040035777 American Society for Information Science and Technology, Silver Spring, MD, USA
Journal of the American Society for Information Science and Technology, Volume 54, No. 11
Kraft, Donald H., Editor; Lunin, Lois F., Editor; Brooks, Terrence A., Editor; Schamber, Linda, Editor; Boyce, Bert R., Editor; Barry, Carl, Editor; Bates, Marcia J., Editor; Bollmann, Peter, Editor; Borgman, Christine L., Editor; Braun, Tibor, Editor, et al.; September 2003; ISSN 1532-2882; 99 pp.; In English; See also 20040035778 - 20040035784; Copyright; Avail: Other Sources

The following reports are included in the NA&SD database:Quality Control in Scholarly Publishing: A New Proposal; Peripheral Social Awareness Information in Collaborative Work; Performance Measurement Framework for Hierarchical Text Classification; A Comparison of Younsters' Use of CD-ROM and the Internet as Information Resources; Relevance Data for Language Models Using Maximum Likelihood; An IP-Level Analysis of Usage Statistics for Electronic Journals in Chemistry: Making Inferences about User Behavior; and Greeklish: An Experimental Interface for AUtomatic Transliteration.
CASI
Information Retrieval; Classifications; Machine Translation

20040035778 Northumbria Univ., Newcastle-upon-Tyne, UK

A Comparison of Youngsters' Use of CD-ROM and the Internet as Information Resources

Shenton, Andrew K.; Dixon, Pat; Journal of the American Society for Information Science and Technology, Volume 54, No. 11; September 2003, pp. 1029-1049; In English; See also 20040035777; Copyright; Avail: Other Sources

Little research has compared youngsters use of CD-ROM and the Internet for information-seeking purposes. Nevertheless, the area has recently been addressed within a largely qualitative project more generally devoted to young people s information universes. Home access to the Internet was seen to be more limited than that to CD-ROM, although the former was consulted to tackle needs of a greater number of types. The strategies employed to exploit each form of information resource were essentially similar. No attempts were reported to check the credibility of any information retrieved from electronic sources. The Internet was, how- ever, used more frequently beyond the informants own homes than was CD-ROM. There was also greater employment of the Internet by adults acting on the young- sters behalf. As Internet use for school purposes rose in accordance with age, that of CD-ROM declined. When youngsters themselves compared the two resources as information-seeking tools, CD-ROM software was criticized for its lack of detailed material and the Internet for the problems in locating what was desired. Project findings have implications in a range of areas, including the marketing of CD-ROM packages, research and development and practices within schools.

Author

Information Retrieval; Comparison

20040035780 Cornell Univ., Ithaca, NY, USA

An IP-Level Analysis of Usage Statistics for Electronic Journals in Chemistry: Making Inferences about User Behavior

Davis, Philip M.; Solla, Leah R.; Journal of the American Society for Information Science and Technology, Volume 54, No. 11; September 2003, pp. 1062-1068; In English; See also 20040035777; Copyright; Avail: Other Sources

This study reports an analysis of American Chemical Society electronic journal downloads at Cornell University by individual IP addresses. While the majority of users (IPS) limited themselves to a small number of both journals and article downloads, a small minority of heavy users had a large effect on total journal downloads. There was a very strong relationship between the num- ber of article downloads and the number of users, implying that a user-population can be estimated by just knowing the total use of a journal. Aggregate users (Le. Library Proxy Sewer and public library computers) can be regarded as a sample of the entire user population. Analysis of article downloads by format (PDF versus HTML) suggests that individuals are using the system like a networked photocopier, for the purposes of creating print-on-demand copies of articles.

Author

Information Retrieval; Correlation

20040035781 Udine Univ., Italy

Quality Control in Scholarly Publishing: A New Proposal

Mizzaro, Stefano; Journal of the American Society for Information Science and Technology, Volume 54, No. 11; September 2003, pp. 989-1005; In English; See also 20040035777

Contract(s)/Grant(s): CEC-IST-1999-10419; Copyright; Avail: Other Sources

This paper describes a new kind of electronic scholarly journal, in which the standard submission-review- publication process is replaced by a more sophisticated approach, based on judgments expressed by the readers: in this way, each reader is, potentially, a peer reviewer. New ingredients, not found in similar approaches, are that each readers judgment is weighted on the basis of the reader s skills as a reviewer, and that readers are encouraged to express correct judgments by a feedback mechanism that estimates their own quality. The new electronic scholarly journal is described in both intuitive and formal ways. Its effectiveness is tested by several laboratory experiments that simulate what might happen if the system were deployed and used.

Author

Quality Control; Electronic Publishing

20040035782 Nanyang Univ., Singapore

Performance Measurement Framework for Hierarchical Text Classification

Sun, Aixin; Lim, Ee-Peng; Ng, Wee-Keong; Journal of the American Society for Information Science and Technology, Volume 54, No. 11; September 2003, pp. 1014-1028; In English; See also 20040035777

Contract(s)/Grant(s): M48020004; Copyright; Avail: Other Sources

Hierarchical text classification or simply hierarchical classification refers to assigning a document to one or more suitable

categories from a hierarchical category space. In our literature survey, we have found that the existing hierarchical classification experiments used a variety of measures to evaluate performance. These performance measures often assume independence between categories and do not consider documents misclassified into categories that are similar or not far from the correct categories in the category tree. In this paper, we therefore propose new performance measures for hierarchical classification. The proposed performance measures consist of category similarity measures and distance-based measures that consider the contributions of misclassified documents. Our experiments on hierarchical classification methods based on SVM clas- sifiers and binary Na'ive Bayes classifiers showed that SVM classifiers perform better than Naive Bayes classifiers on Reuters-21578 collection according to the extended measures. A new classifier-centric measure called blocking measure is also defined to examine the performance of subtree classifiers in a top-down level- based hierarchical classification method.
Author
Classifications; Accuracy; Information Management

20040035783 Hong Kong Univ. of Science and Technology, Clear Water Bay, Hong Kong
Relevance Data for Language Models Using Maximum Likelihood
Bodoff, David; Wu, Bin; Wong, K. Y. Michael; Journal of the American Society for Information Science and Technology, Volume 54, No. 11; September 2003, pp. 1050-1061; In English; See also 20040035777
Contract(s)/Grant(s): HKUST6157/99P; Copyright; Avail: Other Sources

We present a preliminary empirical test of a maximum likelihood approach to using relevance data for training information retrieval (IR) parameters. Similar to language models, our method uses explicitly hypothesized distributions for documents and queries, but we add to this an explicitly hypothesized distribution for relevance judgments. The method unifies document-oriented and query-oriented views. Performance is better than the Rocchio heuristic for document and/or query modification. The maximum likelihood methodology also motivates a heuristic estimate of the MLE optimization. The method can be used to test competing hypotheses regarding the processes of authors term selection, searchers term selection, and assessors relevancy judgments.
Author
Information Retrieval; Accuracy

20040035784 Democritus Univ. of Thrace, Komotini, Greece
Greeklish: An Experimental Interface for Automatic Transliteration
Karakos, Alexandros; Journal of the American Society for Information Science and Technology, Volume 54, No. 11; September 2003, pp. 1069-1074; In English; See also 20040035777; Copyright; Avail: Other Sources

Transliteration in linguistics means the system of conveying as nearly as possible by means of one set of letters or characters the pronunciation of the words in languages written and printed in a totally different script. This term may be applied to a transcription in Latin letters of Greek, Hebrew, or the Slavonic languages written in the Cyrillic alphabet. We present in this article Greeklish, a Windows application that automatically produces English to Greek transliteration and back-transliteration (retransliteration). This transliteration is based on an algorithm with a table of associations between the two character sets. This table can be modified by the user so that it can cover personal preferences or formal present and future rules. The novelty of this system is its speed of operation, its simplicity, and its ease of use. Our examples use a Greek to Latin (English) alphabet mapping, but the Greeklish application can easily use any X to Latin mapping, where X is any non-latin alphabet.
Author
Linguistics; Machine Translation

20040036035 Army War Coll., Carlisle Barracks, PA
Is There Space for the Objective Force?
Coffin, Timothy R.; Apr. 7, 2003; 49 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420092; No Copyright; Avail: CASI; A03, Hardcopy

The Army has launched itself on a daring trajectory toward the Objective Force. It will transform the Army forces into a more lethal and devastating force through the combination of precision weapons and knowledge-based warfare. Army forces will survive through information dominance, provided by a torrent of ones and zeros sent from remote sensors and processed by on board computers. As the Army builds the Objective Force it will attempt to link systems from 'mud to space' in order to create a synergistic effect between the warrior and the information sphere. Information will empower the Army's Objective Forces. Space- based systems will be foundational building blocks for the Objective Force to achieve information dominance

and satellite communications will enable knowledge based battle command on the move. Thus, the ability to link space-based capabilities to warfighting units in a timely and relevant manner is critical to Objective Force success. Army transformation plans for space to lift a heavy load for the Objective Force by using space capabilities to provide intelligence, navigation, warning and more. Nowhere is the Objective Force success more dependent, than on its ability to network together enabling information for dominant situational knowledge. This paper will address Army satellite communications needs to determine if current and future space communications can provide the capabilities the Objective Force requires to succeed. The answer requires analysis of several major areas where space communications impact Objective Force capabilities. First, why does the Objective Force need space to provide the seamless communications required for information dominance across a distributed battlefield? Second, what exists to provide the Objective Force information from ground and space-based sensors for intelligence, surveillance, and reconnaissance (ISR) as well as the warning required by the Objective Force to enable the force to see first.
DTIC
Information Retrieval; Knowledge Based Systems

20040036161 Naval War Coll., Newport, RI
Multiply By 10 - Divide By 9. Is Technology A Force Multiplier or Force Divider in Joint Combat Operations?
Jackson, Ann; May 6, 2003; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420179; No Copyright; Avail: CASI; A03, Hardcopy

Technology has afforded the Joint Force Commanders many capabilities in achieving their objectives. Technology has definitely been an enabler and is continually looked upon to add more to the fight, mostly by adding more technology. However, the addition of technology comes with risks that if not addressed correctly will have a negative impact on force design and employment, especially in combat operations. The paper primarily addresses information technology (IT), however, it does not exclude technology as a whole since it is all inclusive. The paper addresses three particular areas where IT has made a significant impact on how forces are or can be designed and used, such as the insertion of media personnel with combat forces; information warfare and information operations; and trading bodies for technology. These three areas have great potential for JFCs as they conduct the business of war, and likewise have the potential for being great problems for JFCs.
DTIC
Military Operations; Military Technology

20040036199 Naval Postgraduate School, Monterey, CA
A Literature Review of Empowerment With a Suggested Empowerment Model for the BDF
Al sada, Adnan M.; Dec. 2003; 67 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420235; No Copyright; Avail: CASI; A04, Hardcopy

In recent years the topic of empowerment has been given a great deal of attention due to its influence on organizational effectiveness and innovation. This project reviews the empowerment literature including its roots, definitions, notions, elements and different models that have been developed by management experts. Based in the literature review, an empowerment model is proposed for Bahrain Defense Force (BDF). The model is based on three dimensions, namely, empowering management practices, empowered individual and empowering working environment.
DTIC
Employee Relations; System Effectiveness

20040036215 Brooke Army Medical Center, Fort Sam Houston, TX
Brooke Army Medical Center: A Strategic Plan Preparatory Analysis
Goodman, Robert L.; Apr. 5, 1999; 91 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420252; AMDCS-3-99; No Copyright; Avail: CASI; A05, Hardcopy

The project was the preparatory analysis for the 1998 strategic plan for Brooke Army Medical Center (BAMC). Goals of the project were to identify shifts in resources and personnel over time as BAMC ushered in the practice of managed care. The purpose of the study was met by providing relevant information about the shifts in internal operations over time. Nine hypotheses were analyzed. BAMC did shift resources from impatient related activities into ambulatory settings. BAMC did increase information management staffing. BAMC did demonstrate growth in nursing administration. BAMC did not show the expected declines in admissions expected from utilization management activities. BAMC did not show the expected increases in ambulatory visits. Total ambulatory access declined and productivity per provider and/or clinic support staff declined significantly. BAMC did not demonstrate a reduction in ancillary resources or staffing as a result of reductions in inpatient

services. BAMC did not demonstrate any cost savings as a result of administrative business process changes in the logistics division. Finally the comparison between actual contract nursing usage (DD-205-I by work center) showed a significant lack of accountability for these personnel in the WMSN, the UCAPERS, and the MEPRS.
DTIC
Clinical Medicine; Information Systems; Medical Services

20040036217 Keller Army Community Hospital, West Point, NY
An Evolving Customer Service Plan at Keller Army Community Hospital: Doing More with Less and Doing it More Nicely
Kelley, James R.; Apr. 1999; 94 pp.; In English
Report No.(s): AD-A420253; 26-99; No Copyright; Avail: CASI; A05, Hardcopy

Customer service is a critical determinant of patient loyalty. Exceptional service leads to high levels of satisfaction which, ultimately translates into higher patient enrollment. To be successful, the Military Health System (MHS) must demonstrate the ability to change and be focused on meeting customer needs. The Department of Defense is now offering a comprehensive medical program called TRICARE. The Surgeon General of the Army recently stated that 'TRICARE is the future' and 'If we expect to survive as an MHS, we had best get on board.' Knowledge of customer service/patient satisfaction offers insight into the MHS-patient relationship and other essential components associated with health care delivery.
DTIC
Medical Services

20040036247 Naval War Coll., Newport, RI
Network-Centric Commander's Intent: The Key to Network-Centric
Neely, David S.; May 16, 2003; 28 pp.; In English
Report No.(s): AD-A420277; No Copyright; Avail: CASI; A03, Hardcopy

There are many views about how the still- developing concept of Network-Centric Warfare will transform our U.S. military. Operational commanders, leading military forces at the operational level of war, will remain relevant and essential to the effective conduct of Network-Centric Warfare. The key question is how an operational commander can effectively command his dispersed and decentralized forces while taking advantage of the capabilities offered by Network- Centric Warfare. A formal statement of clear, concise Commander's Intent is currently the primary means by which operational commanders guide the effective warfighting of their subordinate commands. A revised and improved style of Commander's Intent that capitalizes on new capabilities will be essential to effective Network-Centric Warfare.
DTIC
Command and Control; Information Systems; Military Operations

20040036421 Massachusetts Inst. of Tech., Cambridge, MA
Project Listen Compute Show (LCS) - Marine
Zue, Victor; Wroclawski, John; Bolotski, Michael; Feb. 2004; 103 pp.; In English
Contract(s)/Grant(s): C-DAAN02-98-K-0003
Report No.(s): AD-A420411; NATICK-TR-04/010; No Copyright; Avail: CASI; A06, Hardcopy

This document is the final report for Project LCS- Marine, carried out by MIT Laboratory for Computer Science and the MicroDisplay Corporation. The goals of the project were to design and evaluate the usefulness of an integrated information delivery system utilizing a) multimodal human- oriented conversational applications and b) a compact handheld wireless terminal device with cell-phone form-factor but rich multimodal (audio, visual, gesture) human interface capabilities. The report describes our work in the key project areas of conversational systems architecture, conversational systems applications, wireless terminal system software, wireless terminal hardware architecture, networking and communications research and development, high resolution micro- display research, development, and fabrication, micro-display optics and driver electronics, and handheld terminal packaging and form-factor considerations.
DTIC
Human-Computer Interface; Technology Transfer

20040036449 Naval Postgraduate School, Monterey, CA
Update of the Navy Contract Writing Guide
Dean, Chad E.; Vosters, Nathan P.; Dec. 2003; 122 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420434; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this MBA Project is to provide a comprehensive update of the Navy Contract Writing Guide. The project was conducted with the sponsorship and assistance of the Office of the Assistant Secretary of the Navy for Research Development and Acquisition. The now out of date guide was originally written in 1996 in an effort to reduce problem disbursements as related to conflict wording and organization. Extensive research, incorporating interviews, websites, periodicals, and texts, was employed to make the guide current. It has been reorganized to address issues and solutions in the same order in which the forms used by contracting officers and administrators have them listed. New issues have been raised since the original writing of this guide and are now incorporated with their recommended solutions.
DTIC
Contract Management; User Manuals (Computer Programs)

20040036461 Naval Air Warfare Center, China Lake, CA
A Tutorial on the Use of GPIB and Spreadsheet Software Macros for Data Acquisition in the Evaluation of Photovoltaic Device Performance
Johnson, Scott K.; Jul. 2003; 21 pp.; In English
Report No.(s): AD-A420445; NAWCWD-TM-8415; No Copyright; Avail: CASI; A03, Hardcopy

We present a lightweight and straightforward way to automate data acquisition (DAQ). This approach uses a general purpose interface board (GPIB) and software with GPIB- compatible devices (i.e., multimeters, electronic loads, etc) and Microsoft Excel to capture data. (Devices with a GPIB hardware interface are equivalent to the HPIB and IEEE-488 hardware interfaces.) One can centrally control several devices automatically for the purpose of data acquisition and/or experiment control. This method is a cheap alternative to expensive software and hardware (i.e., LabVIEW(TradeMark), AID data acquisition boards, etc.), although certain considerations should be taken into account when considering your hardware and software requirements (see Appendix A- 1). The following works well for simple experiments and we give an example that generates IV (i.e., current-to-voltage) curve data for a solar cell.
DTIC
Data Acquisition; Energy Conversion Efficiency; Photovoltaic Conversion

20040036523 Naval Postgraduate School, Monterey, CA
Implementing Knowledge Management as a Strategic Initiative
DiGiacomo, Joseph; Dec. 2003; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420493; No Copyright; Avail: CASI; A05, Hardcopy

This research is intended as an implementation guide for managers to apply knowledge management as a strategic initiative within the contracting element of a major system command. The study incorporates the four-pillar model of knowledge management developed by Dr. Michael Stankosky. The four pillars within the model are: leadership, organization, technology and leaning. Knowledge management was one of five strategic initiatives in the overall strategic plan, which was developed using Kaplan and Norton's Balanced Scorecard methodology. The thesis discusses the elements of knowledge management as well as how contracting organizations can be improved by incorporating knowledge management as a strategic initiative.
DTIC
Contract Management

20040037771 Sandia National Labs., Albuquerque, NM
National Nuclear Security Administration Knowledge Base Core Table Schema Document
Carr, D.; Sep. 2002; 74 pp.; In English
Report No.(s): DE2004-820879; SAND2002-3055; No Copyright; Avail: Department of Energy Information Bridge

The National Nuclear Security Administration is creating a Knowledge Base to store technical information to support the USA nuclear explosion monitoring mission. This document defines the core database tables that are used in the Knowledge Base. The purpose of this document is to present the ORACLE database tables in the NNSA Knowledge Base that on modifications to the CSS3.0 Database Schema developed in 1990. These modifications include additional columns to the affiliation table, an increase in the internal ORACLE format from 8 integers to 9 integers for thirteen IDs, and new primary and unique key definitions for six tables. It is intended to be used as a reference by researchers inside and outside of NNSA/DOE as they compile information to submit to the NNSA Knowledge Base. These core tables are separated into two groups. The Primary tables are dynamic and consist of information that can be used in automatic and interactive processing (e.g. arrivals, locations). The Lookup tables change infrequently and are used for auxiliary information used by the processing.

In general, the information stored in the core tables consists of: arrivals; events, origins, associations of arrivals; magnitude information; station information (networks, site descriptions, instrument responses); pointers to waveform data; and comments pertaining to the information.
NTIS
Data Bases; Nuclear Explosions; Security

20040040151 Defence Science and Technology Organisation, Edinburgh, Australia
Social learning and Knowledge Management: A Journey through the Australian Defence Organisation: The Final Report of the Enterprise Social Learning Architectures Task
Warne, Leoni; Ali, Irena; Pascoe, Celina; August 2003; 83 pp.; In English
Report No.(s): DSTO-RR-0257; DODA-AR-012-854; Copyright; Avail: Other Sources

The research methods, research findings and outcomes of the Enterprise Social Learning Architectures (ESLA) task (JWF 98/004) are reported on in this document. Social learning is defined as learning occurring within or by a group, an organisation, or any cultural cluster and includes the procedures by which knowledge and practice are transmitted across posting cycles, across different work situations and across time. The term social learning reflects that organisations, organisational units, and work groups are social clusters and that learning occurs in a social context. Knowledge management is tightly coupled to social learning. Study results from three ADO settings are discussed: 82Wing Headquarters at the Strike Reconnaissance Group (SRG) at Amberley Air Base in Queensland; the then C4ISREW Division at ADHQ; and finally, Navy Headquarters (NHQ) in Canberra. Organisational and cultural factors that positively contribute to social learning and to the retention of corporate knowledge within the organisations studied are identified with a focus on the elements of workplace culture that foster human interactions conducive to generative learning. The research findings discussed lead to the development of social learning architectures. Architectural depictions of social learning and knowledge management are presented as a representation of factors impacting on social learning and also in terms of a Toolset of actions, processes and strategies.
Author
Cycles; Learning; Navy; Reconnaissance

20040040153 Defence Science and Technology Organisation, Edinburgh, Australia
Joint Warrior Interoperability Demonstration (JWID) Web Data Collection Tool (WDCT) Installation Manual
Kuster, Egon; September 2003; 38 pp.; In English
Report No.(s): DSTO-GD-0378; DODA-AR-012-921; Copyright; Avail: Other Sources

The Web Data Collection Tool (WDCT) allows for the collection of demonstration assessment information from geographically disperse locations. This installation manual provides the WDCT administrator with instructions on how to install and configure the WDCT software. The WDCT in the past has been used for the assessment of JWID (Joint Warrior Interoperability Demonstration) and the CINC21 (Commander in Chief for the 21st Century) ACTD (Advanced Concept Technology Demonstrator). WDCT is a web-based tool that connects to an Oracle database to store its analysis information and configuration settings. Over the past few years that the WDCT has been used within JWID it has proven to be a valuable tool in eliciting feedback from the war-fighters using the demonstrations being assessed.
Author
Interoperability; Installation Manuals; Data Acquisition

20040043757 Naval Postgraduate School, Monterey, CA
Implementing Transformation: An Analysis of Marine Direct Air Support Requirements
Willette, Scott E.; Dec. 2003; 94 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420610; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of this MBA Project was to focus on the Marine Direct Air Support Center and the information systems the Marine Corps is fielding to it as part of the Department of Defense's Transformation. As the nexus between air support and the ground combat element, the DASC executes and integrates the current day's Air Tasking Order with the ground element's fires, Interview responses from participants in Operation Iraqi Freedom identified difficulties the DASC encountered in implementing this emerging technology. This project analyzed the strategic alignment of the DASC by identifying any gaps in the links between its business strategy, organizational infrastructure and processes, IT strategy, and information systems infrastructure and processes. It did so by first determining how the current transformation effort was perceived by members of the DASC community; analyzed how transformation technology was implemented in Operation Iraqi Freedom from a Systems Analysis perspective; and developed an operating definition of what a transformed DASC will be like. These

perspectives were then applied to the Strategic Alignment Model (SAM), developed by Henderson and Venkatmman, to help clarify the fit between the current state of the DASC and where it needs to be in terms of organization and IT to meet the requirements of Transformation.
DTIC
Information Systems; Support Systems; Systems Analysis

20040043775 Naval Postgraduate School, Monterey, CA
Information Warfare Targeting: People and Processes
Wang, Ken; Dec. 2003; 67 pp.; In English
Report No.(s): AD-A420637; No Copyright; Avail: CASI; A04, Hardcopy

Information Warfare targeting has long been a crucial, but unrecognized, part of military operations. From Sun Tzu's targeting of the enemy's will to fight, to today's information-centric warfare, it is those who have understood the techniques and applications of Information Warfare targeting who have most often prevailed. As critical as it is to our success, it is a topic that is controversial, often misunderstood, and subject to various interpretations. This thesis examines the IW targeting process, consisting of people, information, systems, and the interaction between the function of targeting and IW. In the Information Age, IW has been recognized as viable warfare area. However, IW targeting cannot be treated as traditional targeting utilized by other warfare areas. This thesis is intended to serve as a guide for the study of this topic and provides an instructional program designed to satisfy the requirement for a coherent instructional program on IW Targeting. IW targeting affects every facet of warfare and in turn is affected by these facets. In preparing for a future that calls for maximizing the effects while minimizing the effort, it is critical that we understand the process in order to remain effective.
DTIC
Warfare

20040043800 Arizona State Univ., Tempe, AZ
Code Hiding Techniques for Mobile Applications
Bazzi, Rida A.; Candan, K. S.; Jan. 2000; 7 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0063
Report No.(s): AD-A420679; AFRL-SR-AR-TR-04-0137; No Copyright; Avail: CASI; A02, Hardcopy

The main goal of this effort was to enable lightweight clients(mobile devices) to outsource computations without divulging any information about the data and or code of the application. This problem is known to be very difficult. In order to make progress, we had to attempt to solve the problem under some restrictions on the types of programs. We considered programs that have loops and programs that do not have loops. For both types of programs we restricted our study on programs that have linear assignments and conditionals. We also considered the problem of hiding the access patterns to an encrypted database. Provable data hiding and tamper resistance for a simple loop program: we developed techniques that enable provable data hiding for a simple loop program. Data and Code Hiding for non-iterative piece-wise linear programs: we developed techniques that enable data and code hiding for non-iterative piece-wise linear programs, but we were unable to fully quantify the achieved degree of hiding. Data hiding for piece-wise linear programs with linear conditionals: we studied Conditions under which hiding of traversal of tree-structured data.
DTIC
Coding; Security

20040043810 Air War Coll., Maxwell AFB, AL
Bytes: Weapons of Mass Disruption
Lamb, Michael W.; Apr. 2002; 134 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420703; No Copyright; Avail: CASI; A07, Hardcopy

The term 'information warfare' has thus caught the attention of an entire generation of military thinkers. While the term encompasses both offensive and defensive measures, much of the imaginative thinking has concerned attacks on an adversary's command-and-control and information systems using methods as diverse as computer viruses, laser beams, and high- powered microwaves. Much of this thought goes into comprehending the possibilities, and maximizing the effects, of high technology in information warfare. For example, consider the consequences and effects if the following systems were disabled: financial markets, nuclear power plants, telephone systems, power distribution systems, traffic lights, or air traffic control and airline reservations systems.
DTIC
Warfare

20040043814 TRICARE Southwest, San Antonio, TX

Identifying the Critical Performance Indicators for the TRICARE Lead Agent Office Department of Defense Health Service Region 6 Through a Comparative Analysis of Similar Health Plans

Prichard, Curt B.; Apr. 9, 1999; 107 pp.; In English; Original contains color illustrations

Report No.(s): AD-A420712; AMDCS-35-99; No Copyright; Avail: CASI; A06, Hardcopy

The Military Health System's (MHS) benefit program, TRICARE, is administered through a direct care system supported by a civilian network via 12 regional Managed Care Support Contracts (MCSCs). Lead Agents, whose offices serve not only to oversee MCSC performance but also to manage the healthcare benefit program for MHS beneficiaries, monitor these regional contracts. As such, they are inundated with numerous metrics, many of which are not optimal for strategic management. This graduate project identifies the critical performance indicators for the Region 6 Lead Agent Office (TRICARE Southwest) through a comparative analysis of similar health plans. Using a quantitative decision making tool, known as the JUDGE (Judging Utility: a Decision Generator and Evaluator) Model, the performance measurements of TRICARE Southwest were compared with those of TRICARE Northwest and PacifiCare of Texas. Critical performance indicators were identified for three core domains: health status, operations/member services, and cost accountability. An analysis provides the executive staff of TRICARE Southwest recommendations to assist in developing an optimal performance measurement system for Region 6. The critical performance indicators identified should aid leaders in determining the 'health' of the health plan.

DTIC

Defense Program; Health; Identifying; Logistics; Management Planning; Medical Services

20040043815 Air Univ., Maxwell AFB, AL

Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1985. Volume 36, Number 4

Goodman, A. S.; Dec. 1985; 511 pp.; In English

Report No.(s): AD-A420713; No Copyright; Avail: CASI; A22, Hardcopy

The Air University Library Index to Military Periodicals is a subject index to significant articles, news items, and editorials appearing in 76 English language military and aeronautical periodicals. It originated with 23 titles as a quarterly publication in 1949 and has continued on a quarterly basis superseded by annual cumulations (triennial cumulative issues were published from 1952 through 1967). From 1949 to 1962 the Index was issued as Air University Periodical Index. Staff members of Air University Library Index all of the periodicals with the exception of four titles which are indexed by other Air Force, Army, and Navy libraries. The Air University Library Index to Military Periodicals serves primarily the educational and research programs of Air University; it is available to other libraries upon request.

DTIC

Libraries; Periodicals

20040043816 Air Univ., Maxwell AFB, AL

Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1972. Volume 23, Number 4

Rucks, Frances B.; Dec. 1972; 401 pp.; In English

Report No.(s): AD-A420714; No Copyright; Avail: CASI; A18, Hardcopy

The Air University Library Index to Military Periodicals is a subject index to significant articles, news items and editorials appearing in 65 English language military and aeronautical periodicals not indexed in readily available commercial indexing services. The index originated with 23 titles as a quarterly publication in 1949, and has continued on a quarterly basis superseded by annual cumulations; triennial cumulative issues were published from 1952 through 1967. From 1949 to 1962 the Index was issued as Air University Periodical Index. Staff members in the Reader Services Division and Editing Section of Air University Library index the periodicals with the exception of seven titles which other Air Force, Army, and Navy libraries index. Air University Library index to Military Periodicals serves primarily the educational and research programs of Air University. The index is available to other libraries upon request.

DTIC

Libraries; Periodicals

20040043817 Air Univ., Maxwell AFB, AL

Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1980. Volume 31, Number 4

Rucks, Frances B.; Dec. 1980; 473 pp.; In English

Report No.(s): AD-A420715; No Copyright; Avail: CASI; A20, Hardcopy

The Air University Library Index to Military Periodicals is a subject index to significant articles, news items and editorials appearing in 73 English language military and aeronautical periodicals not indexed in readily available commercial indexing services. The Index originated with 23 titles as a quarterly publication in 1949, and has continued on a quarterly basis superseded by annual cumulations (triennial cumulative issues. were published from 1952 through 1967) . From 1949 to 1962 the Index was issued as Air University periodical Index. Staff members of Air University Library index all of the periodicals with the exception of six titles which are indexed by other Air Force, Army, and Navy libraries. Air University Library Index to Military Periodicals serves primarily the educational and research programs of Air University. The Index is available to other libraries upon request.
DTIC
Libraries; Periodicals

20040043821 Air Univ., Maxwell AFB, AL
Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1976. Volume 27, Number 4
Rucks, Frances B.; Dec. 1976; 445 pp.; In English
Report No.(s): AD-A420721; No Copyright; Avail: CASI; A19, Hardcopy
No abstract available
Indexes (Documentation); Libraries; Periodicals; Subjects

20040043826 Air Univ., Maxwell AFB, AL
Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1981. Volume 32, Number 4
Dec. 1981; 406 pp.; In English
Report No.(s): AD-A420726; No Copyright; Avail: CASI; A18, Hardcopy
The Air University Library Index to Military Periodicals is a subject index to significant articles, news items and editorials appearing in 72 English language military and aeronautical periodicals not indexed in readily available commercial indexing services. The Index originated with 23 titles as a quarterly publication in 1949, and has continued on a quarterly basis superseded by annual cumulating (triennial cumulative issues were published from 1952 through 1967). From 1949 to 1962 the Index was issued as Air University Periodical Index. Staff members of Air University Library index all of the periodicals with the exception of four titles which are indexed by other Air Force, Army, and Navy libraries. Air University Library Index to Military Periodicals serves primary the educational and research programs of Air University. The Index is available to other libraries upon request.
DTIC
Libraries; Periodicals

20040043827 Air Univ., Maxwell AFB, AL
Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1979. Volume 30, Number 4
Dec. 1979; 380 pp.; In English
Report No.(s): AD-A420727; No Copyright; Avail: CASI; A17, Hardcopy
The Air University Library Index to Military Periodicals is a subject index to significant articles, news items and editorials appearing in 68 English language military and aeronautical periodicals not indexed in readily available commercial indexing services. The Index originated with 23 titles as a quarterly publication in 1949, and has continued on a quarterly basis superseded by annual cumulating (triennial cumulative issues were published from 1952 through 1967). From 1949 to 1962 the index was issued as Air University Periodical Index. Staff members of Air University Library index all of the periodicals with the exception of six titles which are indexed by other Air Force, Army, and Navy libraries. Air University Library Index to Military Periodicals serves primarily the educational and research programs of Air University. The Index is available to other libraries upon request.
DTIC
Libraries; Periodicals

20040043829 Air Univ., Maxwell AFB, AL
Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1973. Volume 24, Number 4
Rucks, Frances B.; Dec. 1973; 404 pp.; In English
Report No.(s): AD-A420730; No Copyright; Avail: CASI; A18, Hardcopy
No abstract available
Indexes (Documentation); Libraries; Periodicals; Subjects

20040043830 Air Univ., Maxwell AFB, AL

Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1987. Volume 38, Number 4

Adams, Emily J.; Dec. 1987; 667 pp.; In English

Report No.(s): AD-A420731; No Copyright; Avail: CASI; A99, Hardcopy

No abstract available

Indexes (Documentation); Libraries; Periodicals; Subjects

20040043833 George Mason Univ., Fairfax, VA

Request for AFOSR Support of the 24th Annual Conference of the Cognitive Science Society (CogSci2002)

Gray, Wayne; Jan. 2002; 3 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0154

Report No.(s): AD-A420734; AFRL-SR-AR-TR-04-0128; No Copyright; Avail: CASI; A01, Hardcopy

The annual conference of the Cognitive Science Society is the premier forum for the presentation and discussion of high-quality empirical, theoretical, and analytic work that contributes to the advancement of cognitive science. This publication is a request for $15,000 from the Air Force Office of Scientific Research (AFOSR) to support the CogSci2002 conference. The 24th Annual Conference of the Cognitive Science Society is to be held August 8-10, 2002, at George Mason University, Fairfax, VA, with tutorials and workshops on Wednesday, August 7th. AFOSR monies are needed to fund publication of the conference program and proceedings, graduate student participation, plenary speakers, shuttle buses between the campus and conference hotel, and technical demonstrations. Secure space will be provided in the vendor area for AFOSR-funded researchers to set up equipment to demonstrate their Synthetic Task Environment (STE) software. These STE demonstrations include several that will be performed by Dr. Kevin Gluck of the Air Force Research Laboratory, Mesa, Arizona. Copies of the complete proceedings are available online at the Society's website: <http://cogsci. psy.utexas.edu/confproc/gmu02/>

DTIC

Cognition; Conferences; Military Technology; Research and Development

20040043840 Air Univ., Maxwell AFB, AL

Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1974. Volume 25, Number 4

Rucks, Frances B.; Dec. 1974; 427 pp.; In English

Report No.(s): AD-A420743; No Copyright; Avail: CASI; A19, Hardcopy

The Air University Library Index to Military Periodicals is a subject index to significant articles, news items and editorials appearing in 65 English language military and aeronautical periodicals not indexed in readily available commercial indexing services. The Index originated with 23 titles as a quarterly publication in 1949, and has continued on a quarterly basis superseded by annual cumulations; triennial cumulative issues were published from 1952 through 1967. From 1949 to 1962 the Index was issued as Air University Periodical Index. Staff members in the Reader Services Division and Editing Section of Air University Library index the periodicals with the exception of six titles which other Air Force, Army, and Navy libraries index. Air University Library Index to Military Periodicals serves primarily the educational and research programs of Air University. The Index is available to other libraries upon request.

DTIC

Libraries; Periodicals

20040043841 Air Univ., Maxwell AFB, AL

Air University Library Index to Military Periodicals. Cumulative Issue Jan - Dec 1978. Volume 29, Number 4

Rucks, Frances B.; Dec. 1978; 409 pp.; In English

Report No.(s): AD-A420744; No Copyright; Avail: CASI; A18, Hardcopy

The Air University Library Index to Military Periodicals is a subject index to significant articles, news items and editorials appearing in 68 English language military and aeronautical periodicals not indexed in readily available commercial indexing services. The Index originated with 23 titles as a quarterly publication in 1949, and has continued on a quarterly basis superseded by annual cumulations (triennial cumulative issues were published from 1952 through 1967). From 1949 to 1962 the Index was issued as Air University Periodical Index. Staff members of Air University Library index all of the periodicals with the exception of six titles which are indexed by other Air Force, Army, and Navy libraries. Air University Library Index

to Military Periodicals serves primarily the educational and research programs of Air University. The Index is available to other libraries upon request.
DTIC
Libraries; Periodicals

20040043842 Army Research Inst. Field Unit, Fort Benning, GA
Combat Leaders' Guide (CLG) Leader Handbook 2003
Feb. 2004; 231 pp.; In English
Report No.(s): AD-A420746; No Copyright; Avail: CASI; A11, Hardcopy

The Combat Leaders' Guide is both an extract of doctrinal publications and a compilation of tactics, techniques and procedures (TTPs). It is principally designed as a pocket reference and memory-jogger. Some TTPs you have learned in training do not appear here. The material in this job aid comes from the doctrinal literature program. Laminate pages to be written on; remove, reorganize or tab pages based on your mission; insert other job aids, TTPs or standing operating procedures (SOPs) as needed.
DTIC
Combat; Education; Handbooks; Leadership; Military Operations

20040043850 Army Research Office, Research Triangle Park, NC
Distributed Microsensing: Devices Networks and Information Processing
Lavery, John; May 1999; 31 pp.; In English
Report No.(s): AD-A420760; No Copyright; Avail: CASI; A03, Hardcopy

This report summarizes the state of the art in distributed microsensing and outlines promising directions for future research and development. It is expected to enhance the ability of the scientific and engineering community and of the Army Research Laboratory to select directions for research and development with optimal cognizance of the implications of the various alternatives.
DTIC
Data Processing; Microinstrumentation; Sensors

20040045151 QSS Group, Inc., Moffett Field, CA, USA
Lessons Learned from using a Livingstone Model to Diagnose a Main Propulsion System
Sweet, Adam; Bajwa, Anupa; [2003]; 9 pp.; In English; JANNAF 39th CS/27th APS/21st PSHS/3rd MSS Joint Subcommittee Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA; No Copyright; Avail: CASI; A02, Hardcopy

NASA researchers have demonstrated that qualitative, model-based reasoning can be used for fault detection in a Main Propulsion System (MPS), a complex, continuous system. At the heart of this diagnostic system is Livingstone, a discrete, propositional logic-based inference engine. Livingstone comprises a language for specifying a discrete model of the system and a set of algorithms that use the model to track the system's state. Livingstone uses the model to test assumptions about the state of a component - observations from the system are compared with values predicted by the model. The intent of this paper is to summarize some advantages of Livingstone seen through our modeling experience: for instance, flexibility in modeling, speed and maturity. We also describe some shortcomings we perceived in the implementation of Livingstone, such as modeling continuous dynamics and handling of transients. We list some upcoming enhancements to the next version of Livingstone that may resolve some of the current limitations.
Author
Systems Analysis; Diagnosis; Information Systems

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20040045153 NASA Glenn Research Center, Cleveland, OH, USA
Reinventing the Solar Power Satellite
Landis, Geoffrey A.; February 2004; 35 pp.; In English; 53rd International Astronautical Congress, 10-19 Oct. 2002, Houston, TX, USA
Contract(s)/Grant(s): WBS-22-755-04-02
Report No.(s): NASA/TM-2004-212743; IAC-02-R.3.06; IAC-02-R.1.07; E-14268; No Copyright; Avail: CASI; A03, Hardcopy

The selling price of electrical power varies with time. The economic viability of space solar power is maximum if the power can be sold at peak power rates, instead of baseline rate. Price and demand of electricity was examined from spot-market data from four example markets: New England, New York City, suburban New York, and California. The data was averaged to show the average price and demand for power as a function of time of day and time of year. Demand varies roughly by a factor of two between the early-morning minimum demand, and the afternoon maximum; both the amount of peak power, and the location of the peak, depends significantly on the location and the weather. The demand curves were compared to the availability curves for solar energy and for tracking and non-tracking satellite solar power systems in order to compare the market value of terrestrial and solar electrical power. In part 2, new designs for a space solar power (SSP) system were analyzed to provide electrical power to Earth for economically competitive rates. The approach was to look at innovative power architectures to more practical approaches to space solar power. A significant barrier is the initial investment required before the first power is returned. Three new concepts for solar power satellites were invented and analyzed: a solar power satellite in the Earth-Sun L2 point, a geosynchronous no-moving parts solar power satellite, and a nontracking geosynchronous solar power satellite with integral phased array. The integral-array satellite had several advantages, including an initial investment cost approximately eight times lower than the conventional design.
Author
Solar Power Satellites; Spacecraft Power Supplies; Solar Generators

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20040035907 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Targeted Research and Technology Within NASA's Living With a Star Program
Hesse, Michael; November 2003; 42 pp.; In English; Original contains color and black and white illustrations
Report No.(s): FP-2003-11586-GSFC; No Copyright; Avail: CASI; A03, Hardcopy

NASA's Living With a Star (LWS) initiative is a systematic, goal-oriented research program targeting those aspects of the Sun-Earth system that affect society. The Targeted Research and Technology (TR&T) component of LWS provides the theory, modeling, and data analysis necessary to enable an integrated, system-wide picture of Sun-Earth connection science with societal relevance. Recognizing the central and essential role that TR&T would have for the success of the LWS initiative, the LWS Science Architecture Team (SAT) recommended that a Science Definition Team (SDT), with the same status as a flight mission definition team, be formed to design and coordinate a TR&T program having prioritized goals and objectives that focused on practical societal benefits. This report details the SDT recommendations for the TR&T program.
Author
Earth Sciences; Solar Terrestrial Interactions; Mission Planning; NASA Programs

20040035908 Johns Hopkins Univ., Baltimore, MD, USA
Single Stage to Orbit: Politics, Space Technology, and the Quest for Reusable Rocketry
Butrica, Andrew J.; 2003; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

While the glories and tragedies of the space shuttle make headlines and move the nation, the story of the shuttle forms an inseparable part of a lesser-known but no less important drama-the search for a re-useable single-stage-to-orbit rocket. Here an award-winning student of space science, Andrew J. Butrica, examines the long and tangled history of this ambitious concept, from it first glimmerings in the 1920s, when technicians dismissed it as unfeasible, to its highly expensive heyday in the midst of the Cold War, when conservative-backed government programs struggled to produce an operational flight vehicle. Butrica finds a blending of far-sighted engineering and heavy-handed politics. To the first and oldest idea-that of the reusable rocket-powered single-stage- to-orbit vehicle-planners who belonged to what President Eisenhower referred to as the military-industrial complex added experimental (' X '), 'aircraft-like' capabilities and, eventually, a 'faster, cheaper, smaller' managerial approach. Single Stage to Orbit traces the interplay of technology, corporate interest, and politics, a combination that well served the conservative space agenda and ultimately triumphed-not in the realization of inexpensive, reliable space transport-but in a vision of space militarization and commercialization that would appear settled USA policy in the early twenty-first century. 'The 'holy grail' of the spaceship movement has been the development of a vehicle that could accomplish single stage to orbit (SSTO) flight. This study describes the evolution of this concept from the 192'0s to the present, revealing a conservative space agenda that has not yet been the subject of historical analysis. As such, it makes an important contribution

to space history literature.'-Roger D. Launius, The Smithsonian Institution.
Author
Aerospace Engineering; Single Stage to Orbit Vehicles; Space Shuttles; Politics

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20040035736 NASA Goddard Space Flight Center, Greenbelt, MD, USA
VLBI Data Longevity
Ma, Chopo; [2003]; 1 pp.; In English; Third IVS General Meeting, 9-11 Feb. 2004, Ottawa, Canada; No Copyright; Avail: Other Sources; Abstract Only

The current cache of S/X-band geodetic/astrometric VLBI data accumulated since 1979 is approx.4.2 million observations and is increasing by approx.300,000 observations per year. The long time interval and access to all such VLBI data for re-analysis have contributed to their usefulness for the terrestrial and celestial reference frames, Earth orientation parameters, tidal and nontidal loading, and troposphere. While data access and integrity have been maintained through the Mark III data base system as storage devices and media have evolved, past transitions have been major projects. A new format and retention concept to ensure eternal archiving and access should make use of self-documentation, generalized media, network connectivity and multiple redundancy. Similarly permanent organizations or sequences of organizations are also necessary.
Author
Very Long Base Interferometry; Celestial Reference Systems; Superhigh Frequencies; Accumulations; Earth Orientation

20040035744 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Chemical Composition, Evolution And Cinematic Of Solar-Type Stars
OliveiradaSilva, Ronaldo; 2003; 131 pp.; In Portuguese
Report No.(s): INPE-9877-TDI/873; Copyright; Avail: CASI; A07, Hardcopy

The chemical composition of the long-lived solar-type stars is an extremely valuable diagnostic of the chemical evolution of the Galactic disc. There is some evidence that such evolution has been heterogeneous both in time and space, and that the Sun might not be a typical star in what concerns its abundance pattern. In this work, we have determined the abundances of the elements C, N, Na, Mg, Si, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Sr, Y, Zr, Ba, La, Ce, Nd and Sm, in a sample of solar-type stars in the solar neighborhood (distance less than or equal to 25 pc). The technique was the differential spectroscopic analysis, relative to the Sun, based on high resolution (R approx. 46,000) and high sign-to-noise ratio (S/N greater than 300) data obtained with the bench-mounted echelle spectrograph of the 1.5 m telescope of CTIO. In addition, abundances of C and N were obtained based on molecular bands of the Swan and Red Electronic Systems using a spectral synthesis code. The atmospheric parameters were established using photometric colors, the excitation and ionization equilibria of the Fe lines and the analysis of the stellar temperature and luminosity in the HR diagram. The results of chemical abundances obtained here contribute to a better understanding of the relation of the abundances known for the Sun with that of the local population of G-type dwarf stars, since the abundances of many elements (relative to iron) obtained for solar metallicity stars are different from that of the Sun. Such results also contribute to a better understanding of the chemical evolution in the solar neighborhood and of the nucleosynthetic enrichment of the galactic disk.
Author
Dwarf Stars; A Stars; G Stars; Chemical Composition; Chemical Evolution; Stellar Evolution

20040035775 National Optical Astronomy Observatories, Tucson, AZ, USA, National Solar Observatory, Tucson, AZ, USA
NOAO/NSO Newsletter, No. 76
Isbell, Douglas, Editor; Najita, Joan, Editor; Bell, Dave, Editor; Hartman, Mia, Editor; vanderBliek, Nicole S., Editor; Green, Richard, Editor; Hinkle, Ken, Editor; Adams, Sally, Editor; Leibacher, John, Editor; Piano, Priscilla, Editor, et al.; December 2003; 46 pp.; In English; Original contains black and white illustrations; Copyright; Avail: Other Sources

Both NOAO and NSO had an engaging presence at a National Science Foundation - sponsored public symposium on the future of ground-based astronomy, 'The Universe From the Ground Up', held 7-8 October 2003 in Washington, D.C. NSO Deputy Director Mark Giampapa gave a talk on the Advanced Technology Solar Telescope (ATST), and other speakers highlighted the potential capabilities of the Large Synoptic Survey Telescope (LSST) and the 30-meter Giant Segmented

Mirror Telescope (GSMT). This photo shows NOAO Manager of Public Outreach Rich Fedele and ATST Outreach & Education Officer Dave Dooling in front of the NOAO exhibit booth.
Derived from text
Segmented Mirrors; Telescopes; Spectroscopy; Gemini Project; Images

20040035874 Jacobs Sverdrup, Huntsville, AL, USA
L2 Plasma Environments
Minow, Joseph I.; Blackwell, William C., Jr.; June 6, 2003; 1 pp.; In English; 42nd American Inst. of Aeronautics and Astronautics Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: Other Sources; Abstract Only

The second LaGrange point, 1.5 million miles from the Earth in the anti-solar direction, is becoming an important destination for scientific spacecraft. The quasi-stable gravity field requires little energy resources for station keeping and astronomical missions-infrared and microwave in particular-find the minimal impact from Earth albedo radiation and limited restrictions on viewing directions a tremendous advantage in their mission design. Spacecraft design for L2 missions will have to consider the plasma environments of the ambient solar wind, magnetosheath, and magnetotail from energies of a few 10s of an eV through 10s of keV in addition to enhanced energetic particle populations from 10s to 1000 keV during solar energetic particle events. This presentation will provide a background on the appropriate L2 charged particle environments at L2 and describe modeling efforts at MSFC to develop environment specification tools for the L2 plasma environment.
Author
Gravitational Fields; Spacecraft Design; Magnetosheath; Earth Albedo; Microwaves; Solar Wind

20040035909 NASA Marshall Space Flight Center, Huntsville, AL, USA
L2 Plasma Environments
Minow, Joseph I.; Blackwell, William C., Jr.; June 06, 2003; 1 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: Other Sources; Abstract Only

The second LaGrange point, 1.5 million miles from the Earth in the anti-solar direction, is becoming an important destination for scientific spacecraft. The quasi-stable gravity field requires little energy resources for station keeping and astronomical missions-infrared and microwave in particular-find the minimal impact from Earth albedo radiation and limited restrictions on viewing directions a tremendous advantage in their mission design. Spacecraft design for L2 missions will have to consider the plasma environments of the ambient solar wind, magnetosheath, and magnetotail from energies of a few 10s of an eV through 10 s of keV in addition to enhanced energetic particle populations from 10s to l000 keV during solar energetic particle events. This presentation will provide a background on the appropriate L2 charged particle environments at L2 and describe modeling efforts at MSFC to develop environment specification tools for the L2 plasma environment.
Author
Astronomy; Lagrangian Equilibrium Points; Charged Particles; Plasmas (Physics); Space Missions

20040037786 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
The X-Ray Weakness of GPS Radio Galaxies: A Volume-Limited Complete Sample
Mushotzky, Richard F., Technical Monitor; Siemiginowska, Aneta, Principal Investigator; February 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-13267; No Copyright; Avail: CASI; A01, Hardcopy

The XMM observations of Mkn 668 have been analyzed. We found soft X-ray signatures of a hot plasma (kT approximately 10^7 approximately K) and a hard X-ray emission from the nucleus. The X-ray spectrum above 2.5 approximately keV is characterized by a very flat (observed photon index, Gamma approximately 0.5) power-law continuum, alongside with a strong Fe-K-alpha neutral iron fluorescent line (EW approximately 600 approximately eV). The best explanation for the origin of this high energy X-ray emission is in terms of the Compton-reflection of the nuclear emission. The primary X-ray emission is obscured by a Compton-thick (N_H approximately 10^24 approximately cm-2) matter which becomes transparent at higher energies. The observed above 2.5-keV X-rays are mostly due to reflection which is indicated by a strong Fe-K-alpha line. This represents the second hard X-ray detection of the GPS galaxy ever (the first one being 1345+125; O Dea et al. 2000). Interestingly, the both such trend is confirmed by our on going XMM-Newton observations of a larger GPS sample, it would lead us to looking into the question on how the dense nuclear environment impacts the nature and evolution of a GPS source, and more generally, on the history of radio power in the universe. The paper summarizing the

results has been submitted to Astronomy and Astrophysics in December 2003.
Author
Global Positioning System; Radio Galaxies; X Ray Astronomy; Astrophysics

20040037787 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Diffuse Gamma Rays Galactic and Extragalactic Diffuse Emission
Moskalenko, Igor V.; Strong, Andrew W.; Reimer, Olaf; [2004]; 32 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Diffuse gamma rays consist of several components: truly diffuse emission from the interstellar medium, the extragalactic background, whose origin is not firmly established yet, and the contribution from unresolved and faint Galactic point sources. One approach to unravel these components is to study the diffuse emission from the interstellar medium, which traces the interactions of high energy particles with interstellar gas and radiation fields. Because of its origin such emission is potentially able to reveal much about the sources and propagation of cosmic rays. The extragalactic background, if reliably determined, can be used in cosmological and blazar studies. Studying the derived average spectrum of faint Galactic sources may be able to give a clue to the nature of the emitting objects.
Author
Intergalactic Media; Galactic Cosmic Rays; Gamma Ray Astronomy; Cosmology; Gamma Rays

20040037791 Gemini Observatory, Mauna Kea, HI, USA
Gemini Observatory Virtual Tour and Image/Animation Gallery
[2003]; In English; CD-ROM has color illustrations with no full document.; Copyright; Avail: Other Sources

This CD contains the Gemini Observatory Virtual tour as well as over 50 images, animations, and video segments. Video has been provided in QuickTime and MPEG formats, and all images are in JPEG format at medium resolution for computer display use.
CASI
Images; Astronomical Observatories

20040040110 National Space Science and Technology Center, Huntsville, AL, USA, NASA Marshall Space Flight Center, Huntsville, AL, USA
The Impact Imperative: A Space Infrastructure Enabling a Multi-Tiered Earth Defense
Campbell, Jonathan W.; Phipps, Claude; Smalley, Larry; Reilly, James; Boccio, Dona; [2003]; 25 pp.; In English; 2004 Planetary Defense Conference: Protecting Earth from Asteroids, 23-26 Feb. 2004, Garden Grove, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy

Impacting at hypervelocity, an asteroid struck the Earth approximately 65 million years ago in the Yucatan Peninsula a m . This triggered the extinction of almost 70% of the species of life on Earth including the dinosaurs. Other impacts prior to this one have caused even greater extinctions. Preventing collisions with the Earth by hypervelocity asteroids, meteoroids, and comets is the most important immediate space challenge facing human civilization. This is the Impact Imperative. We now believe that while there are about 2000 earth orbit crossing rocks greater than 1 kilometer in diameter, there may be as many as 200,000 or more objects in the 100 m size range. Can anything be done about this fundamental existence question facing our civilization? The answer is a resounding yes! By using an intelligent combination of Earth and space based sensors coupled with an infrastructure of high-energy laser stations and other secondary mitigation options, we can deflect inbound asteroids, meteoroids, and comets and prevent them &om striking the Earth. This can be accomplished by irradiating the surface of an inbound rock with sufficiently intense pulses so that ablation occurs. This ablation acts as a small rocket incrementally changing the shape of the rock's orbit around the Sun. One-kilometer size rocks can be moved sufficiently in about a month while smaller rocks may be moved in a shorter time span. We recommend that space objectives be immediately reprioritized to start us moving quickly towards an infrastructure that will support a multiple option defense capability. Planning and development for a lunar laser facility should be initiated immediately in parallel with other options. All mitigation options are greatly enhanced by robust early warning, detection, and tracking resources to find objects sufficiently prior to Earth orbit passage in time to allow significant intervention. Infrastructure options should include ground, LEO, GEO, Lunar, and libration point laser and sensor stations for providing early warning, tracking, and deflection. Other options should include space interceptors that will carry both laser and nuclear ablators for close range work. Response options must be developed to deal with the consequences of an impact should we move too slowly.
Author
Asteroids; Deflection; Early Warning Systems; Tracking (Position); Meteoroids; Comets

20040040115 Universities Space Research Association, Greenbelt, MD, USA

A Central X-ray Source in the Non-thermal Radio Nebula DA 495

Arzoumanian, Z.; Safi-Harb, S.; Landecker, T. L.; Kothes, R.; [2003]; 5 pp.; In English

Contract(s)/Grant(s): NRA-99-01-LTSA-070; No Copyright; Avail: CASI; A01, Hardcopy

We report the detection, in archival ROSAT and ASCA observations, of X-ray emission from the direction of DA 495 (G65.7+1.2), a likely supernova remnant of uncertain classification but with similarities to the Crab Nebula. An unusual feature of the radio nebula is its annular morphology, with a flux minimum at the geometrical center. In the soft X-ray band, the ROSAT data resolve a compact source near the edge of the central radio hole ; the hard X-ray morphology, at the limit of ASCA's spatial resolution, is suggestive of extended plerionic emission dropping off from a central flux maximum coincident with the ROSAT source. The spectrum is well-described by a power-law with photon index approximately 1.7, and the X-ray flux is roughly constant with time. Taken together, this evidence suggests identification of the X-ray source with a magnetospherically active neutron star and its associated wind nebula. Timing analysis of the ASCA data yields only a weak upper bound on pulsations with periods longer than approximately 30 ms. These results reveal for the first time the high-energy engine that powers the synchrotron nebula, and strengthen the classification of DA 495 as a plerionic supernova remnant, one that may represent a late evolutionary stage of Crab-like nebulae.

Author

Crab Nebula; X Ray Sources; Radio Astronomy; Astrophysics; Supernova Remnants; Detection

20040040123 NASA Goddard Space Flight Center, Greenbelt, MD, USA

LSPECS: A Proposed Robotic Astronomy Mission to the Lunar South Polar Regions

Lowman, Paul D., Jr.; [13 August 2003]; 1 pp.; In English; International Lunar Conference 2003, 2003; No Copyright; Avail: Other Sources; Abstract Only

This paper outlines a possible mission to emplace a robotic infrared/submillimeter wave interferometer array near the lunar south pole. This region has now been investigated by the Clementine and Lunar Prospector missions, and by Earth-based radar, and its topography and thermal environment are fairly well-known. The area would be exceptionally suitable for infrared/submillimeter astronomy because of the continually low temperatures, approaching that of liquid nitrogen (77K) in some places. The presence of ice has been inferred independently from Clementine and Lunar Prospector, providing another incentive for a south polar mission. A submillimeter spaceborne interferometer mission, Submillimeter Probe of the Evolution of the Cosmic Structure (SPECS) has been proposed by John Mather and others, covering the 40 - 500 micron region with 3 formation flying telescopes. The present paper proposes a lunar adaptation of the SPECS concept, LSPECS. This adaptation would involve landing 4 telescopes on the area north of Shackleton crater at zero degrees longitude. This is in nearly year round darkness but is continually radar visible from Earth. The landed payload of LSPECS would include a telerobotic rover, 4 three meter submm telescopes, a solar power array to be emplaced on the continually sunlit north rim of Shackleton crater, and an S-band antenna for data relay to Earth. Operation without the use of expendable cryogenics for cooling might be possible, trading long exposure time for instrument temperatures above that of liquid helium. The LSPECS would permit long-term study of an extremely wide range of cosmic and solar system phenomena in the southern celestial hemisphere. For complete sky coverage, a similar installation near the north pole would be required. The LSPECS site would also be suitable other types of observation, such as optical interferometry or centimeter wavelength radio astronomy. The lunar south pole is also of great interest because of its extensive ice deposits, which may represent cometary infall with pre-biotic compounds.

Author

Robotics; Submillimeter Waves; Infrared Astronomy; Thermal Environments; Topography

20040040133 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Design and Analysis of FKSI Nulling Interferometry Testbed

Wilson, Mark; Crooke, Julie; Howard, Joseph; Martino, Anthony; Danchi, William; [2004]; 1 pp.; In English; Astronomical Telescopes and Instrumentation, 21-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

The Fourier Kelvin Stellar Interferometer is a space borne mission whose purpose is to validate the existence of previously detected Extra Solar Giant Planets (EGP's) and determine the age and primary atmospheric constituents of these EGP's. It consists of 2 collecting telescopes followed by a Mach Zehnder interferometer working in a wavelength range of 3-8 microns. To support this concept, a testbed is being built at NASA Goddard Space Flight Center to demonstrate feasibility of achieving the required nulling ratio (10e-4) across the waveband. This paper describes the design and performance analysis of the testbed. Considerations such as polarization, pupil overlap, and optical path length control are discussed.

Author

Interferometers; Space Missions; Gas Giant Planets; Reliability Analysis; Design Analysis

20040040134 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Need for Direct High-Energy Cosmic-Ray Measurements

Jones, Frank C.; Streitmatter, Robert; [2004]; 1 pp.; In English; American Physical Society Meeting, 1-5 May 2004, Denver, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

Measuring the chemical composition of the cosmic rays in the energy region of greater than or equal to 10(exp 12)eV would be highly useful in settling several nagging questions concerning the propagation of cosmic rays in the galaxy. In particular an accurate measurement of secondary to primary ratios such as Boron to Carbon would gibe clear evidence as to whether the propagation of cosmic rays is determined by a diffusion coefficient that varies with the particle's energy as E(sup 0.5) or E(sup 0.3). This would go a long ways in helping us to understand the anistropy (or lack thereof) of the highest energy cosmic rays and the power requirements for producing those particles at approximately equal to 10(exp 18) eV which are believed to be highest energy particles produced in the Galaxy. This would be only one of the benefits of a mission such as ACCESS to perform direct particle measurements on very high energy cosmic rays.

Author

Chemical Composition; Particle Energy; Galactic Cosmic Rays; Measuring Instruments

20040040135 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Future Probes of the Neutron Star Equation of State Using X-ray Bursts

Strohmayer, Tod E.; [2004]; 8 pp.; In English; X-Ray Timing 2003: Rossi and Beyond, 2003; No Copyright; Avail: CASI; A02, Hardcopy

Observations with NASA s Rossi X-ray Timing Explorer (RXTE) have resulted in the discovery of fast (200 - 600 Hz), coherent X-ray intensity oscillations (hereafter, %urstoscillations) during thermonuclear X-ray bursts from 12 low mass X-ray binaries (LMXBs). Although many of their detailed properties remain to be fully understood, it is now beyond doubt that these oscillations result from spin modulation of the thermonuclear burst flux from the neutron star surface. Among the new timing phenomena revealed by RXTE the burst oscillations are perhaps the best understood, in the sense that many of their properties can be explained in the framework of this relatively simple model. Because of this, detailed modelling of burst oscillations can be an extremely powerful probe of neutron star structure, and thus the equation of state (EOS) of supra-nuclear density matter. Both the compactness parameter beta = GM/c(sup 2)R, and the surface velocity, nu(sub rot) = Omega(sub spin)R, are encoded in the energy-dependent amplitude and shape of the modulation pulses. The new discoveries have spurred much new theoretical work on thermonuclear burning and propagation on neutron stars, so that in the near future it is not unreasonable to think that detailed physical models of the time dependent flux from burning neutron stars will be available for comparison with the observed pulse profiles from a future, large collecting area X-ray timing observatory. In addition, recent high resolution burst spectroscopy with XMM/Newton suggests the presence of redshifted absorption lines from the neutron star surface during bursts. This leads to the possibility of using large area, high spectral resolution measurements of X-ray bursts as a precise probe of neutron star structure. In this work I will explore the precision with which constraints on neutron star structure, and hence the dense matter EOS, can be made with the implementation of such programs.

Author

Neutron Stars; Bursts; Space Probes; Spectral Resolution

20040040157 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Role of Beam Geometry in Population Statistics and Pulse Profiles of Radio and Gamma-ray Pulsars

Gonthier, Peter L.; VanGuilder, Robert; Harding, Alice K.; [2004]; 39 pp.; In English

Contract(s)/Grant(s): CC5813; NSF AST-03-07365; Copyright; Avail: CASI; A03, Hardcopy

We present results of a pulsar population synthesis study that incorporates a number of recent developments and some significant improvements over our previous study. We have included the results of the Parkes multi-beam pulsar survey in our select group of nine radio surveys, doubling our sample of radio pulsars. More realistic geometries for the radio and gamma-ray beams are included in our Monte Carlo computer code that simulates the characteristics of the Galactic population of radio and gamma-ray pulsars. We adopted with some modifications the radio beam geometry of Arzoumanian, Chernoff & Cordes (2002). For the gamma-ray beam, we have assumed the slot gap geometry described in the work of Muslimov & Harding (2003). To account for the shape of the distribution of radio pulsars in the P(dot) - P diagram, we continue to find that decay of the magnetic field on a timescale of 2.8 Myr is needed. With all nine surveys, our model predicts that EGRET should have seen 7 radio-quiet (below the sensitivity of these radio surveys) and 19 radio-loud gamma-ray pulsars. AGILE (nominal sensitivity map) is expected to detect 13 radio-quiet and 37 radio-loud gamma-ray pulsars, while GLAST, with greater sensitivity is expected to detect 276 radio-quiet and 344 radio-loud gamma-ray pulsars. When the Parkes multi-beam pulsar survey is excluded, the ratio of radio-loud to radio-quiet gamma-ray pulsars decreases, especially for GLAST. The

decrease for EGRET is 45%, implying that some fraction of EGRET unidentified sources are radio-loud gamma-ray pulsars. In the radio geometry adopted, short period pulsars are core dominated. Unlike the EGRET gamma-ray pulsars, our model predicts that when two gamma-ray peaks appear in the pulse profile, a dominant radio core peak appears in between the gamma-ray peaks. Our findings suggest that further improvements are required in describing both the radio and gamma-ray geometries.
Author
Pulsars; Radio Astronomy; Statistical Analysis; Monte Carlo Method; Computerized Simulation; Stellar Magnetic Fields; Gamma Ray Sources (Astronomy)

20040040190 Texas A&M Univ., TX, USA
Voyager's Grand Tour: To the Outer Planets and Beyond
Dethloff, Henry C.; Schorn, Ronald A.; June 2003; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Every 176 years, Earth and the outer planets gather on one side of the sun, allowing close observation in a single flight, or Grand Tour. To exploit this alignment, the Voyager team developed the so-called gravity assist that essentially sling-shot Voyager I and II from planet to planet. Since their 1977 launch, the probes have discovered strange new worlds and transmitted streams of revolutionary data and eye-popping images that have exploded long-held theories and raised new questions about our solar system. With unfettered access to NASA archives and imagery, and interviews with Voyager scientists and engineers, Dethloff and Schorn have produced the only comprehensive account of one of man's foremost scientific and engineering achievements. Readers are invited into Voyager's inner circle, conceiving, launching, and directing the craft as it discovers rings around Jupiter, geysers on Triton, and intriguing possibilities of extra terrestrial life. Beyond all expectations Voyager is still transmitting 7 billion miles away as it continues out of our solar system into interstellar space, sparking the imagination of a new generation of space visionaries and enthusiasts.
Derived from text
Alignment; Sun; Solar System; Interstellar Space; Gravitation

20040041345 Academia Sinica, Shanghai, China
Annals of Shanghai Observatory, Academia Sinica, No. 24
Huang, Cheng, Editor; Shao, Zheng-Yi, Editor; Zhang, Xiuz-Hong, Editor; Wan, Ning-Shan, Editor; Chen, Li, Editor; Lin, Qing, Editor; Yu, Zhi-Yao, Editor; Wei, Wen-Ren, Editor; Zhou, Yong-Hong, Editor; Zhuang, Xue-Juan, Editor, et al.; 2003; 175 pp.; In English; In Chinese; Copyright; Avail: Other Sources

Content include the folowing: The report on scientific research and technical work of Shanghai Astronomical Observatory in 2002. The synthesized reduction method of CCD observations and its preliminary examination. Some problems about real-time retrieving Precipitable Water Vapor (PWV) from local GPS network. Earth orientation parameters during 1990 - 2001 solved with LAGOES 1 SLR data. The precise determination of the geocentric coordinates of Nanshan GPS tracking station of Urumqi Astronomical Station. present status of GPS/LEO occultation research in Shao. The application of wavelet analysis theory to the technology of GPS. Satellite laser ranging observations at Shanghai Astronomical Observatory during 2001 - 2002. Complicating of the kinematic data of open cluster and some statistical analysis. Shutter function and linearity of the new CCD camera at the 1.56m reflector in Shao. New CCd camera system of the 1.56m telescope in Shao. Microvariability observation of Markarian 335. The entropy of Vaidya black hole due to arbitrary spin fields. Observational characters of extragalactic H2O megamaster sources. VLBI observations of geosynchronous satellites. Reduce the playback error rate of Mark IV tape formats through checking software.
CASI
Astronomical Observatories; Black Holes (Astronomy); Entropy; Global Positioning System; Markarian Galaxies; Open Clusters; Statistical Analysis; Water Vapor

20040041406 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Measuring the Internal Structure and Physical Conditions in Star and Planet Forming Clouds Cores: Towards a Quantitative Description of Cloud Evolution
Lada, Charles J.; March 2004; 3 pp.; In English
Contract(s)/Grant(s): NAG5-13041; No Copyright; Avail: CASI; A01, Hardcopy

This grant funds a research program to use infrared extinction measurements to probe the detailed structure of dark molecular cloud cores and investigate the physical conditions which give rise to star and planet formation. The goals of this program are to acquire, reduce and analyze deep infrared and molecular-line observations of a carefully selected sample of

nearby dark clouds in order to determine the detailed initial conditions for star formation from quantitative measurements of the internal structure of starless cloud cores and to quantitatively investigate the evolution of such structure through the star and planet formation process.
Derived from text
Infrared Radiation; Molecular Clouds; Extinction

20040043667 NASA Ames Research Center, Moffett Field, CA, USA
Formation of Outer Planets: Overview
Lissauer, Jack; [2003]; 1 pp.; In English; A Comparative Study of the Outer Planets Before the Exploration of Saturn by Cassini-Huygens, 12-17 Jan. 2004, Bern, Switzerland
Contract(s)/Grant(s): 344-30-50-01; No Copyright; Avail: Other Sources; Abstract Only

An overview of current theories of planetary formation, with emphasis on giant planets is presented. The most detailed models are based upon observation of our own Solar System and of young stars and their environments. Terrestrial planets are believe to grow via pairwise accretion until the spacing of planetary orbits becomes large enough that the configuration is stable for the age of the system. According to the prevailing core instability model, giant planets begin their growth by the accumulation of small solid bodies, as do terrestrial planets. However, unlike terrestrial planets, the growing giant cores become massive enough that they are able to accumulate substantial amounts of gas before the protoplanetary disk disspates. The primary questions regarding the core instability model is whether planets with small cores can accrete gaseous envelopes within the lifetimes of gaseous protoplanetary disks. The main alternative giant planet formation model is the disk instability model, in which gaseous planets form directly via gravitational instabilities within protoplanetary disks. Formation of giant planets via gas instability has never been demonstrated for realistic disk conditions. Moreover, this model has difficulty explaining the supersolar abundances of heavy elements in Jupiter and Saturn, and it does not explain the orgin of planets like Uranus and Neptune.
Author
Gravitational Instability; Gas Giant Planets; Protoplanetary Disks; Planetary Evolution; Planetary Orbits

20040045167 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Luminous Binary Supersoft X-Ray Sources
DiStefano, Rosanne; Oliversen, Ronald J., Technical Monitor; April 2004; 4 pp.; In English
Contract(s)/Grant(s): NAG5-10705
Report No.(s): Rept-3; No Copyright; Avail: CASI; A01, Hardcopy

This has been a remarkably productive year. We have completed an algorithm to select SSSs in external galaxies which have been observed by Chandru or XMM-Newton. By applying this algorithm to new data, we have discovered an extension of the class of SSSs to sources that are somewhat harder (100 - 300 eV, instead of tens of eV), but which are nevertheless much softer than canonical X-ray sources. We have completed a study of SSSs in M31 and have also considered several other galaxies. From these studies, some population characteristics are beginning to emerge; these provide clues to the natures of the systems. We have considered ultraluminous SSSs in M1O1 and NGC 300. It is possible that these may correspond to accreting intermediate-mass black holes, rather than accreting white dwarfs. We have also studied individual systems, such as CAL 83, and have followed up on additional sources in fields we have studied, such as in the galaxy NGC 1313. NASA has released a press release on some of our work.
Author
X Ray Sources; Algorithms; Luminosity

20040045179 Hawaii Univ., Honolulu, HI, USA
Spatial Statistics of Large Astronomical Databases: An Algorithmic Approach
Szapudi, Istvan; [2004]; 3 pp.; In English
Contract(s)/Grant(s): NAG5-10750; No Copyright; Avail: CASI; A01, Hardcopy

In this AISRP, the we have demonstrated that the correlation function i) can be calculated for MAP in minutes (about 45 minutes for Planck) on a modest 500Mhz workstation ii) the corresponding method, although theoretically suboptimal, produces nearly optimal results for realistic noise and cut sky. This trillion fold improvement in speed over the standard maximum likelihood technique opens up tremendous new possibilities, which will be persued in the follow up.
Author
Algorithms; Spatial Distribution; Maximum Likelihood Estimates; Astronomy; Correlation

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20040035774 University of Electro-Communications, Tokyo, Japan
Bulletin of the University of Electro-Communications, Volume 16, No. 1
July 2003; ISSN 0915-0935; 96 pp.; In English; In Japanese; Copyright; Avail: Other Sources

Contents include the following: An introductory review of magnetospheric physics. Technical trends of electronic auction protocols. Quantum computations and quantum algorithms. A note on performance result of portfolio strategy with market participants view. Priority control for photonic burst networks. What is the way to get used to basic english structures? Development of HF transmission system specialized for ionospheric disturbance observation.
CASI
Algorithms; Ionospheric Disturbances; Protocol (Computers)

20040035795 NASA Goddard Space Flight Center, Greenbelt, MD, USA
High Energy Emission From Millisecond Pulsars
Harding, Alice K.; [2003]; 1 pp.; In English; 2004 Winter Conference on Astrophysics, 11-17 Jan. 2004, Aspen, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

Emission at X-ray and gamma-ray energies has been detected from millisecond pulsars, both isolated and in binary systems. Although these pulsars have low surface magnetic fields, their short periods allow them to have large magnetospheric potential drops, so that high-energy emission from these sources is not unexpected. In fact, several nearby energetic millisecond pulsars that have been detected in X-rays could easily have been detected in gamma-rays by EGRET, but they were not. The reason for this may lie in a high-energy spectrum that is very different in these sources from that of normal pulsars. Both polar cap and outer gap models predict a two-component spectrum, one component peaking in hard X-rays and the other peaking above 1 GeV, with a gap at EGRET peak sensitivity. I will discuss the models for high-energy emission from millisecond pulsars, highlighting the differences between polar cap and outer gap models in spectrum and geometry of the emission.
Author
Pulsars; Emission Spectra; X Rays; Gamma Rays; Sensitivity

20040035798 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An XMM-Newton Observation of the Seyfert Galaxy 1H0419-577 in an Extreme Low State
Pounds, K. A.; Reeves, J. N.; Page, K. L.; O'Brien, P. T.; [2003]; 27 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Previous observations of the luminous Seyfert galaxy 1H 0419-577 have found its X-ray spectrum to range from that of a typical Seyfert 1 with 2-10 keV power law index Gamma approx. 1.9 to a much flatter power law of Gamma approx. 1.5 or less. We report here a new XMM-Newton observation which allows the low state spectrum to be studied in much greater detail than hitherto. We find a very hard spectrum (Gamma approx. 1.0) which exhibits broad features that can be modelled with the addition of an extreme relativistic Fe K emission line or with partial covering of the underlying continuum by a substantial column density of near-neutral gas. Both the EPIC and RGS data show evidence for strong line emission of OVII and OVIII requiring an extended region of low density photoionised gas in 1H 0419- 577. Comparison with an earlier XMM-Newton observation when 1H 0419-577 was X-ray bright indicates the dominant spectral variability occurs via a steep power law component.
Author
Neutral Gases; Seyfert Galaxies

20040035799 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Big Glitcher - the Rotation History of PSR JO537-6910
Marshall, F. E.; Gotthelf, E. V.; Middleditch, J.; Wang, Q. D.; Zhang, W.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We report the results of an extensive monitoring campaign of PSR 50537-6910, the 16 ms pulsar in the Large Magellanic Cloud, using data acquired with the Rossi X-ray Timing Explorer. The spin evolution of this pulsar is found to experience extreme episodic discontinuities in its spin-down rate during the 2.6 year campaign. The rate of occurance of these timing glitches is 2.3 per year, comparable to the highest seen for any pulsar. The mean glitch amplitude produced a fraction change

in the frequency of Delta(nu)/nu = 0.36 x l0(exp -6) and in the frequency derivative of Delta(dot nu)/dot nu = 3 x 10(exp -4). Despite this prodigous timing activity we are able to derive a phase connected timing solution between glitch events with an average spin-down rate of -1.9743 x 10(exp 10) Hz/s. The integrated effect of the glitches in dot nu was so large that the apparent characteristic age of the pulsar (-nu/2dot nu) decreased significantly during the campaign. We discuss the implications of a large glitch activity and high braking index on the spin evolution of young pulsars.
Author
Pulsars; X Ray Timing Explorer; Magellanic Clouds

20040035817 Lawrence Livermore National Lab., Livermore, CA
MACHO Project Analysis of the Galactic Bulge Microlensing Events with Clump Giants as Sources
Popowski, P.; Vandehei, T.; Griest, K.; Alcock, C.; Allsman, R. A.; Mar. 06, 2002; 10 pp.; In English
Report No.(s): DE2003-15004803; UCRL-JC-147584; No Copyright; Avail: Department of Energy Information Bridge

The structure and composition of our Galaxy is one of the outstanding problems in contemporary astrophysics. Microlensing is a powerful tool to learn about massive objects in the Galaxy. The amount of matter between the source and observer is typically described in terms of the microlensing optical depth, which is defined as the probability that a source flux will be gravitationally magnified by more than a factor of 1.34. Early analyses of the lines of sight toward the Galactic center produced two unexpected results: (1) a very high optical depth inconsistent with Galactic models and observations, (2) an overabundance of long events. Here we analyze a new set of events to probe these controversial issues.
NTIS
Astronomical Models; Astrophysics; Galactic Bulge; Galactic Halos; Clumps

20040035839 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Understanding the Wind/Ejecta of ETA Carinae with the STIS
Gull, Theodore R.; [2003]; 2 pp.; In English; IAU XXV Meeting, 13-26 Jul. 2003, Sydney,, Australia; No Copyright; Avail: Other Sources; Abstract Only

The mysterious Luminous Blue Variable, Eta Carinae, and its ejecta, the Homunculus, are yielding much new and exciting information to the Space Telescope Imaging Spectrograph (STIS). With 0.05 in. pixels and R=5000, we have followed changes in the Central Source and the surrounding ejecta over the past 5.5 year period in the spectral region 1650-10300A. Neutral, partially-ionized and highly-excited nebular regions have been resolved. With 0.025 in., R=30000 and R=120000 between 1180 and 3160A, we are following the changes in the Central Source, the wind structure and at least 20 absorption components, thought to be within the wall of the Humunculus. The Central Source proves to be slightly extended at HST angular resolutions. Theoretical models of the nebular line fluxes are providing new insight to the sources of excitation. Photo-excitation, line and continuum pumping, plus shocks, all play a role. Laboratory measurements of Fe-like elements and improved atomic data bases prove necessary for proper interpretation. Increased angular resolution by larger-aperture space telescopes and improved optics and detectors will lead to new understanding of massive stars, their wind structures and history of ejecta.
Author
Ejecta; Angular Resolution; Apertures; Imaging Techniques; Massive Stars; Numerical Analysis

20040037730 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The FUSE Survey of 0 VI in the Galactic Halo
Sonneborn, George; Savage, B. D.; Wakker, B. P.; Sembach, K. R.; Jenkins, E. B.; Moos, H. W.; Shull, J. M.; [2003]; 1 pp.; In English; IAU XXV General Assembly, Symposium No. 217, July 2003, Sydney, Australia; No Copyright; Avail: Other Sources; Abstract Only

This paper summarizes the results of the Far-Ultraviolet Spectroscopic Explorer (FUSE) program to study 0 VI in the Milky Way halo. Spectra of 100 extragalactic objects and two distant halo stars are analyzed to obtain measures of O VI absorption along paths through the Milky Way thick disk/halo. Strong O VI absorption over the velocity range from -100 to 100 km/s reveals a widespread but highly irregular distribution of O VI, implying the existence of substantial amounts of hot gas with T approx. 3 x 10(exp 5) K in the Milky Way thick disk/halo. The overall distribution of O VI is not well described by a symmetrical plane-parallel layer of patchy O VI absorption. The simplest departure from such a model that provides a reasonable fit to the observations is a plane-parallel patchy absorbing layer with an average O VI mid-plane density of n(sub 0)(O VI) = 1.7 x 10(exp -2)/cu cm, a scale height of approx. 2.3 kpc, and a approx. 0.25 dex excess of O VI in the northern Galactic polar region. The distribution of O VI over the sky is poorly correlated with other tracers of gas in the halo, including

low and intermediate velocity H I, Ha emission from the warm ionized gas at approx. l0(exp 4) K, and hot X-ray emitting gas at approx. l0(exp 6) K . The O VI has an average velocity dispersion, b approx. 60 km/s and standard deviation of 15 km/s. Thermal broadening alone cannot explain the large observed profile widths. A combination of models involving the radiative cooling of hot fountain gas, the cooling of supernova bubbles in the halo, and the turbulent mixing of warm and hot halo gases is required to explain the presence of O VI and other highly ionized atoms found in the halo. The preferential venting of hot gas from local bubbles and superbubbles into the northern Galactic polar region may explain the enhancement of O VI in the North.
Author
Galactic Halos; Milky Way Galaxy; Velocity Distribution; Ionized Gases

20040037736 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Is the Ejecta of ETA Carinae Overabundant or Overexcited
Gull, Theodore; Davidson, Kris; Johansson, Sveneric; Damineli, Augusto; Ishibashi, Kaxunori; Corcoran, Michael; Hartman, Henrick; Viera, Gladys; Nielsen, Krister; [2003]; 2 pp.; In English; IAU XXV Meeting, 13-26 Jul. 2003, Sydney,, Australia; No Copyright; Avail: Other Sources; Abstract Only

The ejecta of Eta Carinae, revealed by HST/STIS, are in a large range of physical conditions. As Eta Carinae undergoes a 5.52 period, changes occur in nebular emission and nebular absorption. 'Warm' neutral regions, partially ionized regions, and fully ionized regions undergo significant changes. Over 2000 emission lines, most of Fe-like elements, have been indentified in the Weigelt blobs B and D. Over 500 emission lines have been indentified in the Strontium Filament. An ionized Little Homunculus is nestled within the neutral-shelled Homunculus. In line of sight, over 500 nebular absorption lines have been identified with up to twenty velocity components. STIS is following changes in many nebular emission and absorption lines as Eta Carinae approaches the minimum, predicted to be in June/July 2003, during the General Assembly. Coordinated observations with HST, CHANDRA, RXTE, FUSE, UVES/VLT, Gemini and other observatories are following this minimum.
Author
Emission Spectra; Abundance; Nebulae

20040037747 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Time-Resolved UV Spectra of Pulsars with HST/STIS
Gull, Theodore R.; Lundqvist, Peter; Sollerman, Jesper; Shibanov, Yura; Lindler, Don; Koptsevich, Alexi; [2003]; 2 pp.; In English; IAUXXV Meeting, 13-26 Jul. 2003, Sydney,, Australia; No Copyright; Avail: Other Sources; Abstract Only

We have used HST/STIS to observe the young Crab pulsar and the middle-aged PSR B0656+14. The Crab pulsar was observed in both the near- and far-UV, and together with ground-based data we establish a spectrum that covers 1140-9250 A. A flat spectrum with a power-law index of 0.11 +/- 0.04 fits the entire spectral region. With the time-tag mode of the spectrograph we obtain the pulse profile, and show that the near- and far-UV profiles are similar, although the primary peak is marginally narrower. In the far-UV spectrum we also see evidence of blueshifted absorption in C IV 1550 A out to 2500km/s, which could be a sign of the long-debated fast shell around the pulsar. PSR B0656+14 was observed using the prism mode of STIS/MAMA in the near-UV, and with this observation we have made it the first middle-aged for which a UV pulse profile has been established. Preliminary analysis shows two distinct pulses per the pulsar period in near-UV, which is in contrast to a single pulse detected in radio and soft X-ray ranges.
Author
Ultraviolet Spectra; Pulsars; Spectral Bands

20040037757 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Constraints on the Energy Content of the Universe from a Combination of Galaxy Cluster Observables
Molnar, Sandor M.; Haiman, Zoltan; Birkinshaw, Mark; Mushotzky, Richard F.; [2003]; 6 pp.; In English
Contract(s)/Grant(s): NAG5-3432; No Copyright; Avail: CASI; A02, Hardcopy

We demonstrate that constraints on cosmological parameters from the distribution of clusters as a function of redshift (dN/dz) are complementary to accurate angular diameter distance (D(sub A)) measurements to clusters, and their combination significantly tightens constraints on the energy density content of the Universe. The number counts can be obtained from X-ray and/or SZ (Sunyaev-Ze'dovich effect) surveys, and the angular diameter distances can be determined from deep observations of the intra-cluster gas using their thermal bremsstrahlung X-ray emission and the SZ effect. We combine constraints from simulated cluster number counts expected from a 12 deg(sup 2) SZ cluster survey and constraints from simulated angular diameter distance measurements based on the X-ray/SZ method assuming a statistical accuracy of 10% in the angular diameter

distance determination of 100 clusters with redshifts less than 1.5. We find that Omega(sub m), can be determined within about 25%, Omega(sub lambda) within 20% and w within 16%. We show that combined dN/dz+(sub lambda) constraints can be used to constrain the different energy densities in the Universe even in the presence of a few percent redshift dependent systematic error in D(sub lambda). We also address the question of how best to select clusters of galaxies for accurate diameter distance determinations. We show that the joint dN/dz+ D(lambda) constraints on cosmological parameters for a fixed target accuracy in the energy density parameters are optimized by selecting clusters with redshift upper cut-offs in the range 0.55 approx. less than 1. Subject headings: cosmological parameters - cosmology: theory - galaxies:clusters: general
Author
Cosmology; Universe; Thermal Emission; Galactic Clusters

20040037781 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Coronagraphic Observations of Optically Thin Debris Disks
Clampin, Mark; [2004]; 1 pp.; In English; IAU XXV Meeting, July 2003, Sydney,, Australia
Report No.(s): IAU02145; No Copyright; Avail: Other Sources; Abstract Only

We present the first observations of the debris disks around HD141569A and HD100546 made with the Advanced Camera for Surveys (ACS) Coronagraph. Both HD141569A and HD100546 are known to possess circumstellar disks with complex structures. HD141569A's disk was shown to exhibit a a gap from NICMOS observations, while HD100546 has been shown to exhibit a disk with spiral structure (Grady et al. 2001). The ACS observations were made as part of the GTO program to study the formation of planetary systems. The performance of the ACS Coronagraph meets pre-launch expectations, and allows us to achieve images with both unparalleled contrast and, a fully-sampled point spread function. We will present new, multi-color images of each object obtained with the F435W, F606W and F814W filters. These images present a significant improvement over the previous observations with NICMOS and STIS. We fully resolve the complex spiral structures observed within these disks and determine the true angular extent of the disks. Disk properties including color variations, disk asymmetries and morphology are determined. We discuss the formation history of these disks in the light of our new observations and review the evidence for the possibility that the systems harbor planets.
Author
Coronagraphs; Debris; Planetary Systems; Stellar Envelopes

20040040192 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
From the Cluster Temperature Function to the Mass Function at Low Z
Mushotzky, Richard, Technical Monitor; Markevitch, Maxim; March 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9945; No Copyright; Avail: CASI; A01, Hardcopy

This XMM project consisted of three observations of the nearby, hot galaxy cluster Triangulum Australis, one of the cluster center and two offsets. The goal was to measure the radial gas temperature profile out to large radii and derive the total gravitating mass within the radius of average mass overdensity 500. The central pointing also provides data for a detailed two-dimensional gas temperature map of this interesting cluster. We have analyzed all three observations. The derivation of the temperature map using the central pointing is complete, and the paper is soon to be submitted. During the course of this study and of the analysis of archival XMM cluster observations, it became apparent that the commonly used XMM background flare screening techniques are often not accurate enough for studies of the cluster outer regions. The information on the cluster's total masses is contained at large off-center distances, and it is precisely the temperatures for those low-brightness regions that are most affected by the detector background anomalies. In particular, our two offset observations of the Triangulum have been contaminated by the background flares ('bad cosmic weather') to a degree where they could not be used for accurate spectral analysis. This forced us to expand the scope of our project. We needed to devise a more accurate method of screening and modeling the background flares, and to evaluate the uncertainty of the XMM background modeling. To do this, we have analyzed a large number of archival EPIC blank-field and closed-cover observations. As a result, we have derived stricter background screening criteria. It also turned out that mild flares affecting EPIC-pn can be modeled with an adequate accuracy. Such modeling has been used to derive our Triangulum temperature map. The results of our XMM background analysis, including the modeling recipes, are presented in a paper which is in final preparation and will be submitted soon. It will be useful not only for our future analysis but for other XMM cluster observations as well.
Author
Galactic Clusters; Xmm-Newton Telescope; Gas Temperature; Temperature Profiles; Mass Distribution

20040041356 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Imagine the Universe!

White, N.; [2003]; 4 pp.; In English

Report No.(s): NASA/EC-2003-12-012-GSFC; No Copyright; Avail: CASI; C01, CD-ROM; A01, Hardcopy

Welcome to the 2004 edition of the education CD from the Laboratory for High Energy Astrophysics at NASA Goddard Space Flight Center. We hope that you will find it to be an exciting and fun learning experience. We have tried very hard to make this CD as user-friendly as possible and along the way we have discovered some things that every user may need to know. Please read the README file found on the CD if you have any questions or problems using the disk. Then, after that, if you still have problems, email us at itu@athena.gsfc.nasa.gov. We will be happy to help you 'get going'! Below are links to all of the sites included on the CD. You will also find the addresses for the on-line version of each of these sites. If you have a good Internet connection available, we recommend that you view the sites on-line. There you will find the latest updated information, interactive activities, and active links to other sites. Included on the disk are: Imagine The Universe! This site is dedicated to a discussion about our Universe... what we know about it, how it is evolving, and the kinds of objects and phenomena it contains. Emphasizing the X-ray and gamma-ray parts of the electromagnetic spectrum, it also discusses how scientists know what they know, what mysteries remain, and how the answers to remaining mysteries may one day be found. Lots of movies, quizzes, and a special section for educators. Geared for ages 14 and up. This site can be viewed on-line at http://imagine.gsfc.nasa.gov/. StarChild: A learning center for young astronomers The 1998 Webby Award Winner for Best Education Website, StarChild is aimed at ages 4-14. It contains easy-to-understand information about our Solar System, the Universe, and space exploration. There are also activities, songs, movies, and puzzles! This site can be viewed on-line at http://starchild.gsfc.nasa.gov/. Astronomy Picture of the Day APOD offers a new astronomical image and caption each calendar day. We have captured the year 2003 entries of this award-winning site and included them on the disk. The images and information provide a wonderful resource for all ages. This site can be viewed on-line at http://apod.gsfc.nasa.gov/apod/astropix.html.

Author

Astronomy; Astrophysics; Universe; Solar System; Education

20040045181 Smithsonian Astrophysical Observatory, Cambridge, MA, USA

Over-Luminous Elliptical Galaxies

Mushotzky, Richard, Technical Monitor; Forman, William; March 2004; 2 pp.; In English

Contract(s)/Grant(s): NAG5-12932; No Copyright; Avail: CASI; A01, Hardcopy

We have completed a first draft of a paper on the galaxy group ES03060170, the hottest known fossil group. We have submitted a first draft of the paper but the final completion is delayed due to several issues mentioned by the referee that we wish to revisit and discuss in more detail. The XMM data was combined with Chandra data which allowed a rich set of projects. The paper discusses the north-south elongation which is similar to that of the central dominant galaxy as well as the galaxy distribution. We detect an X-ray 'finger' or small tail emanating from the central galaxy to the north, suggesting motion of the galaxy within the elongated gravitational potential. The overall agreement between XMM and Chandra data are excellent (although the XMM data extend to larger radii). Both data sets show a cool core centered on the dominant galaxy. Surprisingly, the temperature maps and detailed spectra indicate that the finger of gas is NOT cool, but has the same temperature as the ambient gas. We extracted surface brightness profiles, deprojected gas density profiles, cooling time profiles, and entropy profiles. There is a sharp discontinuity in gas temperature where the surface brightness profile starts to rise rapidly at 10 kpc. This produces a decrease in the cooling time and the gas entropy within 10 kpc. The central cooling time (within 10 kpc) is less than l0(exp 9) years and falls to almost half that value in the inner 5 kpc. Despite the very short cooling time, we find no evidence (even with the excellent statistics from XMM-Newton) for multi-phased gas, i.e., a cooling flow. We find two 'edges' associated with the gas distribution (common in peaked X-ray groups and galaxies). On large scales, the temperature profile is flat and disagrees with the profile predicted by Loken et al. (2003) from detailed numerical simulations. We studied the galaxy distribution within one virial radius. The galaxy concentration associated with the group is detectable only within 0.3 of the virial radius (450 kpc) given the available depth of the optical galaxy catalogs at present. We have derived total mass and gas mass distributions (from the X- ray data) and find the gas fraction approaches a constant 8% (for Ho = 70).

Author

Elliptical Galaxies; Luminosity; Data Acquisition; X Ray Sources

91
LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20040037788 NASA Langley Research Center, Hampton, VA, USA
Mars Exploration Rover Terminal Descent Mission Modeling and Simulation
Raiszadeh, Behzad; Queen, Eric M.; February 2004; 16 pp.; In English; 14th AAS/AIAA Space Flight Mechanics Meeting, 8-12 Feb. 2004, Maui, HI, USA
Contract(s)/Grant(s): 759-30-00
Report No.(s): AAS-04-271; No Copyright; Avail: CASI; A03, Hardcopy

Because of NASA's added reliance on simulation for successful interplanetary missions, the MER mission has developed a detailed EDL trajectory modeling and simulation. This paper summarizes how the MER EDL sequence of events are modeled, verification of the methods used, and the inputs. This simulation is built upon a multibody parachute trajectory simulation tool that has been developed in POST I1 that accurately simulates the trajectory of multiple vehicles in flight with interacting forces. In this model the parachute and the suspended bodies are treated as 6 Degree-of-Freedom (6 DOF) bodies. The terminal descent phase of the mission consists of several Entry, Descent, Landing (EDL) events, such as parachute deployment, heatshield separation, deployment of the lander from the backshell, deployment of the airbags, RAD firings, TIRS firings, etc. For an accurate, reliable simulation these events need to be modeled seamlessly and robustly so that the simulations will remain numerically stable during Monte-Carlo simulations. This paper also summarizes how the events have been modeled, the numerical issues, and modeling challenges.
Author
Mars Exploration; Mars Roving Vehicles; Descent; Space Missions; Mathematical Models; Trajectory Analysis; Computerized Simulation

20040037792 Massachusetts Inst. of Tech., Cambridge, MA, USA
Hydrogen Concentrations on C-Class Asteroids Derived from Remote Sensing
Rivkin, A. S.; Davies, J. K.; Johnson, J. R.; Ellison, S. L.; Trilling, D. E.; Brown, R. H.; Lebofsky, L. A.; Meteoritics and Planetary Science; 2003; Volume 38, No. 9, pp. 1-16; In English
Contract(s)/Grant(s): NAG5-10604; NAG5-11617; Copyright; Avail: Other Sources

We present spectroscopic observations of 16 asteroids from 1.9-3.6 microns collected from the UK Infrared Telescope (UKIRT) from 1996-2000. Of these 16 asteroids, 11 show some evidence of a 3 microns hydrated mineral absorption feature greater than 2(sigma) at 2.9 microns. Using relations first recognized for carbonaceous chondrite powders by Miyamoto and Zolensky and Sato et al., we have determined the hydrogen to silicon ratio for these asteroids and calculated their equivalent water contents, assuming all the hydrogen was in water. The asteroids split into 2 groups, roughly defined as equivalent water contents approx. greater than 7% (8 asteroids, all with 3 microns band depths approx. greater than 20%) and approx. greater than 3% for the remaining 8 asteroids. This latter group includes some asteroids for which a weak but statistically significant 3 microns band of non-zero depth exists. The G-class asteroids in the survey have higher water contents, consistent with CM chondrites. This strengthens the connection between CM chondrites and G asteroids that was proposed by Burbine. We find that the 0.7 microns and 3 microns band depths are correlated for the population of target objects.
Author
Asteroids; Carbonaceous Chondrites; Hydrogen; Moisture Content; Silicon; Water

20040040112 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Buried and Visible Impact Basin Distribution on Mars: Comparison with Magnetization, Gravity and Crustal Thickness Models
Frey, Herbert; 2003; 1 pp.; In English; 2003 Seattle Annual Meeting, 2-5 Nov. 2003, Seattle, WA, USA
Report No.(s): Paper 67-5; Copyright; Avail: Other Sources; Abstract Only

The large population of buried impact basins found in MOLA elevation data on Mars provides compelling evidence for a pre-Noachian crust below the oldest visible Early Noachian surface units, and lowland crust below the younger plains that is Early Noachian in age, older than much of the visible highlands, but not as old as the buried pre-Noachian highlands. The large (D greater than 200 km) buried basins are suggested by Quasi-Circular Depressions (QCDs) that are not apparent in image data, and include features up to 3000 lun diameter in both the lowlands (Utopia) and highlands (a newly found 'Ares Basin'). There are about a dozen QCDs larger than 1000 km diameter. We have placed these large features in a relative age

sequence based on superimposed smaller QCD. Only the youngest and most obvious of these (Hellas, Argyre, Isidis) lack magnetic anomalies within their main rings. These all have an N(200) cumulative crater density of less than 2.5. Somewhat older lowland-making basins (Utopia, Chryse, Acidalia) with an N(200) age of approximately 3.0, have weak magnetic anomalies, and the oldest, most subdued basins (including Ares) with N(200) greater than 3.5 have many strong magnetic anomalies within their main ring. These older basins likely formed before the main magnetic field died. We have compared our inventory of large QCDs with the distribution of gravity anomalies and with a crustal thickness model which shows many roughly circular areas of thinner crust completely or partly surrounded by narrow regions of thicker crust. These have the structure expected for impact basins, and many of them do correspond to the visible or buried QCDs we previously identified. But there are cases where the crustal thickness feature is offset from the QCD found in topography alone, and there are also several, sometimes large examples of such features which do not coincide with QCDs previously identified. For example, we find several likely buried basins revealed in the crustal thickness data in the Arcadia and Amazonis regions which we did not previously identify, including several features in the 600-1200 km diameter range.
Author
Gravitation; Magnetization; Mars Surface; Structural Basins; Planetary Geology; Planetary Crusts

20040040116 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Estimating the k2 Tidal Gravity Love Number of Mars
Smith, David E.; Zuber, Maria; Torrence, Mark; Dunn, Peter; [2003]; 2 pp.; In English; Fall American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Analysis of the orbits of spacecraft can be used to infer global tidal parameters. For Mars, the Mars Global Surveyor (MGS) spacecraft has been used to estimate the second degree Love number, k2 from the tracking DSN tracking Doppler and range data by several authors. Unfortunately, neither of the spacecraft presently in orbit are ideally suited to tidal recovery because they are in sun-synchronous orbits that vary only slightly in local time; and, further, the sub-solar location only varies by about 25 degrees in latitude. Never-the less respectable estimates of the k2 tide have been made by several authors. We present an updated solution of the degree 2 zonal Love number, compare with previous dues, and analyze the sensitivity of the solution to orbital parameters, spacecraft maneuvers, and solution methodology. Estimating the k2 Tidal Gravity Love Number of Mars.
Author
Tides; Numerical Analysis; Gravitation; Sensitivity; Deep Space Network; Mars (Planet)

20040040187 Massachusetts Inst. of Tech., Cambridge, MA, USA
Identification of Aqueous Alteration Products on Low-Albedo Asteroids
Rivkin, Andrew; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-11617; No Copyright; Avail: CASI; A01, Hardcopy

The following accomplishments were funded by this grant: 1) Partially supported the writing and publication of 'Hydrated Minerals on Asteroids'. 2) Partially supported the writing and publication of 'Near-Infrared Spectrophotometry of Phobos and Deimos'. 3) Partially supported the writing and publication of 'Hydrogen concentrations on C-class asteroids derived from remote sensing'. 4) Travel to 2002 Lunar and Planetary Sciences Conferences and presentation of 'Calculated Water Concentrations on C-Class Asteroids'. 5) Reduction of asteroidal spectroscopic data including corrections for thermal flux, as described in the grant proposal and descoping document. These data appeared in the publications listed in items 1, 3 and 4.
Author
Asteroids; Infrared Spectrophotometers; Hydrogen; Heat Flux

20040040302 Raytheon Technical Services Co., Greenbelt, MD, USA
Radiolytic Model for Chemical Composition of Europa's Atmosphere and Surface
Cooper, John F.; March 12, 2004; 15 pp.; In English
Contract(s)/Grant(s): NASW-02037; No Copyright; Avail: CASI; A03, Hardcopy

The overall objective of the present effort is to produce models for major and selected minor components of Europa s neutral atmosphere in 1-D versus altitude and in 2-D versus altitude and longitude or latitude. A 3-D model versus all three coordinates (alt, long, lat) will be studied but development on this is at present limited by computing facilities available to the investigation team. In this first year we have focused on 1-D modeling with Co-I Valery Shematovich s Direct Simulation Monte Carlo (DSMC) code for water group species (H2O, O2, O, OH) and on 2-D with Co-I Mau Wong's version of a similar code for O2, O, CO, CO2, and Na. Surface source rates of H2O and O2 from sputtering and radiolysis are used in the 1-D

model, while observations for CO2 at the Europa surface and Na detected in a neutral cloud ejected from Europa are used, along with the O2 sputtering rate, to constrain source rates in the 2-D version. With these separate approaches we are investigating a range of processes important to eventual implementation of a comprehensive 3-D atmospheric model which could be used to understand present observations and develop science requirements for future observations, e.g. from Earth and in Europa orbit. Within the second year we expect to merge the full water group calculations into the 2-D version of the DSMC code which can then be extended to 3-D, pending availability of computing resources. Another important goal in the second year would be the inclusion of sulk and its more volatile oxides (SO, SO2).
Derived from text
Neutral Atmospheres; Latitude; Longitude; Chemical Composition; Atmospheric Models; Oxygen; Sulfur Dioxides

20040042487 Colorado Univ., Boulder, CO, USA
Multi-Wavelength Analysis of Asteroids: A Search for Evidence of Space Weathering
Hendrix, Amanda; March 31, 2003; 1 pp.; In English
Contract(s)/Grant(s): NAG9-1209; No Copyright; Avail: Other Sources; Abstract Only

This work has resulted in the publication of an article in the planetary science journal Icarus. Further work was presented at the 2003 Lunar and Planetary Science Conference (LPSC), and is in the process of being written up as an article for submission to Icarus or Meteoritics and Planetary Science. The Icarus article and the LPSC abstract are included on the following pages.
Author
Space Weathering; Asteroids

20040043676 NASA Ames Research Center, Moffett Field, CA, USA
The Mobile Agents Integrated Field Test: Mars Desert Research Station April 2003
Clancey, William J.; Sierhuis, Maarten; Alena, Rick; Crawford, Sekou; Dowding, John; Graham, Jeff; Kaskiris, Charis; Tyree, Kim S.; vanHoof, Ron; October 30, 2003; 6 pp.; In English; FLAIR 2004, May 2004, Miami, FL, USA; No Copyright; Avail: CASI; A02, Hardcopy

The Mobile Agents model-based, distributed architecture, which integrates diverse components in a system for lunar and planetary surface operations, was extensively tested in a two-week field 'technology retreat' at the Mars Society s Desert Research Station (MDRS) during April 2003. More than twenty scientists and engineers from three NASA centers and two universities refined and tested the system through a series of incremental scenarios. Agent software, implemented in runtime Brahms, processed GPS, health data, and voice commands-monitoring, controlling and logging science data throughout simulated EVAs with two geologists. Predefined EVA plans, modified on the fly by voice command, enabled the Mobile Agents system to provide navigation and timing advice. Communications were maintained over five wireless nodes distributed over hills and into canyons for 5 km; data, including photographs and status was transmitted automatically to the desktop at mission control in Houston. This paper describes the system configurations, communication protocols, scenarios, and test results.
Author
Planetary Surfaces; Communication Networks; Geological Surveys; Global Positioning System

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20040037777 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Proton-Induced Transients and Charge Collection Mechanisms in a LWIR HgCdTe Focal Plane Array
Marshall, Paul; Hubbs, John E.; Arrington, Douglas C.; Reed, Robert A.; Gee, George; Pickel, Jim C.; Ramos, Rudolfo A.; Marshall, Cheryl J.; [2003]; 8 pp.; In English; Nuclear and Space Radiation Effects Conference, 23 Jul. 2003, Monterey, CA, USA; No Copyright; Avail: CASI; A02, Hardcopy

Low noise performance of IR detectors is required, even in the presence of charged particles. Galactic cosmic rays, trapped protons & solar energetic particles. Particle induced transients identified as an important source of noise on ESA's ISO satellite. Also observed on NICMOS Instrument on NASA% Hubble Space Telescope. Tools to analyse particle induced transients have been developed. To date, comparisons of model have been made to flight data for a HgCdTe array exposed to trapped protons, and to a Si array exposed to laboratory protons. We report ground based proton transient measurements

in a modem LWlR HgCdTe array operating under cryogenic conditions. Demonstration of charge collection mechanisms. Provide benchmarks for modeling tools.
Derived from text
Charged Particles; Protons; Mercury Cadmium Tellurides; Infrared Detectors; Galactic Cosmic Rays

20040040181 Naval Research Lab., Washington, DC, USA
SEP Time-to-Maximum (TTM) Studies and the Ionic Charge States of Solar Heavy Ions
Tylka, Allan J.; Dietrich, William F.; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NASA Order S-13823-G; No Copyright; Avail: CASI; A01, Hardcopy

1. We published a report on the TTM method and presented the results at the 28 International Cosmic Ray Conference. Included in this paper were our results on the energy-dependent charge state of Fe in the 200 1 April 15 ground- level event, the largest of Cycle 23. We showed that our results agreed well with direct measurements from SAMPEX in this event. We also presented results for the 2001 April 14 event, one of the largest impulsive events of Cycle 23. 2. We extracted TTM values for protons and ions of various energies in approx. 50 SEP events in Cycle 23, using time profiles measured by ACE, Wind, GOES, IMPS, SOHO, and SAMPEX. This event sample included many large gradual events, as well as several impulsive events. The TTM analyses typically yielded approx. 300 datapoints per event. 3. We used these data to make preliminary event classifications according to: (a) shapes of the rigidity and/or speed dependence of TTMs in each event; (b) behavior of proton TTMs compared to that of heavier ions; and (c) the behavior of Fe TTMs compared to that of lighter Z greater than I ions. 4. We cross-checked proton fluence and TTM values from 8 instruments on 6 satellites, so as to understand the origin of systematic instrument-to-instrument discrepancies. By also comparing the observed proton spectra, it was possible to extract correction factors to the nominal proton energy bins that removed or greatly reduced the instrument-to-instrument spread among proton TTMs. 5. We began comparisons of proton and He-4 TTM values in some particularly well measured, large SEP events measured by IMP8 in Cycles 21 and 22 when the instruments onboard were functioning better. It is hoped that these data will provide a better understanding of event-to-event variation in the functional dependence of TTMs on velocity and rigidity.
Author
Heavy Ions; Solar Activity; Proton Energy; Charged Particles; Helium Isotopes

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20040037780 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Invited Talks at Naples and Coimbra
Jordan, Stuart; [2003]; 1 pp.; In English; Invited talk at the Solar Observatory, 9-24 Jul. 2003, Naples, Italy; No Copyright; Avail: Other Sources; Abstract Only

Prior to observations of the solar irradiance from space that began in 1979 there was no hope of obtaining even rough estimates of the solar irradiance variation over a solar cycle, since the space observations made since showed that the magnitude of the variation over a cycle to date is less than 0.1 %, a value too small to measure from the ground. At the same time, it would be useful to know the cycle-dependent variation over more than just the two recent cycles. Lacking a complete theory for the solar dynamo responsible for this variation, the current hope is to determine what proxy might yield the best values. Because there is an excellent database on sunspot umbral and penumbral areas from the Greenwich Observatory for the years 1874-1976 (but not beyond), the possibility exists that these data could be used. This talk will summarize results of a joint study in which satellite measurements of the solar irradiance variation are compared with ground-based measurements from the Coimbra Observatory of sunspot number, umbral area, and total sunspot area to determine which would serve as the best proxy for using the Greenwich observations back to 1874. From the near constancy of sunspot umbral magnetic fields upon which the useful parameter photometric sunspot index is based, we expected that umbral area would yield the beat proxy. To our surprise, after performing a statistical study of the observations over the period 1980-1990, preliminary indications are that sunspot number (a parameter available back into the 18th century) may be just as useful as the umbral area. As expected, both are quite superior as proxies to total sunspot area, which includes the penumbral area. This conclusion is consistent with earlier work of Hop and Schatten, who sought a proxy by studies of the umbral-penumbral area ratio. A second motivation for pursuing this work is the possibility that relatively small variations in the solar irradiance may induce larger responses in

Earth's climate than would occur from simply introducing the corresponding heat differential into the terrestrial atmosphere. The talk will conclude with a description of why some climatologists are beginning to explore this possibility, which is suggest by some of the space observations used in the above search for a solar irradiance variation proxy.
Author
Solar Radiation; Satellite Observation; Light (Visible Radiation); Solar Cycles; Solar Magnetic Field

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20040035796 NASA Dryden Flight Research Center, Edwards, CA, USA
Research Engineering
Crawford, J. Larry, Compiler; Cruciani, Everlyn, Compiler; January 2004; 92 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2004-212025; H-2522; No Copyright; Avail: CASI; A05, Hardcopy
Selected research and technology activities at Dryden Flight Research Center are summarized. These activities exemplify the Center's varied and productive research efforts.
Author
Research and Development; Systems Engineering; Aerodynamic Configurations; Flight Tests; Dynamic Structural Analysis; Supersonic Combustion Ramjet Engines

20040040296 NASA Langley Research Center, Hampton, VA, USA
Review of X-43A Return to Flight Activities and Current Status
Reubush, David E.; Nguyen, Luat T.; Rausch, Vincent L.; [2004]; 9 pp.; In English; AIAA 12th International Space Planes and Hypersonic Systems and Technologies Conference, 15-19 Dec. 2003, Norfolk, VA, USA
Report No.(s): AIAA Paper 2003-7085; No Copyright; Avail: CASI; A02, Hardcopy
This paper provides an overview and status of the return to flight activities for the X-43A scramjet flight demonstrator after the first flight mishap. The first flight was attempted on June 2, 2001 and resulted in vehicle destruction by range safety when the booster went out of control early in the flight. In the time since the mishap much work has been done to examine the causes of the failure and make modifications to the booster to insure that the boost for the second flight will be successful. In addition, all other aspects of the flight have been examined to maximize the probability of a successful flight.
Author
Supersonic Combustion Ramjet Engines; Probability Theory; Trajectory Control; Fatigue (Materials)

20040041297 Westinghouse Savannah River Co., Aiken, SC, USA
Internal/External Corrosion Analysis of the SAFKEG 3940A Package in KAMS (U)
Vormelker, P. R.; Jun. 2003; 36 pp.; In English
Report No.(s): DE2004-820086; WSRC-TR-20003-00195; No Copyright; Avail: Department of Energy Information Bridge
This report describes the performance and conclusions of a 10 plus year storage mission evaluation of the potential for corrosion of the stainless steel components of the SAFKEG 3940A package in the Savannah River Site K-Area Materials Storage.
NTIS
Corrosion; Stainless Steels

20040041314 Rhode Island Univ., Kingston, RI, USA
High Order GPS Base Station Support for Rhode Island
August, P.; LaBash, C.; Chapman, D.; Duhaime, R.; Sep. 2001; 16 pp.; In English
Report No.(s): PB2004-104005; No Copyright; Avail: CASI; A03, Hardcopy
The purpose of this project is to provide enhanced web-access to high-accuracy GPS base station reference files for the transportation planning, engineering, and emergency response communities in Rhode Island. In August and September of 2000, we worked in close cooperation with Kathy Cheteyan, Programming Services Officer, RIDOT Survey Section to

participate in a 2-week regional survey campaign to improve the Federal Base Network (FBN) in August and September, 2000. The purpose of the FBN Survey is to establish new FBN positions and to improve the horizontal and vertical accuracy of existing FBN points along with a regional densification of the Cooperative Base Network. Another goal involves cooperation and technology transfer to state and local surveying agencies.
NTIS
Global Positioning System; Densification

20040041360 NASA, Washington, DC, USA
Celebrating a Century of Flight
January 2004; 31 pp.; In English
Report No.(s): NASA/SP-2002-09-511-HQ; No Copyright; Avail: CASI; A03, Hardcopy

The history of aviation is briefly covered in this publication, with sections on the Wright brothers, the balloons of the Montgolfier brothers, other early aviation pioneers before the Wright brothers, the role of aircraft in the world wars, air mail, Charles Lindbergh, women aviators, the jet age, and the space age, among other topics.
Author
Aircraft; Aeronautics; Histories

20040041363 NASA, Washington, DC, USA
The Vision for Space Exploration
February 2004; 32 pp.; In English
Report No.(s): NASA/NP-2004-01-334-HQ; No Copyright; Avail: CASI; A03, Hardcopy

With last year's budget, NASA released a new Strategic Plan outlining a new approach to space exploration using a 'building block' strategy to explore scientifically valuable destinations across our solar system. At the same time that we released the Strategic Plan, our Nation and the NASA family also suffered the loss of the seven brave astronauts aboard the Space Shuttle Columbia. The report of the Columbia Accident Investigation Board emphasized the need for a clearer direction from which to drive NASA's human exploration agenda. On January 14, 2004, the President articulated a new vision for space exploration. You hold in your hands a new, bolder framework for exploring our solar system that builds upon the policy that was announced by the President after months of careful deliberations within the Administration. This plan does not undertake exploration merely for the sake of adventure, however exciting that may be, but seeks answers to profound scientific and philosophical questions, responds to recent discoveries, will put in place revolutionary technologies and capabilities for the future, and will genuinely inspire our Nation, the world, and the next generation. Our aim is to explore in a sustainable, affordable, and flexible manner. We believe the principles and roadmap set down in this document will stand the test of time. Its details will be subject to revision and expansion as new discoveries are made, new technologies are applied, and new challenges are met and overcome. This plan is guided by the Administration's new space exploration policy, 'A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration,' a copy of which is provided on the following pages. NASA is releasing this plan simultaneously with NASA's FY 2005 Budget Justification. This plan is fiscally responsible, consistent with the Administration s goal of cutting the budget deficit in half within the next five years. I cannot overstate how much NASA will change in the coming years as this plan is implemented. I also cannot overstate how profound the rewards will be on this new course. With the support of Congress, the science community, the NASA civil and contractor workforce, and most importantly, the American public, we will embark on this very exciting future. When Christopher Columbus made his voyages across the Atlantic in the 15th and 16th centuries, his ships carried the inscription 'Following the light of the sun, we left the Old World.' I look forward to joining you as we follow the light of the planets and the stars into the new worlds of the 21st century.
Author
NASA Programs; Project Management; Space Exploration

20040043713 NASA Ames Research Center, Moffett Field, CA, USA
Lyophilization for Water Recovery From Solid Waste
Flynn, Michael; Litwiller, Eric; Reinhard, Martin; [2003]; 1 pp.; In English; Habitation 2004, 4-7 Jan. 2004, Orlando, FL, USA
Contract(s)/Grant(s): 131-20-10-26; No Copyright; Avail: Other Sources; Abstract Only

This abstract describes the development of a solid waste treatment system designed for a near term human exploration mission. The technology being developed is an energy- efficient lyophilization technique that recovers water from spacecraft

solid waste. In the lyophilization process water in an aqueous waste is frozen and then sublimed, resulting in the separation of the waste into a dried solid material and liquid water. This technology is ideally suited to applications where water recovery rates approaching 100% are desirable but production of CO, is not. Water contained within solid wastes accounts for approximately 3% of the total water balance. If 100% closure of the water loop is desired the water contained within this waste would need to be recovered. To facilitate operation in microgravity thermoelectric heat pumps have be used in place of traditional fluid cycle heat pumps. A mathematical model of a thermoelectric lyophilizer has been developed and used to generate energy use and processing rate parameters. The results of laboratory investigations and discussions with ALS program management have been used to iteratively arrive at a prototype design. This design address operational limitations which were identified in the laboratory studies and handling and health concerns raised by ALS program management. The current prototype design is capable of integration into the ISS Waste Collection System.

Author

Waste Treatment; Solid Wastes; Waste Water

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