National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

Scientific and Technical Aerospace Reports

STAR

Volume 42 Issue 5

March 12, 2004

WHAT'S INSIDE

- NASA STI Program Overview
- Introduction
- NASA STI Availability Information
- Table of Contents
- Subject Term Index
- Personal Author Index

NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program plays a key part in helping NASA maintain this important role.

The NASA STI Program provides access to the NASA Aeronautics and Space Database, the largest collection of aeronautical and space science in the world. The STI Program is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- TECHNICAL PUBLICATION. Reports of completed research or major significant phases of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed of continuing reference value. NASA counterpart of peer-reviewed formal professional papers, but has less stringent limitations on manuscript length and extent of graphic presentations.
- TECHNICAL MEMORANDUM. Scientific and technical findings that are of preliminary or specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.
- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.
- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that help round out the STI Program's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results ... even providing videos.

The NASA STI Program is managed by the NASA STI Program Office (STIPO). STIPO is the administrative office at Langley Research Center for the NASA STI Program.

For more information about the NASA STI Program, you can:

- Access the NASA STI Program Home Page at http://www.sti.nasa.gov
- E-mail your question via the Internet to help@sti.nasa.gov
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Telephone the NASA STI Help Desk at (301) 621-0390
- Write to:
  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (*STAR*) is an online information resource listing citations and abstracts of NASA and world wide aerospace-related STI. Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related Research & Development (R&D) results.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to Research & Development (R&D) results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

The NASA Scientific and Technical Information (STI) Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up to date NASA STI, visit the STI Program's website at http://www.sti.nasa.gov.

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the NASA Technical Reports Server (TRS) – the publicly available contents of the NASA Aeronautics and Space Database.

Each citation in *STAR* indicates a 'Source of Availability'. When CASI is indicated, the user can order this information directly from CASI using the STI Online Order Form or contact help@sti.nasa.gov or telephone the CASI Help Desk at 301-621-0390. Before ordering you may access price code tables for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at http://www.ntis.gov.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** (FDLP) to ensure access by the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal Depository Libraries http://www.access.gpo.gov/su_docs.

The U.S. Patent and Trademark Office (USPTO)

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/.

Table of Contents

Subject Divisions/Categories

Document citations are grouped by division and then by category, according to the *NASA Scope and Coverage Category Guide.*

Aeronautics

01 Aeronautics (General) 1
02 Aerodynamics 2
03 Air Transportation and Safety 3
05 Aircraft Design, Testing and Performance 6
07 Aircraft Propulsion and Power 10
08 Aircraft Stability and Control 13
09 Research and Support Facilities (Air) 13

Astronautics

12 Astronautics (General) 14
13 Astrodynamics 15
15 Launch Vehicles and Launch Operations 16
17 Space Communications, Spacecraft Communications, Command and Tracking 16
18 Spacecraft Design, Testing and Performance 17
19 Spacecraft Instrumentation and Astrionics 20
20 Spacecraft Propulsion and Power 20

Chemistry and Materials

23 Chemistry and Materials (General) 25
24 Composite Materials 28
25 Inorganic, Organic and Physical Chemistry 31
26 Metals and Metallic Materials 43
27 Nonmetallic Materials 49
28 Propellants and Fuels 51

Engineering

31 Engineering (General) 53
32 Communications and Radar 55
33 Electronics and Electrical Engineering 59
34 Fluid Mechanics and Thermodynamics 67
35 Instrumentation and Photography 77
36 Lasers and Masers 83
37 Mechanical Engineering 85
38 Quality Assurance and Reliability 87
39 Structural Mechanics 88

Geosciences

42 Geosciences (General) 92
43 Earth Resources and Remote Sensing 93
44 Energy Production and Conversion 98
45 Environment Pollution 99
46 Geophysics 103
47 Meteorology and Climatology 106
48 Oceanography 120

Life Sciences

51 Life Sciences (General) 124
52 Aerospace Medicine 134
53 Behavioral Sciences 135
54 Man/System Technology and Life Support 136

Mathematical and Computer Sciences

59 Mathematical and Computer Sciences (General) 138
60 Computer Operations and Hardware 144
61 Computer Programming and Software 145
62 Computer Systems 155
63 Cybernetics, Artificial Intelligence and Robotics 158
64 Numerical Analysis 161
65 Statistics and Probability 165
66 Systems Analysis and Operations Research 165

Physics

70 Physics (General) 167
71 Acoustics 176
72 Atomic and Molecular Physics 180
73 Nuclear Physics 181
74 Optics 181
75 Plasma Physics 193
76 Solid-State Physics 195
77 Physics of Elementary Particles and Fields 196

Social and Information Sciences

80 Social and Information Sciences (General) 197
81 Administration and Management 197
82 Documentation and Information Science 199
85 Technology Utilization and Surface Transportation 203

Space Sciences

88 Space Sciences (General) 204
89 Astronomy 204
90 Astrophysics 211
91 Lunar and Planetary Science and Exploration 220
92 Solar Physics 222

General

99 General 225

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for linking to the corresponding document citation from *NASA Thesaurus* terms and personal author names.

Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 42, MARCH 12, 2004

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*.

20040016440 Lawrence Livermore National Lab., Livermore, CA
Computational Simulation of a Heavy Vehicle Trailer Wake
Ortega, J. M.; Dunn, T.; McCallen, R.; Salari, K.; Dec. 04, 2002; 20 pp.; In English
Report No.(s): DE2003-15005068; UCRL-JC-152549; No Copyright; Avail: Department of Energy Information Bridge

To better understand the flow mechanisms that contribute to the aerodynamic drag of heavy vehicles, unsteady large-eddy simulations are performed to model the wake of a truncated trailer geometry above a no-slip surface. The truncation of the heavy vehicle trailer is done to reduce the computational time needed to perform the simulations. Both unsteady and time-averaged results are presented from these simulations for two grids. A comparison of velocity fields with those obtained from a wind tunnel study demonstrate that there is a distinct difference in the separated wake of the experimental and computational results, perhaps indicating the influence of the geometry simplification, turbulence model, boundary conditions, or other aspects of the chosen numerical approach.
NTIS
Large Eddy Simulation; Trailers; Turbulence Models; Computerized Simulation

20040027571 NASA Marshall Space Flight Center, Huntsville, AL, USA
Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development'
Johnson, Dale L.; Vaughan, William W.; Keller, Vernon W.; [2003]; 12 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paper 2004-0910; RenoPaper2004E8-DC:10-30-03; No Copyright; Avail: CASI; A03, Hardcopy

This paper addresses the updating of NASA's Terrestrial Environment (Climatic) Criteria handbook for Use in Aerospace Vehicle Development. This handbook covers the primary terrestrial environment factors with which the design and operation of an aerospace vehicle is concerned. It is intended as a source document for the development of terrestrial environment design requirements and, in this regard, provides consistent and coordinated information for this purpose. The handbook and its predecessors have been used in the design, development, and operation of many NASA flight vehicles, payloads and related activities.
Author
Aerospace Vehicles; Handbooks; Atmospheric Models; Climatology; NASA Programs; Extraterrestrial Environments

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*.

20040027041 NASA Glenn Research Center, Cleveland, OH, USA
Computational Study of Axisymmetric Off-Design Nozzle Flows
DalBello, Teryn; Georgiadis, Nicholas; Yoder, Dennis; Keith, Theo; December 2003; 26 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NCC3-922; WBS 22-708-73-22
Report No.(s): NASA/TM-2003-212876; E-14289; AIAA Paper 2004-0530; No Copyright; Avail: CASI; A03, Hardcopy

Computational Fluid Dynamics (CFD) analyses of axisymmetric circular-arc boattail nozzles operating off-design at transonic Mach numbers have been completed. These computations span the very difficult transonic flight regime with shock-induced separations and strong adverse pressure gradients. External afterbody and internal nozzle pressure distributions computed with the Wind code are compared with experimental data. A range of turbulence models were examined, including the Explicit Algebraic Stress model. Computations have been completed at freestream Mach numbers of 0.9 and 1.2, and nozzle pressure ratios (NPR) of 4 and 6. Calculations completed with variable time-stepping (steady-state) did not converge to a true steady-state solution. Calculations obtained using constant timestepping (timeaccurate) indicate less variations in flow properties compared with steady-state solutions. This failure to converge to a steady-state solution was the result of using variable time-stepping with large-scale separations present in the flow. Nevertheless, time-averaged boattail surface pressure coefficient and internal nozzle pressures show reasonable agreement with experimental data. The SST turbulence model demonstrates the best overall agreement with experimental data.
NASA
Axisymmetric Flow; Mathematical Models; Computational Fluid Dynamics; Stress Analysis; Nozzle Flow

20040030518 Air Force Research Lab., Wright-Patterson AFB, OH, USA
UAV Aerial Refueling - Wind Tunnel Results and Comparison with Analytical Predictions
Blake, William B.; Dickes, Edward G.; Jan. 2004; 10 pp.; In English
Report No.(s): AD-A419949; AFRL-VA-WP-TP-2004-300; No Copyright; Avail: CASI; A02, Hardcopy

Results from a wind tunnel. test of a delta wing UAV behind a KC-135R are presented and compared with predictions from a planar vortex lattice code. Both the predictions and data show wake interference effects on the UAV that vary significantly with relative lateral and vertical position, and weakly with relative longitudinal position. Predicted trends are excellent for all force and moments except for drag, and magnitudes are reasonably well predicted. The distribution of lift between the tanker wing and tail is shown to have a strong effect on the receiver aerodynamics.
DTIC
Wind Tunnel Tests; Air to Air Refueling; Aerodynamic Interference

20040031358 NASA Langley Research Center, Hampton, VA, USA, National Inst. of Aerospace, Hampton, VA, USA
A Flight Dynamics Model for a Small Glider in Ambient Winds
Beeler, Scott C.; Moerder, Daniel D.; Cox, David E.; November 2003; 20 pp.; In English
Contract(s)/Grant(s): WU 23-762-40-41
Report No.(s): NASA/TM-2003-212665; L-18338; No Copyright; Avail: CASI; A03, Hardcopy

In this paper we describe the equations of motion developed for a point-mass zero-thrust (gliding) aircraft model operating in an environment of spatially varying atmospheric winds. The wind effects are included as an integral part of the flight dynamics equations, and the model is controlled through the three aerodynamic control angles. Formulas for the aerodynamic coefficients for this model are constructed to include the effects of several different aspects contributing to the aerodynamic performance of the vehicle. Characteristic parameter values of the model are compared with those found in a different set of small glider simulations. We execute a set of example problems which solve the glider dynamics equations to find aircraft trajectory given specified control inputs. The ambient wind conditions and glider characteristics are varied to compare the simulation results under these different circumstances.
Author
Mathematical Models; Equations of Motion; Gliders; Wind (Meteorology); Aircraft Models; Meteorological Parameters

20040031368 NASA Langley Research Center, Hampton, VA, USA
Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry
Tucker, Paul G.; Rumsey, Christopher L.; Bartels, Robert E.; Biedron, Robert T.; December 2003; 67 pp.; In English
Contract(s)/Grant(s): WU 23-719-10-50
Report No.(s): NASA/TM-2003-212680; L-18339; No Copyright; Avail: CASI; A04, Hardcopy

Eikonal, Hamilton-Jacobi and Poisson equations can be used for economical nearest wall distance computation and modification. Economical computations may be especially useful for aeroelastic and adaptive grid problems for which the grid deforms, and the nearest wall distance needs to be repeatedly computed. Modifications are directed at remedying turbulence model defects. For complex grid structures, implementation of the Eikonal and Hamilton-Jacobi approaches is not straightforward. This prohibits their use in industrial CFD solvers. However, both the Eikonal and Hamilton-Jacobi equations can be written in advection and advection-diffusion forms, respectively. These, like the Poisson s Laplacian, are commonly occurring industrial CFD solver elements. Use of the NASA CFL3D code to solve the Eikonal and Hamilton-Jacobi equations in advective-based forms is explored. The advection-based distance equations are found to have robust convergence. Geometries studied include single and two element airfoils, wing body and double delta configurations along with a complex electronics system. It is shown that for Eikonal accuracy, upwind metric differences are required. The Poisson approach is found effective and, since it does not require offset metric evaluations, easiest to implement. The sensitivity of flow solutions to wall distance assumptions is explored. Generally, results are not greatly affected by wall distance traits.
Author
Computational Fluid Dynamics; Time Dependence; Transport Theory; Walls; Flow Distribution; Aeroelasticity; Mathematical Models; Body-Wing and Tail Configurations

20040031410 NASA, Washington, DC, USA
The Wind and Beyond: A Documentary Journey into the History of Aerodynamics in America, Volume 1, The Ascent of the Airplane
Hansen, James R., Editor; Taylor, D. Bryan; Kinney, Jeremy; Lee, J. Lawrence; 2003; 761 pp.; In English
Report No.(s): NASA/SP-2003-4409/VOL1; LC-2002-035774; No Copyright; Avail: CASI; A99, Hardcopy

This first volume, plus the succeeding five now in preparation, covers the impact of aerodynamic development on the evolution of the airplane in America. As the six-volume series will ultimately demonstrate, just as the airplane is a defining technology of the twentieth century, aerodynamics has been the defining element of the airplane. Volumes two through six will proceed in roughly chronological order, covering such developments as the biplane, the advent of commercial airliners, flying boats, rotary aircraft, supersonic flight, and hypersonic flight. This series is designed as an aeronautics companion to the Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program (NASA SP-4407) series of books. As with Exploring the Unknown, the documents collected during this research project were assembled from a diverse number of public and private sources. A major repository of primary source materials relative to the history of the civil space program is the NASA Historical Reference Collection in the NASA Headquarters History Office. Historical materials housed at NASA field centers, academic institutions, and Presidential libraries were other sources of documents considered for inclusion, as were papers in the archives of private individuals and corporations.
Author
Aerodynamics; Aircraft Design

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*.

20040020104 Congressional Research Service, Washington, DC, USA
Air Cargo Security, Updated September 11, 2003. CRS Report for Congress
Elias, B.; Sep. 11, 2003; 32 pp.
Report No.(s): PB2004-103202; No Copyright; Avail: CASI; A03, Hardcopy

The air cargo system is a complex, multi-faceted network that handles a vast amount of freight, packages, and mail carried aboard passenger and all-cargo aircraft. The air cargo system is vulnerable to several security threats including: potential plots

to place explosives aboard aircraft; illegal shipments of hazardous materials; criminal activities such as smuggling and theft; and potential hijackings and sabotage by persons with access to aircraft. The Aviation and Transportation Security Act (ATSA, P.L. 107-71) contains general provisions for cargo screening, inspection, and security measures. Cargo carried in passenger airplanes must be screened or its security otherwise ensured. In practice, the Transportation Security Administration (TSA) has relied heavily on known shipper programs to prevent shipments of cargo from unknown sources on passenger aircraft. ATSA alsomandated that a security plan for all-cargo operations was to be put in place as soon as possible, but aviation security initiatives to date have primarily focused on enhancing the security of passenger operations. In the 108th Congress, several legislative proposals to address concerns over air cargo security are under consideration. The Air Cargo Security Act (S. 165) was passed by the Senate on May 8, 2003, and similar legislation (H.R. 1103) has been introduced in the House. Other legislation (H.R. 2455, H.Amdt. 183 to H.R. 2555) would require the screening of all cargo placed on passenger aircraft. Proposals to expand the current program for arming pilots, to include all-cargo pilots in addition to pilots of passenger airliners, are also under consideration (see S. 516, H.R. 765, H.R. 1049, S. 165). This report will be updated as needed.
NTIS
Air Cargo; Security

20040021314 NASA Langley Research Center, Hampton, VA, USA
Description of a Normal-Force In-Situ Turbulence Algorithm for Airplanes
Stewart, Eric C.; December 2003; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WU 23-728-40-30
Report No.(s): NASA/TM-2003-212666; L-18274; No Copyright; Avail: CASI; A03, Hardcopy

A normal-force in-situ turbulence algorithm for potential use on commercial airliners is described. The algorithm can produce information that can be used to predict hazardous accelerations of airplanes or to aid meteorologists in forecasting weather patterns. The algorithm uses normal acceleration and other measures of the airplane state to approximate the vertical gust velocity. That is, the fundamental, yet simple, relationship between normal acceleration and the change in normal force coefficient is exploited to produce an estimate of the vertical gust velocity. This simple approach is robust and produces a time history of the vertical gust velocity that would be intuitively useful to pilots. With proper processing, the time history can be transformed into the eddy dissipation rate that would be useful to meteorologists. Flight data for a simplified research implementation of the algorithm are presented for a severe turbulence encounter of the NASA ARIES Boeing 757 research airplane. The results indicate that the algorithm has potential for producing accurate in-situ turbulence measurements. However, more extensive tests and analysis are needed with an operational implementation of the algorithm to make comparisons with other algorithms or methods.
Author
Algorithms; In Situ Measurement; Commercial Aircraft; Atmospheric Turbulence

20040027745 Army Safety Center, Fort Rucker, AL
Flightfax: Army Aviation Risk-Management Information. Volume 31, Number 12, December 2003
Dec. 2003; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419771; No Copyright; Avail: CASI; A03, Hardcopy

This issue of Flightfax contains the following contributions: DASAF's Corner -- Safety Success in Korea: Leadership in Action reviews the aviation safety strategies in place in Korea that keep the accident rate there lower than in the Army at large; FY03 Aviation Safety Performance Review provides accident statistics for four helicopters and fixed wing aircraft; STACOMs are Back! provides trend information for the standardization of aircrew training programs that has accumulated over the last 12 months; Dust Takeoffs and Landings in the UH-60 takes a look at the different approaches training manuals advocate for takeoffs and landings in snow, sand, and dust; NCO Corner -- Wrong Part, No Book gives a first-person account of a Chinook crew member's experience using The Book when his engine was changed from an L-7 to an L- 11; Investigators' Forum --What We Do...Insight from an Aviation Accident Investigator provides major lessons learned from an accident investigator; and War Stories -- The Need to Know describes a flight student's near-mishap when executing a stall on a solo flight. This issue also contains the 2003 Flightfax Index and Accident Briefs.
DTIC
Aircraft Accidents; Aircraft Safety; Military Aviation; Risk; Flight Safety

20040027827 Air Force Research Lab., Wright-Patterson AFB, OH
AF ManTech Highlights, Winter 2003
Punatar, Dilip; Cunningham, Gary; Jan. 2003; 12 pp.; In English
Report No.(s): AD-A419897; No Copyright; Avail: CASI; A03, Hardcopy

This issue of AF ManTech contains the following articles: 'ManTech's Affordable Millimeter Wave Units Program Driving Down Costs, Weight, Size in Vital Defense Satellite Program,' by Dilip Punatar; 'Lean Production Approaches Benefit Space Vehicle Integration and Testing,' by Dilip Punatar; 'ManTech's Lean Value Chain Success Relieves Critical Part Shortage, Gets Warfighter Back in the Air Faster,' by Gary Cunningham; and 'ManTech's AMP Provides Air Force Depots a Faster, Safer, Less Expensive De-paint Method,' by Gary Cunningham.
DTIC
Aircraft Maintenance; Production Engineering

20040028085 NASA Glenn Research Center, Cleveland, OH, USA
Preliminary Analysis of X-Band and Ka-Band Radar for Use in the Detection of Icing Conditions Aloft
Reehorst, Andrew L.; Koenig, George G.; January 2004; 16 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): WBS 22-728-41-05
Report No.(s): NASA/TM-2004-212901; AIAA Paper 2004-0233; No Copyright; Avail: CASI; A03, Hardcopy

NASA and the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) have an on-going activity to develop remote sensing technologies for the detection and measurement of icing conditions aloft. Radar has been identified as a strong tool for this work. However, since the remote detection of icing conditions with the intent to identify areas of icing hazard is a new and evolving capability, there are no set requirements for radar sensitivity. This work is an initial attempt to quantify, through analysis, the sensitivity requirements for an icing remote sensing radar. The primary radar of interest for cloud measurements is Ka-band, however, since NASA is currently using an X-band unit, this frequency is also examined. Several aspects of radar signal analysis were examined. Cloud reflectivity was calculated for several forms of cloud using two different techniques. The Air Force Geophysical Laboratory (AFGL) cloud models, with different drop spectra represented by a modified gamma distribution, were utilized to examine several categories of cloud formation. Also a fundamental methods approach was used to allow manipulation of the cloud droplet size spectra. And an analytical icing radar simulator was developed to examine the complete radar system response to a configurable multi-layer cloud environment. Also discussed is the NASA vertical pointing X-band radar. The radar and its data system are described, and several summer weather events are reviewed.
Author
Superhigh Frequencies; Meteorological Radar; Aircraft Icing; Aviation Meteorology; Detection; Remote Sensing

20040031536 NASA Langley Research Center, Hampton, VA, USA
A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies
Garber, Donald P.; Minnis, Patrick; Costulis, Kay P.; [2003]; 7 pp.; In English; European Conference on Aviation, Atmosphere and Climate, 30 Jun. - 3 Jul. 2003, Friedrichschafen at Lake Constance, Germany
Contract(s)/Grant(s): 621-82-80-15; No Copyright; Avail: CASI; A02, Hardcopy

A new air traffic database over the contiguous USA of America (USA) has been developed from a commercially available real-time product for 2001-2003 for all non-military flights above 25,000 ft. Both individual flight tracks and gridded spatially integrated flight legs are available. On average, approximately 24,000 high-altitude flights were recorded each day. The diurnal cycle of air traffic over the USA is characterized by a broad daytime maximum with a 0130-LT minimum and a mean day-night air traffic ratio of 2.4. Each week, the air traffic typically peaks on Thursday and drops to a low Saturday with a range of 18%. Flight density is greatest during late summer and least during winter. The database records the disruption of air traffic after the air traffic shutdown during September 2001. The dataset should be valuable for realistically simulating the atmospheric effects of aircraft in the upper troposphere.
Author
Data Bases; Troposphere; Exhaust Emission; Commercial Aircraft; Air Traffic; United States

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*.

20040016454 Lawrence Livermore National Lab., Livermore, CA
Cooperative Mobile Sensing Networks
Roberts, R. S.; Kent, C. A.; Jones, E. D.; Cunningham, C. T.; Armstrong, G. W.; Feb. 10, 2003; 18 pp.; In English
Report No.(s): DE2003-15004901; UCRL-ID-151762; No Copyright; Avail: Department of Energy Information Bridge

A cooperative control architecture is presented that allows a fleet of Unmanned Air Vehicles (UAVs) to collect data in a parallel, coordinated and optimal manner. The architecture is designed to react to a set of unpredictable events thereby allowing data collection to continue in an optimal manner.
NTIS
Remote Sensing; Aircraft; Robotics

20040021326 Analex Corp., Brook Park, OH, USA
Initial Feasibility Assessment of a High Altitude Long Endurance Airship
Colozza, Anthony; Dolce, James, Technical Monitor; December 2003; 105 pp.; In English
Contract(s)/Grant(s): NAS3-00145; WBS 719-30-02
Report No.(s): NASA/CR-2003-212724; E-14248; No Copyright; Avail: CASI; A06, Hardcopy

A high altitude solar powered airship provides the ability to carry large payloads to high altitudes and remain on station for extended periods of time. This study examines the feasibility of this concept. Factors such as time of year, latitude, wind speeds and payload are considered in establishing the capabilities of a given size airship. East and West coast operation were evaluated. The key aspect to success of this type of airship is the design and operation of the propulsion and power system. A preliminary propulsion/power system design was produced based on a regenerative fuel cell energy storage system and solar photovoltaic array for energy production. A modular system design was chosen with four independent power/propulsion units utilized by the airship. Results on payload capacity and flight envelope (latitude and time of year) were produced for a range of airship sizes.
Author
Feasibility Analysis; Airships; High Altitude; Solar Powered Aircraft

20040027694 Air Force Research Lab., Wright-Patterson AFB, OH
Path Elongation for UAV Task Assignment
Schumacher, Corey; Chandler, Phillip R.; Rasmussen, Steven J.; Walker, David; Sep. 2003; 11 pp.; In English
Report No.(s): AD-A419752; AFRL-VA-WP-TP-2003-331; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents a path planning and path- elongation method for wide area search munitions, a type of small Unmanned Air Vehicle. Variable-length paths are necessary to allow sufficient flexibility for efficient task assignment meeting timing constraints for UAVs. Five specific cases are developed that identify the best method of elongation based only on the initial position and heading of the vehicle with respect to the target. The cases include one linear direct method of path elongation and four cases which use an iterative approach for the nonlinear path elongation. The iterative methods are similar to a Newton-Raphson search over a function for a specific value (a path of the desired length). The function searched are the path length vs. the delay used, are monotonically increasing, and are very well behaved. The result is fast convergence to a small window around the desired value (path length). Multiple aspects of the path elongation program are presented. First, the problem setup is reviewed which includes the correction to the heading algorithm and the definition of the different cases and their associated elongation methods. The process of the iterative method is described and the results of the individual methods are presented. Results are shown for elongated paths for each of the five cases, and simulation results are shown using the path elongation algorithms in a task assignment problem.
DTIC
Elongation; Algorithms; Newton-Raphson Method; Trajectory Planning; Nonlinearity

20040027730 Tuskegee Inst., AL, USA

Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications

Mahfuz, Hassan; Dean, Derrick; Jeelani, Shaik; Baseer, Mohammed; Mohamed, Gamaleldin; Dec. 2003; 92 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-00-1-0348

Report No.(s): AD-A419868; AFRL-SR-AR-TR-04-0070; No Copyright; Avail: CASI; A05, Hardcopy

The search for lightweight and highly efficient structural components is a continuing process. Reducing the structural weight and improving the load carrying capabilities of these structures will allow designers to add additional capabilities while reducing cost. The basic functions of aerospace structures are to transmit and sustain the applied loads, provide a basic shape and to protect the payload. Shell stiffened structures have been used for many years to fulfill these applications. Most of the airframe components are normally plate or shell type structures. Efficiency dictates that they are stiffened or semi-monocoque in construction. The usual means of stiffening is to use longitudinal stringers and frames or ribs. An alternate approach to stiffening is the concept of isogrid, which employs a repetitive equilateral triangular pattern of ribs. The isotropic property and effective Poisson's ratio around 0.3 enables the isogrid to be mathematically transformed to an equivalent homogeneous material layer 1-2. Isogrids, in general, offer a unique set of advantages: (1) they possess a high stiffness to weight ratio; (2) stiffening results in high effective bending stiffness for circumventing local flutter, vibration and buckling problems; (3) stiffening members are useful for attachment of secondary structures and non-structural items and for the introduction of concentrated or localized loads; and (4) cutouts for access doors and windows are easily incorporated into the design.

DTIC

Laminates; Structural Analysis; Airframes; Aircraft Structures

20040027845

Improved Air Combat Awareness; with AESA and Next- Generation Signal Processing

Sep. 2002; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419797; No Copyright; Avail: CASI; A03, Hardcopy

Viewgraphs on a presentation for the improvement of air combat awareness using AESA and next-generation signal processing

DTIC

Combat; Signal Processing

20040027951 Army Vehicle Technology Center, Hampton, VA, USA

Aerodynamic Design Study of an Advanced Active Twist Rotor

Sekula, Martin K.; Wilbur, Matthew L.; Yeager, William T., Jr.; November 14, 2003; 12 pp.; In English; AHS 4th Decennial Specialists' Conference on Aeromechanics, 21-23 Jan. 2004, San Francisco, CA, USA

Contract(s)/Grant(s): 762-61-11; No Copyright; Avail: CASI; A03, Hardcopy

An Advanced Active Twist Rotor (AATR) is currently being developed by the U.S. Army Vehicle Technology Directorate at NASA Langley Research Center. As a part of this effort, an analytical study was conducted to determine the impact of blade geometry on active-twist performance and, based on those findings, propose a candidate aerodynamic design for the AATR. The process began by creating a baseline design which combined the dynamic design of the original Active Twist Rotor and the aerodynamic design of a high lift rotor concept. The baseline model was used to conduct a series of parametric studies to examine the effect of linear blade twist and blade tip sweep, droop, and taper on active-twist performance. Rotor power requirements and hub vibration were also examined at flight conditions ranging from hover to advance ratio = 0.40. A total of 108 candidate designs were analyzed using the second-generation version of the Comprehensive Analytical Model of Rotorcraft Aerodynamics and Dynamics (CAMRAD II) code. The study concluded that the vibration reduction capabilities of a rotor utilizing controlled, strain-induced twisting are enhanced through the incorporation of blade tip sweep, droop, and taper into the blade design, while they are degraded by increasing the nose-down linear blade twist. Based on the analysis of rotor power, hub vibration, and active-twist response, a candidate aerodynamic design for the AATR consisting of a blade with approximately 10 degrees of linear blade twist and a blade tip design with 30 degree sweep, 10 degree droop, and 2.5:1 taper ratio over the outer five percent of the blade is proposed.

Author

Rotor Aerodynamics; Rotor Blades (Turbomachinery); Twisting; Aircraft Design; Wind Tunnel Models; Mathematical Models

20040027969 Stanford Univ., Stanford, CA, USA
Aircraft Optimization for Minimum Environmental Impact
Antoine, Nicolas; Kroo, Ilan M.; [2001]; 21 pp.; In English
Contract(s)/Grant(s): NAG1-2144; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this research is to investigate the tradeoff between operating cost and environmental acceptability of commercial aircraft. This involves optimizing the aircraft design and mission to minimize operating cost while constraining exterior noise and emissions. Growth in air traffic and airport neighboring communities has resulted in increased pressure to severely penalize airlines that do not meet strict local noise and emissions requirements. As a result, environmental concerns have become potent driving forces in commercial aviation. Traditionally, aircraft have been first designed to meet performance and cost goals, and adjusted to satisfy the environmental requirements at given airports. The focus of the present study is to determine the feasibility of including noise and emissions constraints in the early design of the aircraft and mission. This paper introduces the design tool and results from a case study involving a 250-passenger airliner.
Author
Acceptability; Aircraft Design; Design to Cost; Environmental Surveys; Operating Costs; Tradeoffs

20040028036 NASA Glenn Research Center, Cleveland, OH, USA
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation
Morrison, Carlos R.; Provenza, Andrew; Kurkov, Anatole; Montague, Gerald; Duffy, Kirsten; Mehmed, Oral; Johnson, Dexter; Jansen, Ralph; January 2004; 24 pp.; In English
Contract(s)/Grant(s): WBS 22-708-28-14
Report No.(s): NASA/TP-2004-212694; E-14196; No Copyright; Avail: CASI; A03, Hardcopy

The Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig, a significant advancement in the Dynamic Spin Rig (DSR), is used to perform vibration tests of turbomachinery blades and components under rotating and nonrotating conditions in a vacuum. The rig has as its critical components three magnetic bearings: two heteropolar radial active magnetic bearings and a magnetic thrust bearing. The bearing configuration allows full vertical rotor magnetic suspension along with a feed-forward control feature, which will enable the excitation of various natural blade modes in bladed disk test articles. The theoretical, mechanical, electrical, and electronic aspects of the rig are discussed. Also presented are the forced-excitation results of a fully levitated, rotating and nonrotating, unbladed rotor and a fully levitated, rotating and nonrotating, bladed rotor in which a pair of blades was arranged 180 degrees apart from each other. These tests include the bounce mode excitation of the rotor in which the rotor was excited at the blade natural frequency of 144 Hz. The rotor natural mode frequency of 355 Hz was discerned from the plot of acceleration versus frequency. For nonrotating blades, a blade-tip excitation amplitude of approximately 100 g/A was achieved at the first-bending critical (approximately 144 Hz) and at the first-torsional and second-bending blade modes. A blade-tip displacement of 70 mils was achieved at the first-bending critical by exciting the blades at a forced-excitation phase angle of 908 relative to the vertical plane containing the blades while simultaneously rotating the shaft at 3000 rpm.
Author
Excitation; Magnetic Bearings; Spin; Thrust Bearings; Rotor Dynamics; Turbomachinery

20040028115 Army Aeromedical Research Lab., Fort Rucker, AL
Nonspeech Audio in Helicopter Aviation
Houtsma, Adrianus J.; Dec. 2003; 22 pp.; In English
Report No.(s): AD-A419911; USAARL-2004-03; No Copyright; Avail: CASI; A03, Hardcopy

This report describes the results of a literature study on the use of nonspeech audio in human-machine interaction, especially applied to helicopter aviation. The study focuses on various design philosophies for communicating important states of a machine to its operators through the use of nonspeech sounds. The two most popular sound designs are the so-called auditory icons (natural sounds that have a meaning by association with a real object) and earcons (abstracts sounds whose meaning must be learned). Usability indices such as effectiveness, efficiency and user satisfaction are reviewed for a number of experimental cases. The conclusion is that designs of auditory icons and earcons are not necessarily mutually exclusive. It appears entirely possible to develop sets of artificial sounds that combine the best features of each design approach.
DTIC
Helicopters; Man Machine Systems

20040028129 Defence Evaluation Research Agency, Bedford, UK

Pitfalls in the Interpretation of Delta Wing Flow Visualisation

Greenwell, Dr. D. I.; Mar. 2003; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419841; No Copyright; Avail: CASI; A03, Hardcopy

This paper illustrates some pitfalls in the interpretation of flow visualisation 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 analysed, 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 centreline trace seen in water tunnels is demonstrated. For helical (burst) vortices, the crossflow topology visualised 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 visualised flow structures resembling axisymirietric bubble breakdowns. It is postulated that the intermittent open- ended bubble burst seen in delta wing vortices is in fact an artefact of the tracer flow visualisation technique, as transient disturbances temporarily reduce the pitch of the fundamental helical burst structure.

DTIC

Flow Visualization; Delta Wings

20040031343 NASA Langley Research Center, Hampton, VA, USA

Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control

Geiselhart, Karl A., Technical Monitor; Daggett, David L.; Kawai, Ron; Friedman, Doug; December 2003; 39 pp.; In English

Contract(s)/Grant(s): NAS3-01140; WU 23-714-05-30

Report No.(s): NASA/CR-2003-212670; No Copyright; Avail: CASI; A03, Hardcopy

A CFD analysis was performed on a Blended Wing Body (BWB) aircraft with advanced, turbofan engines analyzing various inlet configurations atop the aft end of the aircraft. The results are presented showing that the optimal design for best aircraft fuel efficiency would be a configuration with a partially buried engine, short offset diffuser using active flow control, and a D-shaped inlet duct that partially ingests the boundary layer air in flight. The CFD models showed that if active flow control technology can be satisfactorily developed, it might be able to control the inlet flow distortion to the engine fan face and reduce the powerplant performance losses to an acceptable level. The weight and surface area drag benefits of a partially submerged engine shows that it might offset the penalties of ingesting the low energy boundary layer air. The combined airplane performance of such a design might deliver approximately 5.5% better aircraft fuel efficiency over a conventionally designed, pod-mounted engine.

Author

Active Control; Blended-Wing-Body Configurations; Computational Fluid Dynamics; Engine Inlets; Flow Distribution; Ingestion (Engines)

20040031588 NASA Langley Research Center, Hampton, VA, USA

Biologically Inspired Micro-Flight Research

Raney, David L.; Waszak, Martin R.; [2003]; 13 pp.; In English; SAE Aerospace Congress and Exhibition, 8-12 Sep. 2003, Montreal, Canada

Contract(s)/Grant(s): 762-40-41-03

Report No.(s): SAE-2003-01-3042; No Copyright; Avail: CASI; A03, Hardcopy

Natural fliers demonstrate a diverse array of flight capabilities, many of which are poorly understood. NASA has established a research project to explore and exploit flight technologies inspired by biological systems. One part of this project focuses on dynamic modeling and control of micro aerial vehicles that incorporate flexible wing structures inspired by natural fliers such as insects, hummingbirds and bats. With a vast number of potential civil and military applications, micro aerial vehicles represent an emerging sector of the aerospace market. This paper describes an ongoing research activity in which mechanization and control concepts for biologically inspired micro aerial vehicles are being explored. Research activities focusing on a flexible fixed- wing micro aerial vehicle design and a flapping-based micro aerial vehicle concept are presented.

Author

Wind Tunnel Tests; Aerospace Vehicles; Aircraft Design; Biology; Technology Utilization; Mechanization; Research and Development

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*.

20040016321 NASA Glenn Research Center, Cleveland, OH, USA
Computation of Transverse Injection Into Supersonic Crossflow With Various Injector Orifice Geometries
Foster, Lancert; Engblom, William A.; December 2003; 18 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): WBS 22-708-92-24
Report No.(s): NASA/TM-2003-212878; E-14291; AIAA Paper 2004-1199; No Copyright; Avail: CASI; A03, Hardcopy

Computational results are presented for the performance and flow behavior of various injector geometries employed in transverse injection into a non-reacting Mach 1.2 flow. 3-D Reynolds-Averaged Navier Stokes (RANS) results are obtained for the various injector geometries using the Wind code with the Mentor s Shear Stress Transport turbulence model in both single and multi-species modes. Computed results for the injector mixing, penetration, and induced wall forces are presented. In the case of rectangular injectors, those longer in the direction of the freestream flow are predicted to generate the most mixing and penetration of the injector flow into the primary stream. These injectors are also predicted to provide the largest discharge coefficients and induced wall forces. Minor performance differences are indicated among diamond, circle, and square orifices. Grid sensitivity study results are presented which indicate consistent qualitative trends in the injector performance comparisons with increasing grid fineness.
Author
Cross Flow; Injection; Orifices; Stress Analysis; Reynolds Equation

20040016354 NASA Marshall Space Flight Center, Huntsville, AL, USA
Numerical Modeling of Pulse Detonation Rocket Engine Gasdynamics and Performance
Morris, C. I.; December 12, 2003; 13 pp.; In English; Original contains black and white illustrations
Report No.(s): AIAA Paper 2004-0463; No Copyright; Avail: CASI; A03, Hardcopy

Pulse detonation engines (PDB) have generated considerable research interest in recent years as a chemical propulsion system potentially offering improved performance and reduced complexity compared to conventional gas turbines and rocket engines. The detonative mode of combustion employed by these devices offers a theoretical thermodynamic advantage over the constant-pressure deflagrative combustion mode used in conventional engines. However, the unsteady blowdown process intrinsic to all pulse detonation devices has made realistic estimates of the actual propulsive performance of PDES problematic. The recent review article by Kailasanath highlights some of the progress that has been made in comparing the available experimental measurements with analytical and numerical models.
Derived from text
Mathematical Models; Numerical Analysis; Pulse Detonation Engines; Rocket Engines; Gas Dynamics; Performance Prediction

20040027581 NASA Glenn Research Center, Cleveland, OH, USA
The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters
Hofer, Richard R.; Jankovsky, Robert S.; December 2003; 17 pp.; In English; 28th International Electric Propulsion Conference, 17-21 Mar. 2003, Toulouse, France; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS3-00145; WBS 755-04-12
Report No.(s): NASA/TM-2003-212605; E-14163; IEPC-2003-142; No Copyright; Avail: CASI; A03, Hardcopy

Recent studies of xenon Hall thrusters have shown peak efficiencies at specific impulses of less than 3000 s. This was a consequence of modern Hall thruster magnetic field topographies, which have been optimized for 300 V discharges. On-going research at the NASA Glenn Research Center is investigating this behavior and methods to enhance thruster performance. To conduct these studies, a laboratory model Hall thruster that uses a pair of trim coils to tailor the magnetic field topography for high specific impulse operation has been developed. The thruster-the NASA-173Mv2 was tested to determine how current density and magnetic field topography affect performance, divergence, and plasma oscillations at voltages up to 1000 V. Test results showed there was a minimum current density and optimum magnetic field topography at which efficiency monotonically increased with voltage. At 1000 V, 10 milligrams per second the total specific impulse was 3390 s and the total

efficiency was 60.8%. Plume divergence decreased at 400-1000 V, but increased at 300-400 V as the result of plasma oscillations. The dominant oscillation frequency steadily increased with voltage, from 14.5 kHz at 300 V, to 22 kHz at 1000 V. An additional oscillatory mode in the 80-90 kHz frequency range began to appear above 500 V. The use of trim coils to modify the magnetic field improved performance while decreasing plume divergence and the frequency and magnitude of plasma oscillations.
Author
Current Density; Hall Thrusters; Magnetic Fields; Plasma Oscillations; Specific Impulse; Topography; Optimization

20040027586 NASA Glenn Research Center, Cleveland, OH, USA
An Analysis of Model Scale Data Transformation to Full Scale Flight Using Chevron Nozzles
Brown, Clifford; Bridges, James; December 2003; 37 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-781-30-12
Report No.(s): NASA/TM-2003-212732; E-14257; No Copyright; Avail: CASI; A03, Hardcopy

Ground-based model scale aeroacoustic data is frequently used to predict the results of flight tests while saving time and money. The value of a model scale test is therefore dependent on how well the data can be transformed to the full scale conditions. In the spring of 2000, a model scale test was conducted to prove the value of chevron nozzles as a noise reduction device for turbojet applications. The chevron nozzle reduced noise by 2 EPNdB at an engine pressure ratio of 2.3 compared to that of the standard conic nozzle. This result led to a full scale flyover test in the spring of 2001 to verify these results. The flyover test confirmed the 2 EPNdB reduction predicted by the model scale test one year earlier. However, further analysis of the data revealed that the spectra and directivity, both on an OASPL and PNL basis, do not agree in either shape or absolute level. This paper explores these differences in an effort to improve the data transformation from model scale to full scale.
NASA
Aeroacoustics; Noise Reduction; Aircraft Noise; Aerodynamic Noise; Turbojet Engines; Flight Tests

20040028028 NASA Glenn Research Center, Cleveland, OH, USA
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser
Hendricks, R. C.; Shouse, D. T.; Roquernore, W. M.; Burrus, D. L.; Duncan, B. S.; Ryder, R. C.; Brankovic, A.; Liu, N.-S.; Gallagher, J. R.; Hendricks, J. A.; January 2004; 20 pp.; In English
Report No.(s): NASA/TM-2004-212507; E-12899-1; No Copyright; Avail: CASI; A03, Hardcopy

The Trapped Vortex Combustor (TVC) potentially offers numerous operational advantages over current production gas turbine engine combustors. These include lower weight, lower pollutant emissions, effective flame stabilization, high combustion efficiency, excellent high altitude relight capability, and operation in the lean burn or RQL modes of combustion. The present work describes the operational principles of the TVC, and extends diffuser velocities toward choked flow and provides system performance data. Performance data include EINOx results for various fuel-air ratios and combustor residence times, combustion efficiency as a function of combustor residence time, and combustor lean blow-out (LBO) performance. Computational fluid dynamics (CFD) simulations using liquid spray droplet evaporation and combustion modeling are performed and related to flow structures observed in photographs of the combustor. The CFD results are used to understand the aerodynamics and combustion features under different fueling conditions. Performance data acquired to date are favorable compared to conventional gas turbine combustors. Further testing over a wider range of fuel-air ratios, fuel flow splits, and pressure ratios is in progress to explore the TVC performance. In addition, alternate configurations for the upstream pressure feed, including bi-pass diffusion schemes, as well as variations on the fuel injection patterns, are currently in test and evaluation phases.
Author
Combustion Chambers; Computational Fluid Dynamics; Diffusion; Trapped Vortices; Numerical Analysis; Aerodynamics

20040028038 NASA Glenn Research Center, Cleveland, OH, USA
Development of a High-Pressure Gaseous Burner for Calibrating Optical Diagnostic Techniques
Kojima, Jun; Nguyen, Quang-Viet; December 2003; 18 pp.; In English
Contract(s)/Grant(s): WBS 22-714-02-16
Report No.(s): NASA/TM-2003-212738; E-14263; No Copyright; Avail: CASI; A03, Hardcopy

In this work-in-progress report, we show the development of a unique high-pressure burner facility (up to 60 atm) that provides steady, reproducible premixed flames with high precision, while having the capability to use multiple fuel/oxidizer combinations. The highpressure facility has four optical access ports for applying different laser diagnostic techniques and will

provide a standard reference flame for the development of a spectroscopic database in high-pressure/temperature conditions. Spontaneous Raman scattering (SRS) was the first diagnostic applied, and was used to successfully probe premixed hydrogen-air flames generated in the facility using a novel multi-jet micro-premixed array burner element. The SRS spectral data include contributions from H2, N2, O2, and H2O and were collected over a wide range of equivalence ratios ranging from 0.16 to 4.9 at an initial pressure of 10-atm via a spatially resolved point SRS measurement with a high-performance optical system. Temperatures in fuel-lean to stoichiometric conditions were determined from the ratio of the Stokes to anti-Stokes scattering of the Q-branch of N2, and those in fuel-rich conditions via the rotational temperature of H2. The SRS derived temperatures using both techniques were consistent and indicated that the flame temperature was approximately 500 K below that predicted by adiabatic equilibrium, indicating a large amount of heat-loss at the measurement zone. The integrated vibrational SRS signals show that SRS provides quantitative number density data in high-pressure H2-air flames.
Author
Burners; Calibrating; High Pressure; Combustion Physics; Gas Flow; Optics

20040030572 California Univ., Irvine, CA, USA
Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow
Demayo, T. N.; Leong, M. Y.; Samuelsen, G. S.; January 2004; 25 pp.; In English
Contract(s)/Grant(s): NAG3-1110; WBS 22-714-02-08
Report No.(s): NASA/CR-2004-212886; E-14300; No Copyright; Avail: CASI; A03, Hardcopy

In many advanced low NOx gas turbine combustion techniques, such as rich-burn/quick-mix/lean-burn (RQL), jet mixing in a reacting, hot, fuel-rich crossflow plays an important role in minimizing all pollutant emissions and maximizing combustion efficiency. Assessing the degree of mixing and predicting jet penetration is critical to the optimization of the jet injection design strategy. Different passive scalar quantities, including carbon, oxygen, and helium are compared to quantify mixing in an atmospheric RQL combustion rig under reacting conditions. The results show that the O2-based jet mixture fraction underpredicts the C-based mixture fraction due to jet dilution and combustion, whereas the He tracer overpredicts it possibly due to differences in density and diffusivity. The He-method also exhibits significant scatter in the mixture fraction data that can most likely be attributed to differences in gas density and turbulent diffusivity. The jet mixture fraction data were used to evaluate planar spatial unmixedness, which showed good agreement for all three scalars. This investigation suggests that, with further technique refinement, O2 or a He tracer could be used instead of C to determine the extent of reaction and mixing in an RQL combustor.
Author
Cross Flow; Gas Turbine Engines; Combustion Chambers; Exhaust Emission; Nitrogen Oxides; Reacting Flow; Jet Mixing Flow

20040031316 NASA Glenn Research Center, Cleveland, OH, USA
Toward a Fast-Response Active Turbine Tip Clearance Control
Melcher, Kevin J.; Kypuros, Javier A.; December 2003; 14 pp.; In English; 16th International Symposium on Airbreathing Engines, 31 Aug. - 5 Sep. 2003, Cleveland, OH, USA
Contract(s)/Grant(s): WBS 22-708-87-23
Report No.(s): NASA/TM-2003-212627; E-14185; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes active tip clearance control research being conducted by NASA to improve turbine engine systems. The target application for this effort is commercial aircraft engines. However, technologies developed for clearance control can benefit a broad spectrum of current and future turbomachinery. The first portion of the paper addresses the research from a programmatic viewpoint. Recent studies that provide motivation for the work, identification of key technologies, and NASA's plan for addressing deficiencies in the technologies are discussed. The later portion of the paper drills down into one of the key technologies by presenting equations and results for a preliminary dynamic model of the tip clearance phenomena.
Author
Turbine Blades; Blade Tips; Clearances; Active Control

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*.

20040016381 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Nonlinear Observers for Gyro Calibration Coupled with a Nonlinear Control Algorithm
Thienel, Julie; Sanner, Robert M.; [2003]; 20 pp.; In English; AAS Guidance and Control Conference, February 2004, Breckenridge, CO, USA; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Nonlinear observers for gyro calibration are presented. The first observer estimates a constant gyro bias. The second observer estimates scale factor errors. The third observer estimates the gyro alignment for three orthogonal gyros. The observers are then combined. The convergence properties of all three observers, and the combined observers, are discussed. Additionally, all three observers are coupled with a nonlinear control algorithm. The stability of each of the resulting closed loop systems is analyzed. Simulated test results are presented for each system.
Author
Algorithms; Feedback Control; Gyroscopes; Nonlinearity; Attitude Control

20040021348 NASA Dryden Flight Research Center, Edwards, CA, USA
Manual Manipulation of Engine Throttles for Emergency Flight Control
Burcham, Frank W., Jr.; Fullerton, C. Gordon; Maine, Trindel A.; January 28, 2004; 80 pp.; In English
Contract(s)/Grant(s): 090-50-00
Report No.(s): NASA/TM-2004-212045; H-2547; No Copyright; Avail: CASI; A05, Hardcopy

If normal aircraft flight controls are lost, emergency flight control may be attempted using only engines thrust. Collective thrust is used to control flightpath, and differential thrust is used to control bank angle. Flight test and simulation results on many airplanes have shown that pilot manipulation of throttles is usually adequate to maintain up-and-away flight, but is most often not capable of providing safe landings. There are techniques that will improve control and increase the chances of a survivable landing. This paper reviews the principles of throttles-only control (TOC), a history of accidents or incidents in which some or all flight controls were lost, manual TOC results for a wide range of airplanes from simulation and flight, and suggested techniques for flying with throttles only and making a survivable landing.
Author
Manual Control; Engine Control; Flight Control; Emergencies

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)*.

20040027499 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics
Woodgate, Bruce E.; Bowers, Charles W.; Grady, Carol A.; Wassell, Edward J.; Palunas, Povilas; [2003]; 1 pp.; In English; AMOS, 7-12 Sep. 2003, Maui, HI, USA; No Copyright; Avail: Other Sources; Abstract Only

The Goddard Fabry-Perot has been used at the Apache Point Observatory 3.5-m telescope to diagnose jets from young Herbig Ae (HD163296) and T Tauri stars (DL Tau and CW Tau), detected by the Space Telescope Imaging Spectrograph coronagraph on the Hubble Space Telescope. The additional spectral discrimination of the Fabry-Perot allows these faint jets to be detected from the ground, to obtain velocities and densities, and to find further extensions. In order to plan what measurements require space coronagraphs, we need to explore the extent to which coronagraphic detections can be made from the ground, including using adaptive optics. Modifications to the Fabry-Perot tunable narrow band coronagraph for possible use with the AEOS 3.65-m telescope will be described.
Author
Continuous Radiation; Coronagraphs; Detection; T Tauri Stars

20040027607 Air Force Research Lab., Tyndall AFB, FL
Recent Advances in Matting Technology for Military Runways
Dover, Dov; Anderson, Mark; Brown, Randall W.; Jul. 2002; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 8637-98-C-6001; Proj-4915
Report No.(s): AD-A419684; AFRL-ML-TY-TP-2002-4626; No Copyright; Avail: CASI; A03, Hardcopy

Following a historical overview of the military use of mats on runways, taxiways, aprons, and parking areas, this paper discusses common matting systems, which fall into two general categories: structural matting and foreign-object- damage (FOD) covers. Structural matting, such as AM-2, is used to increase the runway's structural support when the surface is otherwise inadequate. FOD covers, such as folded fiberglass mats (FFMs), are used on surfaces that are adequate structurally, but have a high incidence of FOD. The body of the paper focuses on recent developments at the Air Force Research Laboratory (AFRL), Tyndall AFB, Florida, to improve the performance and usefulness of matting systems. The paper focuses on the pioneering efforts of AFRL in the use of Elastomer Sprayed Coating (ESC) in three major Rapid Runway Repair (RRR) areas: (1) unreinforced ESC as a FOD cover, (2) ESC with wire mesh reinforcement to create an improved FOD cover, and (3) ESC as a means of expediently anchoring FFMs. The study concluded that ESC is a viable alternative for expedient FOD covers, particularly when reinforced with aluminum wire, and that ESC is a viable alternative for expedient anchoring of FFMs. AFRL is currently pursuing improvements for structural matting which will, when completed, greatly improve RRR capability. In addition, ongoing research at AFRL on structural mat improvements is briefly discussed, including interior AM-2 mat repair techniques and a revolutionary lightweight replacement for AM-2 matting. (1 table, 7 figures, 4 refs.)
DTIC
Elastomers; Polyurethane Resins; Plastic Coatings; Runways

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*.

20040028046 Air Force Occupational Measurement Center, Randolph AFB, TX
USAF Training Extract, AFSC 2MOX2 - Active Duty, Missile & Space Systems Maintenance, Active Duty, OSSN 2522
Aug. 2003; 220 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419975; No Copyright; Avail: CASI; A10, Hardcopy

The enclosed training extract has been compiled to assist you in making training decisions. It is comprised of a series of computer printouts which show data collected from your speciality. By learning to understand this document and how it applies to training programs, you will find it to be a valuable source of information. This specialty concerns missile and space systems maintenance for active duty personnel.
DTIC
Space Maintenance; Training Analysis; Maintenance; Missile Systems

20040030400 Synergy, Inc., Washington, DC, USA
Virtual Space Logistics Readiness Center (VSLRC): Concept of Operations
Dumouchel, Lonna; Allen, Randy P.; Aug. 2003; 73 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-99-D-6001; Proj-1710
Report No.(s): AD-A419931; AFRL-HE-WP-TR-2003-0141; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this research was to collect, analyze, and define high-level needs and features of the Virtual Space Logistics Readiness Center (VSLRC). It focuses on the capabilities needed by the stakeholders and targeted users, and why those needs exist. The VSLRC is an interactive system that increases support to the space systems warfighter by providing access to near real-time system operational and equipment status, and linking logistics data to it's impact on operational readiness. The VSLRC will integrate all necessary logistics, maintenance, and operations data into a single system that decision-makers can use to identify, diagnose, and take corrective actions to solve logistics issues in the space systems' supply chains. VSLRC is a web-based system, and will operate within a portal-like environment that adheres to Air Force and Department of Defense (DoD) interoperability standards. Initially, the VSLRC will be housed in a secure environment (i.e.,

Secure Internet Protocol Network (SIPRNET), but will eventually transfer information between classified and unclassified environments for ease of use.
DTIC
Military Operations; Logistics; Information Systems

13
ASTRODYNAMICS

Includes powered and free flight trajectories; orbital and launching dynamics.

20040016312 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Comprehensive Survey of Earth-Moon Libration Orbits: Stationkeeping Strategies And Intra-Orbit Transfers
Folta, David; Vaughn, Frank; [2004]; 2 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference and Exhibit, 16-19 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Cislunar space is a readily accessible region that may well develop into a prime staging area in the effort to colonize space near the Earth or to colonize the moon. While there have been statements made by various NASA programs regarding placement of resources in orbit about the Earth-Moon Lagrangian locations, there is no survey of the total cost associated with attaining and maintaining these unique orbits in an optimal fashion. Transfer trajectories between these orbits required for assembly, servicing, and positioning of these resources have not been extensively investigated. These orbits are dynamically similar to those used for the Sun-Earth missions, but differences in governing gravitational ratios and perturbation sources result in their having their own unique characteristics.
Author
Libration; NASA Programs; Stationkeeping; Costs; Cislunar Space

20040016319 NASA Glenn Research Center, Cleveland, OH, USA, QSS Group, Inc., Cleveland, OH, USA
Mission Steering Profiles of Outer Planetary Orbiters Using Radioisotope Electric Propulsion
Fiehler, Douglas; Oleson, Steven; January 2004; 13 pp.; In English; Space Technology and Applications International Forum, 8-12 Feb. 2004, Albuquerque, NM, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS3-00145; WBS 22-982-10-03
Report No.(s): NASA/TM-2004-212877; E-14290; No Copyright; Avail: CASI; A03, Hardcopy

Radioisotope Electric Propulsion (REP) has the potential to enable small spacecraft to orbit outer planetary targets with trip times comparable to flyby missions. The ability to transition from a flyby to an orbiter mission lies in the availability of continuous low power electric propulsion along the entire trajectory. The electric propulsion system s role is to add and remove energy from the spacecraft s trajectory to bring it in and out of a heliocentric hyperbolic escape trajectory for the outermost target bodies. Energy is added and the trajectory is reshaped to rendezvous with the closer-in target bodies. Sample REP trajectories will be presented for missions ranging for distances from Jupiter orbit to the Pluto-Kuiper Belt.
Author
Electric Propulsion; Kuiper Belt; Mission Planning; Spacecraft Trajectories; Space Exploration

20040030398 NorthWest Research Associates, Inc., Bellevue, WA
Ionospheric Sensor Developments for the Year-2000 Solar Maximum
Fremouw, E. J.; Mazzella, A. J., Jr.; Rao, G. S.; Oct. 23, 2000; 45 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-97-C-0078
Report No.(s): AD-A419928; NWRA-CR-00-R225; AFRL-VS-TR-2001-1538; No Copyright; Avail: CASI; A03, Hardcopy

This report summarizes research during the third year of a contract for investigating (a) natural variations in ionospheric total electron content (TEC) and (b) plasma and electromagnetic effects produced by transmitting high-powered HF waves into the ionosphere. The efforts included collecting, processing, and analyzing TEC data from USAF Ionospheric Measuring Systems (IMS) and Real-Time Monitors (RTM) deployed at various sites, maintaining and operating those MS and RTM units, negotiating the 'Year-2000 transition, developing 20-Hz GPS data-collection systems for deployment. and initial developments toward extending current IMS capabilities. in addition to recording TEC variations by means of two-frequency GPS receivers at several locations, work during the year enhanced and exploited several diagnostic instruments deployed for the High frequency Active Aurora Research Program (HAARP). Under HAARP, measurements employing both GPS and coherent VHF- UHF signals transmitted from satellites in low-earth polar orbit resulted in time histories and latitudinal scans of absolute TEC over Maska, and enhanced operation of the HAARP classic riometer resulted in essentially continuous

observations of 30-MHz radiowave absorption over south-central Alaska. Analysis of a thermal instability expected to enhance generation of ELF/VLF waves by amplitude modulation of an HF heating wave has been extended into the non-linear regime. DTIC

Ionospheres; Electromagnetic Properties; Solar Physics; Riometers

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*.

20040016346 Raytheon Co., Huntsville, AL, USA

Evaluation of the Space Shuttle Transatlantic Abort Landing Atmospheric Sounding System

Leahy, Frank B.; [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 Transatlantic Abort Landing (TAL) Atmospheric Sounding System (TASS). The system has Global Positioning System (GPS) tracking capability and includes a helium-filled latex balloon that carries an instrument package (sonde) and various ground equipment that receives and processes the data from the sonde. TASS is used to provide vertical profiles of thermodynamic and low-resolution wind data in support of Shuttle abort landing operations at TAL sites. TASS uses GPS to determine height, wind speed, and wind direction. The TASS sonde has sensors that directly measure air temperature and relative humidity. These are then used to derive air pressure and density. Test flights were conducted where a TASS sonde and a reference sonde were attached to the same balloon and the two profiles were compared. The objective of the testing was to determine if TASS thermodynamic and wind data met Space Shuttle Program (SSP) accuracy requirements outlined in the Space Shuttle Launch and Landing Program Requirements Document (PRD).

Author

Space Shuttles; Atmospheric Sounding; Aborted Missions; Spacecraft Landing; Wind (Meteorology)

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*.

20040030476 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment

Thienel, Julie; Harman, Rick; Bar-Itzhack, Itzhack; [2004]; 4 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

The Magnetometer Navigation (MAGNAV) algorithm is currently running as a flight experiment as part of the Wide Field Infrarad Explorer Post-Science Engineer- ing Testbed. Initialization of MAGNAV occured on September 4, 2004. MAGNAV is designed to autonomously estimate the spacecraft orbit, attitude, and rate using magnetometer and sun sensor data. Since the earth s magnetic field is a function of time and position, and since time is known quite precisely, the differences between the computed magnetic field and measured magnetic field components, as measured by the magnetometer throughout the entire spacecraft orbit, are a function of the spacecraft trajectory and attitude errors. Therefore, these errors are used to estimate both trajec- tory and attitude. In addition, the time rate of change of the magnetic field vector is used to estimate the spacecraft rotation rate. The estimation of the attitude and tra- jectory is augmented with the rate estimation into an Extended Kalman filter blended with a pseudc-linear Kalman filter. Sun sensor data is also used to improve the accu- racy and observability of the attitude and rate estimates. This test serves to validate MAGNAV as a single low cost navigation system which utilizes reliable, flight qualified sensors. MAGNAV is intended as a backup algorithm, an initialization algorithm, or possibly a prime navigation algorithm for a mission with coarse constraints.

NASA

Magnetometers; Kalman Filters; Magnetic Fields; Spacecraft Trajectories; Spacecraft Orbits; Geomagnetism

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*.

20040016358 NASA Marshall Space Flight Center, Huntsville, AL, USA
Test Results for Entry Guidance Methods for Reusable Launch Vehicles
Hanson, John M.; Jones, Robert E.; [2003]; 11 pp.; In English; AIAA 2004 Aerospace Sciences Meeting, 5-8 Jan. 2004, Reno, NV, USA; No Copyright; Avail: CASI; A03, Hardcopy

There are a number of approaches to advanced guidance and control (AG&C) that have the potential for achieving the goals of significantly increasing reusable launch vehicle (RLV) safety and reliability, and reducing the cost. This paper examines some approaches to entry guidance. An effort called Integration and Testing of Advanced Guidance and Control Technologies (ITAGCT) has recently completed a rigorous testing phase where these algorithms faced high-fidelity vehicle models and were required to perform a variety of representative tests. The algorithm developers spent substantial effort improving the algorithm performance in the testing. This paper lists the test cases used to demonstrate that the desired results are achieved, shows an automated test scoring method that greatly reduces the evaluation effort required, and displays results of the tests. Results show a significant improvement over previous guidance approaches. The two best-scoring algorithm approaches show roughly equivalent results and are ready to be applied to future reusable vehicle concepts.
Author
Performance Tests; Algorithms; Reliability; Display Devices

20040020085 NASA Marshall Space Flight Center, Huntsville, AL, USA
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System
Farr, R. A.; Elam, S. K.; Hicks, G. D.; Sanders, T. M.; London, J. R.; Mayne, A. W.; Christensen, D. L.; October 22, 2003; 10 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA; No Copyright; Avail: CASI; A02, Hardcopy

As a part of NASA s 2003 Centennial of Flight celebration, engineers and technicians at Marshall Space Flight Center (MSFC), Huntsville, Alabama, in cooperation with the Alabama-Mississippi AIAA Section, have reconstructed historically accurate, functional replicas of Dr. Robert H. Goddard s 1926 first liquid- fuel rocket. The purposes of this project were to clearly understand, recreate, and document the mechanisms and workings of the 1926 rocket for exhibit and educational use, creating a vital resource for researchers studying the evolution of liquid rocketry for years to come. The MSFC team s reverse engineering activity has created detailed engineering-quality drawings and specifications describing the original rocket and how it was built, tested, and operated. Static hot-fire tests, as well as flight demonstrations, have further defined and quantified the actual performance and engineering actual performance and engineering challenges of this major segment in early aerospace history.
Author
Replicas; Liquid Fuels; Rocket Thrust; Rocket Vehicles

20040020088 NASA Marshall Space Flight Center, Huntsville, AL, USA
Passive Isolators for use on the International Space Station
Houston, Janice; Gattis, Christy; November 03, 2003; 8 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): 477-03-83
Report No.(s): AIAA Paper 2004-0787; No Copyright; Avail: CASI; A02, Hardcopy

The value of the International Space Station (ISS) as a premier microgravity environment is currently at risk due to structure-borne vibration. The vibration sources are varied and include crew activities such as exercising or simply moving from module to module, and electro- mechanical equipment such as fans and pumps. Given such potential degradation of usable microgravity, anything that can be done to dampen vibration on-orbit will significantly benefit microgravity users. Most vibration isolation schemes, both active and passive, have proven to be expensive - both operationally and from the cost of integrating isolation systems into primary/secondary structural interfaces (e.g., the ISS module/rack interface). Recently, passively absorptive materials have been tested at the bolt interfaces between the operating equipment and support structure (secondary/tertiary structural interfaces). The results indicate that these materials may prove cost-effective in mitigating the

vibrational problems of the ISS. We report herein tests of passive absorbers placed at the interface of a vibration-inducing component: the Development Distillation Assembly, a subassembly of the Urine Processing Assembly, which is a rotating centrifuge and cylinder assembly attached to a mounting plate. Passive isolators were installed between this mounting plate and its support shelf. Three materials were tested: BISCO HT-800, Sorbothane 30 and Sorbothane 50, plus a control test with a hard shim. In addition, four distinct combinations of the HT-800 and Sorbothane 50 were tested. Results show a significant (three orders of magnitude) reduction of transmitted energy, as measured in power spectral density (PSD), using the isolation materials. It is noted, however, that passive materials cannot prevent the transmission of very strong forces or absorb the total energy induced from structural resonances.
Author
Isolators; Vibration Isolators; Microgravity; Isolation; Rotating Cylinders; Subassemblies

20040021405 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Spacecraft Formation Design Near the Sun-Earth L(sub 2) Point
Collange, Guillaume; Leitner, Jesse; December 23, 2003; 19 pp.; In English; AIAA GN and C Conference, Aug. 2004, Providence, RI, USA; Copyright; Avail: CASI; A03, Hardcopy

Over the next two decades international space agencies including the National Aeronautics and Space Administration and the European Space Agency are proposing space missions which employ distributed spacecraft technologies to enable vast improvements in remote sensing performance as compared to fundamental performance limitations associated with fairing sizes of even the largest launch vehicles. A key initial step towards enabling such challenging missions is the development of processes and algorithms for designing the desired motion of the spacecraft formation subject to simultaneous gravitational and fuel constraints. In this paper we develop analogous methodologies for designing trajectories of relative motion near the L(sub 2) point as have been thoroughly developed for the Earth-orbiting regime. In this preliminary study, we confine ourselves to the basic assumptions of the Circular Restricted Three-Body Problem where disturbances, non-gravitational effects, and fourth and greater body affects are ignored. The focus is on determining formations that are defined primarily by the natural gravitational effects on the vehicles, such that maintenance over long-term will not require significant fuel consumption.
Author
Remote Sensing; Space Missions; Algorithms; Gravitational Effects

20040026971 NASA Glenn Research Center, Cleveland, OH, USA
New NASA SEE LEO Spacecraft Charging Design Guidelines: How to Survive in LEO Rather Than GEO
Ferguson, Dale C.; Hillard, G. Barry; December 2003; 12 pp.; In English; Eigth Spacecraft Charging Technology Conference, 20-24 Oct. 2003, Huntsville, AL, USA
Contract(s)/Grant(s): WBS 22-755-04-04
Report No.(s): NASA/TM-2003-212737; E-14262; No Copyright; Avail: CASI; A03, Hardcopy

It has been almost two solar cycles since the 1984 GEO Guidelines of Purvis, Garrett, Whittlesey, and Stevens were published. In that time, interest in high voltage LEO systems has increased. Correct and conventional wisdom has been that LEO conditions are sufficiently different from GEO that the GEO Guidelines (and other GEO and POLAR documents produced since then) should not be used for LEO spacecraft. Because of significant recent GEO spacecraft failures that have been shown in ground testing to be likely to also occur on LEO spacecraft, the SEE program commissioned the production of the new LEO Spacecraft Charging Design Guidelines. Now available in CD-ROM form, the LEO Guidelines highlight mitigation techniques to prevent spacecraft arcing on LEO solar arrays and other systems. We compare and contrast the mitigation techniques for LEO and GEO in this paper. We also discuss the extensive bibliography included in the LEO Guidelines, so results can be found in their primary sources.
NASA
Low Earth Orbits; Spacecraft Charging; Solar Cycles; Solar Arrays

20040027695 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Linear State-Space Representation of the Dynamics of Relative Motion, Based on Restricted Three Body Dynamics
Luquette,Richard J.; Sanner, Robert M.; January 2004; 11 pp.; In English; AIAA Guidance and Control Conference, 16-19 Aug. 2004, Providence, RI, USA; Copyright; Avail: CASI; A03, Hardcopy

Precision Formation Flying is an enabling technology for a variety of proposed space-based observatories, including the Micro-Arcsecond X-ray Imaging Mission (MAXIM) , the associated MAXIM pathfinder mission, Stellar Imager (SI) and the

Terrestrial Planet Finder (TPF). An essential element of the technology is the control algorithm, requiring a clear understanding of the dynamics of relative motion. This paper examines the dynamics of relative motion in the context of the Restricted Three Body Problem (RTBP). The natural dynamics of relative motion are presented in their full nonlinear form. Motivated by the desire to apply linear control methods, the dynamics equations are linearized and presented in state-space form. The stability properties are explored for regions in proximity to each of the libration points in the Earth/Moon - Sun rotating frame. The dynamics of relative motion are presented in both the inertial and rotating coordinate frames.
Author
Formation Flying; Three Body Problem; Algorithms; Nonlinearity; Stability

20040031535 NASA Langley Research Center, Hampton, VA, USA
Hyper-X Stage Separation Trajectory Validation Studies
Tartabini, Paul V.; Bose, David M.; McMinn, John D.; Martin, John G.; Strovers, Brian K.; [2003]; 16 pp.; In English; AIAA Modeling and Simulation Technologies Conference and Exhibit, 11-14 Aug. 2003, Austin, TX, USA
Contract(s)/Grant(s): 23-706-51-71
Report No.(s): AIAA Paper 2003-5819; Copyright; Avail: CASI; A03, Hardcopy

An independent twelve degree-of-freedom simulation of the X-43A separation trajectory was created with the Program to Optimize Simulated trajectories (POST II). This simulation modeled the multi-body dynamics of the X-43A and its booster and included the effect of two pyrotechnically actuated pistons used to push the vehicles apart as well as aerodynamic interaction forces and moments between the two vehicles. The simulation was developed to validate trajectory studies conducted with a 14 degree-of-freedom simulation created early in the program using the Automatic Dynamic Analysis of Mechanics Systems (ADAMS) simulation software. The POST simulation was less detailed than the official ADAMS-based simulation used by the Project, but was simpler, more concise and ran faster, while providing similar results. The increase in speed provided by the POST simulation provided the Project with an alternate analysis tool. This tool was ideal for performing separation control logic trade studies that required the running of numerous Monte Carlo trajectories.
Author
Trajectories; X-43 Vehicle; Stage Separation; Optimization; Computerized Simulation; Automatic Control; Systems Simulation

20040031559 NASA Glenn Research Center, Cleveland, OH, USA
Experimental Study of Arcing on High-Voltage Solar Arrays
Vayner, Boris; Galofaro, Joel; Ferguson, Dale; [2003]; 16 pp.; In English; 18th Space Photovoltaic Research and Technology Conference, 16-18 Sep. 2003, Cleveland, OH, USA; Original contains black and white illustrations
Contract(s)/Grant(s): 22-755-60-04; No Copyright; Avail: CASI; A03, Hardcopy

The main obstacle to the implementation of a high-voltage solar array in space is arcing on the conductor-dielectric junctions exposed to the surrounding plasma. One obvious solution to this problem would be the installation of fully encapsulated solar arrays which were not having exposed conductors at all. However, there are many technological difficulties that must be overcome before the employment of fully encapsulated arrays will turn into reality. An alternative solution to raise arc threshold by modifications of conventionally designed solar arrays looks more appealing, at least in the nearest future. A comprehensive study of arc inception mechanism suggests that such modifications can be done in the following directions: 1) To insulate conductor-dielectric junction from a plasma environment (wrapthrough interconnects); 2) To change a coverglass geometry (overhang); 3) To increase a coverglass thickness; 4) To outgas areas of conductor-dielectric junctions. The operation of high-voltage array in LEO produces also the parasitic current power drain on the electrical system. Moreover, the current collected from space plasma by solar arrays determines the spacecraft floating potential that is very important for the design of spacecraft and its scientific apparatus. In order to verify the validity of suggested modifications and to measure current collection five different solar array samples have been tested in a large vacuum chamber. Each sample (36 silicon based cells) consists of three strings containing 12 cells connected in series. Thus, arc rate and current collection can be measured on every string independently, or on a whole sample when strings are connected in parallel. The heater installed in the chamber provides the possibility to test samples under temperature as high as 80 C that stimulates the LEO operational temperature. The experimental setup is described below.
Author
Plasma Jets; Solar Arrays; Space Plasmas; Environmental Tests

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*.

20040021395 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration
FROM; FROM; FROM; FROM; Markham, Brian L.; Thome, Kurtis J.; Barsi, Julia A.; Kaita, Ed; Helder, Dennis L.; Barker, John L.; [2003]; 44 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

The Landsat-7 spacecraft carries the Enhanced Thematic Mapper Plus (ETM+) instrument. This instrument images the Earth land surface in eight parts of the electromagnetic spectrum, termed spectral bands. These spectral images are used to monitor changes in the land surface, so a consistent relationship, i.e., calibration, between the image data and the Earth surface brightness, is required. The ETM+ has several on- board calibration devices that are used to monitor this calibration. The best on-board calibration source employs a flat white painted reference panel and has indicated changes of between 0.5% to 2% per year in the ETM+ response, depending on the spectral band. However, most of these changes are believed to be caused by changes in the reference panel, as opposed to changes in the instrument's sensitivity. This belief is based partially on on-orbit calibrations using instrumented ground sites and observations of 'invariant sites', hyper-arid sites of the Sahara and Arabia. Changes determined from these data sets indicate are 0.1% - 0.6% per year. Tests and comparisons to other sensors also indicate that the uncertainty of the calibration is at the 5% level.
Author
Calibrating; Landsat 7; Electromagnetic Spectra; Thematic Mappers (Landsat); Spectral Bands

20040027587 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft
Thienel, Julie; Harman, Rick; Oshman, Yaakov; [2003]; 5 pp.; In English; 2003 AAS/AIAA Astrodynamics Specialist Conference Meeting, 3-7 Aug. 2003, Big Sky, MT, USA; Copyright; Avail: CASI; A01, Hardcopy

The Far Ultraviolet Spectroscopic Explorer (FUSE) is equipped with two ring laser gyros on each of the spacecraft body axes. In May 2001 one gyro failed. It is anticipated that all of the remaining gyros will also fail based on intensity warnings. In addition to the gyro failure, two of four reaction wheels failed in late 2001. The spacecraft control now relies heavily on magnetic torque to perform the necessary science maneuvers and hold on target. The only sensor consistently available during slews is a magnetometer. This paper documents the testing and development of magnetometer-based gyroless attitude and rate estimation algorithms for FUSE. The results of two approaches are presented, one relies on a kinematic model for propagation, a method used in aircraft tracking, and the other is a pseudo-linear Kalman filter that utilizes Euler's equations in the propagation of the estimated rate. Both algorithms are tested using flight data collected over a few months before and after the reaction wheel failure. Finally, the question of closed-loop stability is addressed. The ability of the controller to meet the science slew requirements, without the gyros, is tested through simulations.
Author
Far UV Spectroscopic Explorer; Laser Gyroscopes; Ring Lasers; Magnetometers; Spacecraft Control; Feedback Control

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*.

20040016351 NASA Marshall Space Flight Center, Huntsville, AL, USA
Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects
Edwards, David; Hovater, Mary; Hubbs, Whitney; Wertz, George; Hollerman, William; Gray, Perry; [2003]; 1 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA; No Copyright; Avail: Other Sources; Abstract Only

Solar sailing is a unique form of propulsion where a spacecraft gains momentum from incident photons. Solar sails are not limited by reaction mass and provide continual acceleration, reduced only by the lifetime of the lightweight film in the

space environment and the distance to the Sun. Once thought to be difficult or impossible, solar sailing has come out of science fiction and into the realm of possibility. Any spacecraft using this method would need to deploy a thin sail that could be as large as many kilometers in extent. The availability of strong, ultra lightweight, and radiation resistant materials will determine the future of solar sailing. The National Aeronautics and Space Administration's Marshall Space Flight Center (MSFC) is concentrating research into the utilization of ultra lightweight materials for spacecraft propulsion. The Space Environmental Effects Team at MSFC is actively characterizing candidate solar sail material to evaluate the thermo-optical and mechanical properties after exposure to space environmental effects. This paper will describe the exposure of candidate solar sail materials to emulated space environmental effects including energetic electrons, combined electrons and Ultraviolet radiation, and hypervelocity impact of irradiated solar sail material. This paper will describe the testing procedure and the material characterization results of this investigation.
Author
Solar Sails; Aerospace Environments; Propulsion; Environment Effects; Hypervelocity Impact

20040016433 Lawrence Livermore National Lab., Livermore, CA
Tests of the Contamination Analysis Unit, Phase 2
Meltzer, M.; Daley, P.; Jan. 21, 2003; 48 pp.; In English
Report No.(s): DE2003-15004860; UCRL-CR-151434; No Copyright; Avail: Department of Energy Information Bridge
Results are reported for a project testing the capabilities of a mass spectrometer-based system for analyzing in-situ organic compounds on a variety of substrates. The system, which was built and operated at Lawrence Livermore National Laboratory (LLNL), is termed a Contamination Analysis Unit (CAU) and employs vacuum and thermal desorption of surface residues, followed by ionization and analysis with a Leybold Inficon Transpector mass spectrometer. The CAU was employed in this study to examine soils, cleaner residues, and substrates on Space Shuttle Reusable Solid Rocket Motor (RSRM) components.
NTIS
Rocket Engines; Cleaning; Contamination; Space Shuttles

20040021329 NASA Glenn Research Center, Cleveland, OH, USA
Magnetic Bearing Controller Improvements for High Speed Flywheel System
Dever, Timothy P.; Brown, Gerald V.; Jansen, Ralph H.; Kascak, Peter E.; Provenza, Andrew J.; November 2003; 15 pp.; In English; First International Energy Conversion Engineering Conference, 17-21 Aug. 2003, Portsmouth, VA, USA
Contract(s)/Grant(s): WBS 22-319-20-M1
Report No.(s): NASA/TM-2003-212733; AIAA Paper 2003-12234; E-14258; No Copyright; Avail: CASI; A03, Hardcopy
A magnetic bearing control system for a high-speed flywheel system is described. The flywheel utilizes a five axis active magnetic bearing system, using eddy current sensors for position feedback to the bearing controller. Magnetic bearing controller features designed to improve flywheel operation and testing are described. Operational improvements include feed forward control to compensate for rotor imbalance, moving notch filtering to compensate for synchronous and harmonic rotational noise, and fixed notching to prevent rotor bending mode excitation. Testing improvements include adding safe gain, bearing current hold, bearing current zero, and excitation input features. Performance and testing improvements provided by these features are measured and discussed.
NASA
Magnetic Bearings; Controllers; Flywheels; Bearing (Direction)

20040027579 Georgia Inst. of Tech., Atlanta, GA, USA
Real-Time Control of Lean Blowout in a Turbine Engine for Minimizing No(x) Emissions
Zinn, Ben; [2004]; 15 pp.; In English
Contract(s)/Grant(s): NAG2-1488; No Copyright; Avail: CASI; A03, Hardcopy
This report describes research on the development and demonstration of a controlled combustor operates with minimal NO, emissions, thus meeting one of NASA s UEET program goals. NO(x) emissions have been successfully minimized by operating a premixed, lean burning combustor (modeling a lean prevaporized, premixed LPP combustor) safely near its lean blowout (LBO) limit over a range of operating conditions. This was accomplished by integrating the combustor with an LBO precursor sensor and closed-loop, rule-based control system that allowed the combustor to operate far closer to the point of LBO than an uncontrolled combustor would be allowed to in a current engine. Since leaner operation generally leads to lower NO, emissions, engine NO, was reduced without loss of safety.
Author
Real Time Operation; Blowouts; Combustion Products; Nitrogen Oxides; Combustion Chambers; Control Equipment

20040027584 Arizona State Univ., Tempe, AZ, USA, Ohio Aerospace Inst., OH, USA
Pulsed Inductive Thruster (PIT): Modeling and Validation Using the MACH2 Code
Schneider, Steven, Technical Monitor; Mikellides, Pavlos G.; December 2003; 18 pp.; In English; 28th International Electric Propulsion Conference, 17-21 Mar. 2003, Toulouse, France; Original contains color and black and white illustrations
Contract(s)/Grant(s): SA-02-1422; NCC3-860; WBS 22-755-70-07
Report No.(s): NASA/CR-2003-212714; E-14235; IEPC-2003-135; No Copyright; Avail: CASI; A03, Hardcopy

Numerical modeling of the Pulsed Inductive Thruster exercising the magnetohydrodynamics code, MACH2 aims to provide bilateral validation of the thruster's measured performance and the code's capability of capturing the pertinent physical processes. Computed impulse values for helium and argon propellants demonstrate excellent correlation to the experimental data for a range of energy levels and propellant-mass values. The effects of the vacuum tank wall and massinjection scheme were investigated to show trivial changes in the overall performance. An idealized model for these energy levels and propellants deduces that the energy expended to the internal energy modes and plasma dissipation processes is independent of the propellant type, mass, and energy level.
NASA
Pulsed Inductive Thrusters; Mathematical Models; Magnetohydrodynamics; Argon; Helium

20040027585 Arizona State Univ., AZ, USA
Real-Time Embedded Software Verification and Validation 2001
Lee, Yann-Hang; [2002]; 1 pp.; In English
Contract(s)/Grant(s): CSIP02-41; No Copyright; Avail: Other Sources; Abstract Only

As the space applications become more complex and timing constraints on control actions are more stringent, the task of integrating and testing NASA's real-time systems (such as X-38 Crew Return Vehicle, and certain International Space Station autonomous systems) has become a great challenge. A testing environment where can preserve consistent temporal behaviors as in the target execution must be established for system-level verification and software quality assurance. Our goal is to develop an analysis suite for validation and verification of real-time systems that are used to perform human- in-the-loop control operations during safety-critical missions. The suite will be able to carry out quantitative approaches of coverage diagnostic and temporal behavior evaluation in order to measure test coverage, to optimize test utilization, and to verify timing correctness.
Author
Computer Programs; Program Verification (Computers); Quality Control; Real Time Operation; Software Reliability

20040027672 Phillips Lab., Edwards AFB, CA
Overview of the Air Force ESEX Flight Experiment
Sutton, A. M.; Aug. 1993; 8 pp.; In English
Contract(s)/Grant(s): Proj-6340
Report No.(s): AD-A419694; PL-TP-93-3089; IEPC-93-057; No Copyright; Avail: CASI; A02, Hardcopy

In the post cold war, the USA Air Force is challenged by the need for increased maneuverability of the U.S. space assets, and the need to reduce launch costs. These needs have spawned the Electric Propulsion Space Experiment (ESEX). ESEX will address key issues associated with high power arcjets. Measuring performance in space and interactions on the spacecraft of this new plasma propulsion system will provide the first step towards the operational use of high power arcjets. Currently, the program is nearing completion of the second phase, in which the subsystems are being built, tested, and integrated into a flight unit. In the third phase, the flight unit environmental tests will be performed. In the last phases, the flight unit will fly aboard the P91-1 spacecraft, the Advanced Research Global Observation Satellite (ARGOS) in late 1995.
DTIC
Aerospace Environments; Arc Jet Engines; Electric Propulsion; Flight Tests

20040027682 Air Force Research Lab., Edwards AFB, CA, USA
Program Research and Announcement PRDA 04-01-PKT Integrated High Payoff Rocket Propulsion Technology XI (IHPRPT)
Gulczinaki, Frank; Feb. 3, 2004; 34 pp.; In English
Contract(s)/Grant(s): Proj-5033
Report No.(s): AD-A419729; AFRL-PR-ED-TP-2004-015; No Copyright; Avail: CASI; A03, Hardcopy

The Air Force Research Laboratory, Propulsion Directorate, AFRL/PR-West, Edwards AFB, CA is soliciting unclassified

technical and price proposals for the effort described in Section A. This announcement provides a complete description of the topic, the government projected funding profile and the technology areas to which the topic belongs. Proposals should be addressed to the Contracting POCs and Technical POC stated in the Preface with the appropriate markings. This is an unrestricted solicitation. The North American Industry Classification (NAICS) applicable to this acquisition is 541710 with 1000 employees as the threshold between small business and large business classification. Small businesses are encouraged to propose on this solicitation. Proposals shall be submitted in accordance with this announcement. There will be no other solicitation issued in regard to this requirement. Offerors should be alert for any PRDA amendments that may permit extensions to the proposal submission date.
DTIC
Spacecraft Propulsion; Research and Development

20040027692 Phillips Lab., Edwards AFB, CA
Multimegawatt Quasi-Steady MPD Thruster Facility
Castillo, S.; Tilley, D.; Jul. 1992; 9 pp.; In English
Report No.(s): AD-A419743; AIAA-92-3158; No Copyright; Avail: CASI; A02, Hardcopy

The multi-megawatt, quasi-steady MPD thruster facility at the Air Force Phillips Laboratory is now fully operational. This operational status is the result of many modifications and improvements completed in the past year. An update of facility capabilities and operation is presented. In particular the vacuum, propellant, and electrical systems are described, followed by a description of an impulse thrust stand and diagnostics capabilities. Finally, preliminary NPD thruster test results are presented.
DTIC
Diagnosis; Magnetoplasmadynamic Thrusters; Thrustors

20040027857 NASA Glenn Research Center, Cleveland, OH, USA
HAN-Based Monopropellant Technology Development
Reed, Brian; December 10, 2002; 8 pp.; In English; Propulsion Engineering Research Center 14th Annual Symposium on Propulsion, 10-11 Dec. 2002, State College, PA, USA
Contract(s)/Grant(s): 755-70-02; No Copyright; Avail: CASI; A02, Hardcopy

NASA Glenn Research Center is sponsoring efforts to develop technology for high-performance, high-density, low-freezing point, low-hazards monopropellant systems. The program is focused on a family of monopropellant formulations composed of an aqueous solution of hydroxylammonium nitrate (HAN) and a fuel component. HAN-based monopropellants offer significant mass and volume savings to small (less than 100 kg) satellite for orbit raising and on-orbit propulsion applications. The low-hazards characteristics of HAN-based monopropellants make them attractive for applications where ground processing costs are a significant concern. A 1-lbf thruster has been demonstrated to a 20-kg satellite orbit insertion duty cycle, using a formulation compatible with currently available catalysts. To achieve specific impulse levels above those of hydrazine, catalyst materials that can withstand the high-temperature, corrosive combustion environment of HAN-based monopropellants have to be developed. There also needs to be work done to characterize propellant properties, burning behavior, and material compatibility. NASA is coordinating their monopropellant efforts with those of the USA Air Force.
Author
Monopropellants; Ammonium Nitrates; Hydroxyl Compounds; Small Satellite Technology; Propulsion System Performance

20040027860 NASA Glenn Research Center, Cleveland, OH, USA, Ohio Aerospace Inst., Cleveland, OH, USA
NASA GRC High Power Electromagnetic Thruster Program
LaPointe, Michael R.; Pensil, Eric J.; October 03, 2004; 11 pp.; In English; Space Technologies and Applications International Forum 2004, 8-12 Feb. 2004, Albuquerque, NM, USA
Contract(s)/Grant(s): NCC3-860; WBS 22-755-70-07
Report No.(s): STAIF-086; No Copyright; Avail: CASI; A03, Hardcopy

High-power electromagnetic thrusters have been proposed as primary in-space propulsion options for several bold new interplanetary and deep-space missions. As the lead center for electric propulsion, the NASA Glenn Research Center designs, develops, and tests high-power electromagnetic technologies to meet these demanding mission requirements. Two high-power thruster concepts currently under investigation by Glenn are the magnetoplasmadynamic (MPD) thruster and the Pulsed

Inductive Thruster (PIT). This paper describes the MPD thruster and the test facility.
Author (revised)
Magnetoplasmadynamic Thrusters; Test Facilities

20040028049 NASA Glenn Research Center, Cleveland, OH, USA
Ion Species Fractions in the Far-Field Plume of a High-Specific Impulse Hall Thruster
Hofer, Richard R.; Gallimore, Alec D.; December 2003; 16 pp.; In English; 39th Joint Propulsion Conference and Exhibit, 20-23 Jul. 2003, Huntsville, AL, USA
Contract(s)/Grant(s): NAS3-00145; WBS 22-755-04-12
Report No.(s): NASA/CR-2003-212893; AIAA Paper 2003-5001; E-14311; No Copyright; Avail: CASI; A03, Hardcopy

An ExB probe was used to measure the ion species fractions of Xe(+), Xe(2+), and Xe(3+) in the far-field plume of the NASA-173Mv2 laboratory-model Hall thruster. The thruster was operated at a constant xenon flow rate of 10 milligrams per second and discharge voltages of 300 to 900 V. The ExB probe was placed two meters downstream of the thruster exit plane on the thruster centerline. At a discharge voltage of 300 V, the species fractions of Xe(2+) and Xe(3+) were lower, but still consistent with, previous Hall thruster studies using other mass analyzers. Over discharge voltages of 300 to 900 V, the Xe(2+) species fractions increased from 0.04 to 0.12 and the Xe(3+) species fraction increased from 0.01 to 0.02.
Author
Hall Thrusters; Specific Impulse; Far Fields; Plumes; Xenon; Ion Probes

20040028051 QSS Group, Inc., Cleveland, OH, USA
Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster
Hofer, Richard R.; Haas, James M.; Gallimore, Alec D.; December 2003; 18 pp.; In English; 39th Joint Propulsion Conference and Exhibit, 20-23 Jul. 2003, Huntsville, AL, USA
Contract(s)/Grant(s): NAS3-00145; WBS 755-04-12
Report No.(s): NASA/CR-2003-212895; AIAA Paper 2003-4556; E-14313; No Copyright; Avail: CASI; A03, Hardcopy

The effects of the magnetic field and discharge voltage on the far-field plume of the NASA 173Mv2 laboratory-model Hall thruster were investigated. A cylindrical Langmuir probe was used to measure the plasma potential and a retarding potential analyzer was employed to measure the ion voltage distribution. The plasma potential was affected by relatively small changes in the external magnetic field, which suggested a means to control the plasma surrounding the thruster. As the discharge voltage increased, the ion voltage distribution showed that the acceleration efficiency increased and the dispersion efficiency decreased. This implied that the ionization zone was growing axially and moving closer to the anode, which could have affected thruster efficiency and lifetime due to higher wall losses. However, wall losses may have been reduced by improved focusing efficiency since the total efficiency increased and the plume divergence decreased with discharge voltage.
Author
Electric Potential; Far Fields; Hall Thrusters; Ion Distribution; Plumes; Specific Impulse; Magnetic Fields

20040030466 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Modeling and Validation of a Propellant Mixer for Controller Design
Richter, Hanz; Barbieri, Enrique; Figueroa, Fernando; June 1, 2003; 19 pp.; In English; Original contains poor quality, truncated or crooked pages
Contract(s)/Grant(s): NASW-99027; NAS13-98033
Report No.(s): SE-2002-12-00083-SSC; No Copyright; Avail: CASI; A03, Hardcopy

A mixing chamber used in rocket engine testing at the NASA Stennis Space Center is modelled by a system of two nonlinear ordinary differential equations. The mixer is used to condition the thermodynamic properties of cryogenic liquid propellant by controlled injection of the same substance in the gaseous phase. The three inputs of the mixer are the positions of the valves regulating the liquid and gas flows at the inlets, and the position of the exit valve regulating the flow of conditioned propellant. Mixer operation during a test requires the regulation of its internal pressure, exit mass flow, and exit temperature. A mathematical model is developed to facilitate subsequent controller designs. The model must be simple enough to lend itself to subsequent feedback controller design, yet its accuracy must be tested against real data. For this reason, the model includes function calls to thermodynamic property data. Some structural properties of the resulting model that pertain to controller design, such as uniqueness of the equilibrium point, feedback linearizability and local stability are shown to hold under conditions having direct physical interpretation. The existence of fixed valve positions that attain a desired operating

condition is also shown. Validation of the model against real data is likewise provided.
Author
Controllers; Cryogenic Rocket Propellants; Mixers; Thermodynamic Properties

20040030515 Whitworth Coll., Spokane, WA, USA
Proposal for Testing and Validation of Vacuum Ultra-Violet Atomic Laser-Induced Fluorescence as a Method to Analyze Carbon Grid Erosion in Ion Thrusters
Stevens, Richard; [2003]; 9 pp.; In English
Contract(s)/Grant(s): NAG3-2822; No Copyright; Avail: CASI; A02, Hardcopy

Previous investigation under award NAG3-25 10 sought to determine the best method of LIF to determine the carbon density in a thruster plume. Initial reports from other groups were ambiguous as to the number of carbon clusters that might be present in the plume of a thruster. Carbon clusters would certainly affect the ability to LIF; if they were the dominant species, then perhaps the LIF method should target clusters. The results of quadrupole mass spectroscopy on sputtered carbon determined that minimal numbers of clusters were sputtered from graphite under impact from keV Krypton. There were some investigations in the keV range by other groups that hinted at clusters, but at the time the proposal was presented to NASA, there was no data from low-energy sputtering available. Thus, the proposal sought to develop a method to characterize the population only of atoms sputtered from a graphite target in a test cell. Most of the ground work had been established by the previous two years of investigation. The proposal covering 2003 sought to develop an anti-Stokes Raman shifting cell to generate VUW light and test this cell on two different laser systems, ArF and YAG- pumped dye. The second goal was to measure the lowest detectable amounts of carbon atoms by 156.1 nm and 165.7 nm LIF. If equipment was functioning properly, it was expected that these goals would be met easily during the timeframe of the proposal, and that is the reason only modest funding was requested. The PI was only funded at half- time by Glenn during the summer months. All other work time was paid for by Whitworth College. The college also funded a student, Charles Shawley, who worked on the project during the spring.
Author
Carbon; Density (Mass/Volume); Thrustors; Plumes; Atoms; Ion Engines

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*.

20040016283 Lawrence Livermore National Lab., Livermore, CA
Thermal Decomposition of New and Aged LX-04 and PBX 9501
Tran, T. D.; Tarver, C.; Idar, D. J.; Rodin, W. A.; Apr. 09, 2002; 14 pp.; In English
Report No.(s): DE2003-15004649; UCRL-JC-147459-R1; No Copyright; Avail: Department of Energy Information Bridge

One-Dimensional-Time-To-Explosion (ODTX) experiments were conducted to study the thermal decomposition of new and aged LX-04, PBX 9501, HMX class 1 and class 2, Estane and Estane/BDNPA-F (PBX 9501 plasticized-binder) materials. New and aged LX-04 showed comparable decomposition kinetics. The data for aged PBX 9501 showed slightly longer explosion times at equivalent temperatures. Analysis of the error in time measurement is complicated by several experimental factors but the small time change appears to be experimentally significant. The results suggest that aged PBX 9501 is slightly more thermally stable.
NTIS
Explosions; Thermal Decomposition; Aging (Materials); Plasticizers; Binders (Materials)

20040016431 Lawrence Livermore National Lab., Livermore, CA
Simulation of a Spherical Wave Experiment in Marble Using a Multidirectional Damage Model
Antoun, T. H.; Lomov, I. N.; Jul. 18, 2003; 10 pp.; In English
Report No.(s): DE2003-15004857; UCRL-JC-154428; No Copyright; Avail: Department of Energy Information Bridge

This paper presents experimental results and computational simulations of spherical wave propagation in Danby marble. The experiment consisted of a 2-cm-diameter explosive charge detonated in the center of a cylindrical rock sample. Radial particle velocity histories were recorded at several concentric locations in the sample. An extensively damaged region near the

charge cavity and two networks of cracks were evident in the specimen after the test. The first network consists of radial cracks emanating form the cavity and extending about halfway through the specimen. The second network consists of circumferential cracks occurring in a relatively narrow band that extends from the outer boundary of the radially cracked region toward the free surface. The experiment was simulated using the GEODYN code and a multi-directional damage model. The model is developed within the framework of a properly invariant nonlinear thermomechanical theory with damage represented by a second order tensor that admits load-induced anisotropy such as was observed in the experiment.
NTIS
Anisotropy; Spherical Waves; Thermodynamics; Cylindrical Bodies; Loads (Forces)

20040016458 Lawrence Livermore National Lab., Livermore, CA
Laser-Material Interaction of Powerful Ultrashort Laser Pulses
Komashko, A. M.; Jan. 06, 2003; 238 pp.; In English
Report No.(s): DE2003-15005034; UCRL-LR-150191; No Copyright; Avail: Department of Energy Information Bridge
Laser-material interaction of powerful (up to a terawatt) ultrashort (several picoseconds or shorter) laser pulses and laser-induced effects were investigated theoretically in this dissertation. Since the ultrashort laser pulse (USLP) duration time is much smaller than the characteristic time of the hydrodynamic expansion and thermal diffusion, the interaction occurs at a solid-like material density with most of the light energy absorbed in a thin surface layer. Powerful USLP creates hot, high-pressure plasma, which is quickly ejected without significant energy diffusion into the bulk of the material, Thus collateral damage is reduced. These and other features make USLPs attractive for a variety of applications. The purpose of this dissertation was development of the physical models and numerical tools for improvement of our understanding of the process and as an aid in optimization of the USLP applications.
NTIS
Laser Materials; Ultrashort Pulsed Lasers; Mathematical Models

20040020039 Lawrence Livermore National Lab., Livermore, CA
Crystal Level Model for Phase Transformation Allowing for Large Volume Changes
Barton, N. R.; Benson, D. J.; Becker, R.; Apr. 02, 2003; 10 pp.; In English
Report No.(s): DE2003-15005038; UCRL-JC-151558; No Copyright; Avail: Department of Energy Information Bridge
We present a model for materials undergoing diffusionless structural changes including martensitic phase transformation and twinning, with the phase transformations involving large volume changes. Within a given material element, structural changes induce mass fraction rates between the constituents in the material. Deformation results from both these structural changes and elasto-viscoplastic deformation of the constituents themselves.
NTIS
Phase Transformations; Deformation; Structural Analysis

20040020056 Westinghouse Savannah River Co., Aiken, SC, USA
Analysis of Events Associated with First Charge of Desicooler Material
Alexander, D. E.; 2003; 50 pp.; In English
Report No.(s): DE2003-815776; WSRC-TR-2003-00242; No Copyright; Avail: Department of Energy Information Bridge
The HB-Line Scrap Recovery process has a mission to dissolve scrap material, uranium and plutonium oxide, in nitric acid. The resulting solution is then transferred to H-Canyon for further processing. HB-Line has a dual train dissolving system. One train consists of a dissolver (RD-13 or RD-14) and a Product Hold Tank (RT-33 or RT-34). Each dissolver is a slab tank with a 30-liter capacity. The dissolution process consists of adding 15 liters of 12 molar nitric acid with a small addition of fluoride to act as a catalyst for the reaction. When combined with about one liter of heel, this results in a total dissolver volume of 16 liters. The material is introduced and the solution is heated. Once dissolution is complete, the cooled solution is transferred to RT-33/34 and transferred to H-Canyon.
NTIS
Radioactive Wastes; Nitric Acid; Plutonium Oxides; Uranium Oxides

20040027850 Air Force Research Lab., Edwards AFB, CA, USA
Investigating the Effect of Interfacial Strength on Deformation and Failure Mechanisms in Bond Systems
Liu, C. T.; Chiang, Fu-Pen; Jan. 20, 2004; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2302
Report No.(s): AD-A419905; AFRL-PR-ED-VG-2004-009; No Copyright; Avail: CASI; A03, Hardcopy

Objectives: 1) Investigate the effects of Interfacial Strength on Deformation and Failure Mechanisms in Bi-Material Bonded Specimens under a 0.01 in/min Constant Displacement Rate Condition. 2) Determine the Strain Rate Distribution in the Bi-Material Bonded Specimens.
DTIC
Deformation; Joints (Junctions); Bonding

20040028067 Naval Research Lab., Washington, DC
Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell
Durkin, Arthur F.; Nguyen, Xuan-An; Williams, Frederick W.; Pham, Hung V.; Wong, Jennifer T.; Jan. 16, 2004; 45 pp.; In English
Report No.(s): AD-A420003; NRL/MR/6180--04-8742; No Copyright; Avail: CASI; A03, Hardcopy
The subject test coatings were applied in a range of thickness in excess of Navy paint application. Radiant flux from the wood crib fire was insufficient to trigger any intumescent response in the C. B. Environmental products FB-1 and FB-520. Direct flame impingement from the heptane pool fire did not provide an insult sufficient to activate any large-scale, intumescent response from the C. B. Environmental product FB-2. The C. B. Environmental coatings FB-1, FB-2, and FB-520 may provide some thermal resistance to conductive heat transfer at an application thickness of 60 to 80 mils.
DTIC
Protective Coatings; Fire Fighting; Performance Tests; Navy

20040028130 Academy of Sciences of the Ukraine, Kharkov, Ukraine
Magneto-Optically Guided and Fully Ionized Metal/Carbon Arc Plasma Source for Thin Film Coatings to Control, Wear, and Fretting
Strelnytskly, Volodymyr; Jan. 2003; 29 pp.; In English
Report No.(s): AD-A419842; No Copyright; Avail: CASI; A03, Hardcopy
This report results from a contract tasking Kharkov Institute of Physics and Technology as follows: The current project is directed toward developing the curvalence arc plasma source of carbon and metal plasma for producing tribological films. This includes plasma source design, study, and optimization to operate with graphite, aluminum, and zirconium targets, and to produce low friction and hard diamond-like carbon (DLC), alumina, and zirconia films. A study of plasma properties, including ionization state, density, and energy distributions will be performed. The results will be used to manufacture a demonstration system with an optimized plasma source by the KIPT. This system will be used by the KIPT to study plasma characteristics in tribological material synthesis and prepare samples of tribological films for evaluation at the Air Force Research Laboratory, Wright-Patterson Air Force Base (AFRL, WPAFB) , Ohio. The system will be then transferred to AFRL, WPAFB together with required power supplies, control modules, and design documentation for installation, testing, and on-site technology demonstration. Specifically, the use of the technology in production of DLC films with a high percentage of sp3 electronic hybridization, synthesis of cubic BN, deposition of crystalline metals, oxides, carbides, and nitrides at low substrate temperatures, and production of nanocomposite materials made of nanocrystalline and amorphous phase% will be the focus of the seminars.
DTIC
Plasmas (Physics); Thin Films; Coatings

20040028132 Army Construction Engineering Research Lab., Champaign, IL, USA
Development of Product Descriptions for Lead- Immobilizing Overcoating Systems
Race, Timothy D.; Drozdz, Susan A.; Dec. 2003; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-CW
Report No.(s): AD-A419963; ERDC/CERL-TR-03-33; No Copyright; Avail: CASI; A03, Hardcopy
This report evaluates the performance of selected commercially available moisture cure urethane and calcium sulfonate coating systems. It includes product descriptions for each type of system. The primary purpose of these coating systems is as overcoat materials for aged lead-containing paints.
DTIC
Coatings; Lead Compounds; Paints; Urethanes; Evaluation

24
COMPOSITE MATERIALS

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

20040016272 Department of the Navy, Washington, DC
Molybdenum-Copper Composite Material
Hardro, Peter J., Inventor; Aug. 4, 2003; 19 pp.; In English
Patent Info.: Filed 4 Aug. 2003; US-Patent-Appl-SN-10637084
Report No.(s): AD-D020115; No Copyright; Avail: Other Sources

Accordingly, it is an object of the present invention to provide a composite material that offers the ability to create tools and prototype parts requiring working temperatures up to 1000 degrees Centigrade. It is a further object of the present invention to provide a composite material as above which has a low coefficient of thermal expansion. It is still a further object of the present invention to provide a method for manufacturing the above composite material. The foregoing objects are attained by the composite material and method of the present invention. In accordance with the present invention, a composite material is provided which has a molybdenum particulate and an oxygen free copper matrix. The molybdenum is preferably present in an amount of 35 - 65 vol% with the balance being of oxygen free copper. Also, in accordance with the present invention, a method for manufacturing a molybdenum-copper composite material broadly comprises forming a mixture of molybdenum, phenolic, and wax, forming the mixture into a green form using either a selective laser sintering processor a cold pressing process, placing the green form and oxygen free copper into the furnace adjacent to the green form, and subjecting the green form and the oxygen free copper to a furnace cycle. During the furnace cycle the wax and phenolic thermoset resin is vaporized and the molybdenum is sintered. Additionally, the sintered molybdenum substrate, which is contacted with copper, is heated above the melting point of the copper which causes the-copper to infiltrate the molybdenum substrate, forming the molybdenum-copper composite part.
DTIC
Copper; Composite Materials; Molybdenum; Thermal Expansion

20040016459 Lawrence Livermore National Lab., Livermore, CA
Delamination Failure Investigation for Out-of-Plane Loading in Laminates
Christensen, R. M.; DeTeresa, S. J.; Mar. 26, 2003; 12 pp.; In English
Report No.(s): DE2003-15005069; UCRL-JC-152637; No Copyright; Avail: Department of Energy Information Bridge

In contrast to failure approaches at the lamina level or the micromechanics level the present work concerns failure characterization at the laminate level. Specifically, attention is given to the ultimate failure characterization for quasi-isotropic laminates. This is in further contrast to the commonly used approaches for initial damage or progressive damage. It is shown that the analytical failure forms decompose into two modes, one for out of plane, delamination type failure and one for in plane, fiber controlled type failure. The work here is mainly given over to the delamination mode of failure. Experimental results are presented for laminates in this mode of failure. These results are then integrated with the analytical forms to give a simple criterion for delamination failure.
NTIS
Failure; Characterization; Micromechanics

20040020118 NASA Glenn Research Center, Cleveland, OH, USA
High Temperature Polymeric Materials for Space Transportation Propulsion Applications
Meador, Michael A.; Campbell, Sandi G.; Chuang, Kathy C.; Scheimann, Daniel A.; Mintz, Eric; Hylton, Donald; Veazie, David; Criss, James; Kollmansberg, Ron; Tsotsis, Tom; [2003]; 9 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 22-713-82-23; No Copyright; Avail: CASI; A02, Hardcopy

High temperature polymer matrix composites are attractive materials for space transporation propulsion systems because of their low density and high specific strength. However, the relatively poor stability and processability of these materials can render them unsuitable for many of these applications. New polymeric materials have been developed under the Propulsion Research and Technology Program through the use of novel resin chemistry and nanotechnology. These new materials can significantly enhance the durability and weight and improve the processability and affordability of propulsion components for advanced space transportation systems.
Author
Space Transportation; Refractory Materials; Propulsion System Performance; Nanotechnology; Polymer Matrix Composites

20040027839 NASA Ames Research Center, Moffett Field, CA, USA

Ultra-High Temperature Ceramic Composites for Leading Edges

Levine, Stanley R.; Singh, Mrityunjay; Opila, Elizabeth J.; Lorincz, Jonathan A.; Petko, Jeanne; Ellerby, Donald T.; Gasch, Matthew J.; [2003]; 10 pp.; In English; JANNAF 39th Combustion Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA
Contract(s)/Grant(s): 706-85-08; No Copyright; Avail: CASI; A02, Hardcopy

Ultra-high temperature ceramics (UHTC) have performed unreliably due to material flaws and attachment design. These deficiencies are brought to the fore by the low fracture toughness and thermal shock resistance of UHTC. If these deficiencies are overcome, we are still faced with poor oxidation resistance as a limitation on UHT applicability to reusable launch vehicles. We have been addressing the deficiencies of UHTC for the past two years via a small task at GRC that is in the Airframe part of the Next Generation Launch Technology Program. Our focus is on composite constructions and functional grading to address the mechanical issues and on composition modification to address the oxidation issue. The progress on approaches to improving oxidation resistance by alloying and functional grading will be reported. In particular, initial tests of tantalum additions have shown potential for major improvement. Less promising results of additional tests at higher temperatures will be presented. Two fabrication approaches are being pursued to produce carbon fiber reinforced UHTC composites: prepregging and rigid perform infiltration. Fabrication procedures and microstructures for composites will be reported.

Author

Leading Edges; High Temperature; Ceramic Matrix Composites; Fabrication; Durability; Thermodynamics; Microstructure

20040027843 Howard Univ., Washington, DC, USA

Next Generation Aerospace Composites Through Nanotechnology

Raghavan, D.; Jan. 2003; 42 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0299
Report No.(s): AD-A419900; AFRL-SR-AR-TR-04-0071; No Copyright; Avail: CASI; A03, Hardcopy

In recent years, the area of nanocomposites has received considerable attention with the expectation that nanotechnology can leas to lighter, better materials for engineering applications. For example, the attractiveness of polymer-clay nanocomposites resides in the potential of adding infinitesimally small clay platelets, to improve mechanical, thermal, barrier, and flame-retardant properties without increasing the specific gravity or reducing the transparency of the nanocomposite relative to the base material. One of the major roadblocks in the wider use of nanoclay platelets in thermoset and thermoplastic polymeric materials has been the poor dispersion of polar clay into a non-polar polymer matrix. It is believed that consistent improvements in strength and modulus of clay loaded polymeric system can be achieved by minimizing clay aggregation, promoting the formation of chemical bonds between polymer and clay and achieving exfoliation of clay. The other major problem that the nanocomposite community faces is the reduction in fracture toughness and failure strain of the nanocomposites due to the addition of clay.

DTIC

Composite Materials; Aerospace Systems; Chemical Bonds

20040027859 Ohio Aerospace Inst., Brook Park, OH, USA

Comparison of Matrix Cracking in Melt-Infiltrated SiC/SiC Composites with 3D and 2D-Woven Orthogonal Architectures

Morscher, Gregory N.; [2003]; 28 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-763; 714-04-22; No Copyright; Avail: CASI; A03, Hardcopy

Acoustic emission techniques combined with microstructural observations were used to determine the dependence of through thickness matrix cracking (TTMC) on in-plane tensile stress for melt infiltrated Sylramic fiber-based SIC/SiC composite panels with various 3D-woven orthogonal fiber architectures. Results were compared with prior TTMC results from similar panels with 2D woven orthogonal architectures.Both data sets were analysed on the basis that the source for TTMC originated in the 90 degree or Z-fiber tows.

Author

Composite Structures; Tensile Stress; Silicon Carbides; Cracks

20040028006 NASA Marshall Space Flight Center, Huntsville, AL, USA, Ultramet Co., Pacoima, CA, USA

Recent Advances in the Development of Thick-Section Melt-Infiltrated C/SiC Composites

Babcock, Jason R.; Ramachandran, Gautham; Williams, Brian E.; Effinger, Michael R.; [2004]; 1 pp.; In English; 28th Annual Conference on Composites, Materials and Structures, 26-30 Jan. 2004, Cocoa Beach, FL, USA; No Copyright; Avail: Other Sources; Abstract Only

Using a pressureless melt infiltration and in situ reaction process to form the silicon carbide (SiC) matrix, Ultramet has been developing a means to rapidly fabricate ceramic matrix composites (CMCs) targeting thicker sections. The process also employs a unique route for the application of oxide fiber interface coatings designed to protect the fiber and impart fiber-matrix debond. Working toward a 12 inch diameter, 2.5 inch thick demonstrator component, the effect of various processing parameters on room temperature flexure strength is being studied with plans for more extensive elevated temperature mechanical strength evaluation to follow this initial optimization process.
Author
Ceramic Matrix Composites; Fabrication; Thick Plates; Infiltration

20040028024 Ultramet Co., Pacoima, CA, USA
Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites
Babcock, Jason R.; Ramachandran, Gautham; Williams, Brian E.; Effinger, Michael R.; [2004]; 2 pp.; In English; 28th Annual Conference on Composites, Materials and Structures, 26-30 Jan. 2004, Cocoa Beach, FL, USA; No Copyright; Avail: Other Sources; Abstract Only

Ultraviolet-enhanced chemical vapor deposition (UVCVD) has been developed to lower the required substrate temperature thereby allowing for the application of metal oxide-based coatings to carbon and ceramic fibers without causing significant fiber damage. An effort to expand this capability to other ceramic phases chosen to maximize oxidation protection in the likely event of matrix cracking and minimize possible reaction between the coating and fiber during long-term high temperature use will be presented along with studies aimed at the demonstration of these and other benefits for the next-generation interface coating systems being developed herein.
Author
Vapor Deposition; Ultraviolet Radiation; Multilayer Insulation; Resistance; Fiber Composites; Reinforcing Materials; Carbon Fibers

20040030499 NASA Glenn Research Center, Cleveland, OH, USA
Thermal Conductivity of Alumina-Toughened Zirconia Composites
Bansal, Narottam P.; Zhu, Dong-Ming; December 2003; 14 pp.; In English
Contract(s)/Grant(s): WBS 22-708-02-06
Report No.(s): NASA/TM-2003-212896; E-14314; No Copyright; Avail: CASI; A03, Hardcopy

10-mol% yttria-stabilized zirconia (10YSZ)-alumina composites containing 0 to 30 mol% alumina were fabricated by hot pressing at 1500 C in vacuum. Thermal conductivity of the composites, determined at various temperatures using a steady-state laser heat flux technique, increased with increase in alumina content. Composites containing 0, 5, and 10-mol% alumina did not show any change in thermal conductivity with temperature. However, those containing 20 and 30-mol% alumina showed a decrease in thermal conductivity with increase in temperature. The measured values of thermal conductivity were in good agreement with those calculated from simple rule of mixtures.
Author
Thermal Conductivity; Yttria-Stabilized Zirconia; Composite Materials; Aluminum Oxides; Fabrication

20040030527 National Center for Atmospheric Research, Boulder, CO, USA
Measurement of Peroxyacetyl Nitrate (PAN), Peroxypropionyl Nitrate (PPN) and Peroxymethacryloyl Nitrate (MPAN) during TRACE-P
Flocke, Frank; Weinheimer, Andrew J.; [2003]; 6 pp.; In English
Contract(s)/Grant(s): NCC1-423; No Copyright; Avail: CASI; A02, Hardcopy

In Fall 2000, the PANs gas chromatograph (GC) was improved and prepared for installation on the NASA P-3. A number of experiments were conducted in conjunction with the NCAR NO,, instrument (B. Ridley) to settle some of the fine details of the output of the calibration system for each instrument. In addition, the sampling frequency was improved.
Derived from text
Gas Chromatography; Nitrates; Measuring Instruments

20040031560 NASA Glenn Research Center, Cleveland, OH, USA
Matrix Cracking in 3D Orthogonal Melt-Infiltrated SiC/SiC Composites with Various Z-Fiber Types
Morscher, Gregory N.; Yun, Hee Mann; DiCarlo, James A.; [2003]; 24 pp.; In English
Contract(s)/Grant(s): NCC3-763; 714-04-10; No Copyright; Avail: CASI; A03, Hardcopy

The occurrence of matrix cracks in melt-infiltrated SiC/SiC composites with a 3D orthogonal architecture was determined at room temperature for specimens tested in tension oriented in the X-direction (parallel to Z-bundle weave direction) and Y-direction (perpendicular to Z-bundle weave direction) and Y-direction (perpendicular to Z-bundle weave direction). The fiber-types were Sylramic and Sylramic-IBN in the X and Y-directions and lower modulus ZMI, T300, and rayon in the Z-direction. Acoustic emission (AE) was used to monitor the matrix cracking activity. For Y-direction composites, the AE data was used to determine the exact (+/- 0.25 mm) location where matrix cracks occurred in the 3D orthogonal architecture. This enabled the determination of the stress-dependent matrix crack distributions for small but repeatable matrix rich 'unidirectional' and the matrix poor 'cross-ply' regions within the architecture. It was found that matrix cracking initiated at very low stresses (approx. 40 MPa) in the 'unidirectional' regions for the largest z-direction fiber tow composites. Decreasing the size of the z-fiber bundle, increased the stress for matrix cracking in the 'unidirectional' regions. Matrix cracking in the 'cross-ply' regions always occurred at higher stresses than in 'unidirectional' regions, and the stress-dependent matrix crack distribution of the 'cross-ply' regions was always over a wider stress-range than the 'unidirectional' regions. For composites tested in the X-direction, a lower elastic modulus and a narrower and lower stress-range for matrix cracking were observed compared to composites tested in the Y-direction.
Author
Fiber Composites; Cracking (Fracturing); Silicon Carbides; Fiber Orientation

20040031565 Ohio Aerospace Inst., Brook Park, OH, USA
Matrix Cracking in Four Different 2D SiC/SiC Composite Systems
Morscher, Gregory N.; [2003]; 14 pp.; In English; 35th International SAMPE Technical Conference, 28 Sep. - 2 Oct. 2003, Dayton, OH, USA
Contract(s)/Grant(s): 714-04-22; No Copyright; Avail: CASI; A03, Hardcopy

Silicon carbide fiber reinforced, silicon carbide matrix composites are some of the most advanced composite systems for high-temperature, high-stress applications in oxidizing environments. A basic area that needs to be understood for the purpose of material behavior modeling and optimization is the architectural, constituent, and mechanistic factors that contribute to non-linear stress-strain behavior. The mechanism that causes non-linear stress-strain in dense-matrix composites is the formation and propagation of bridged matrix cracks. In addition, the occurrence and propagation of matrix cracks controls the time-dependent strength-properties of these materials in oxidizing environments at elevated temperatures. A modal acoustic emission technique has been used to monitor and estimate the stress-dependent matrix cracking. Two different SiC matrix systems, chemical vapor infiltrated (CVI) and melt-infiltrated (MI), with two different SiC fiber reinforcement, Hi-Nicalon (trademark) and Sylramic (trademark) were compared. Even though the averages of the range where matrix cracking occurred for the composites varied by more than 0.1% in strain and almost 200 MPa in stress, the range or distribution for matrix cracking could be reduced to a narrow band of stress for CVI SiC and MI SiC composites if it were assumed that all matrix cracks emanate outside of the load-bearing fiber, interphase, CVI preform minicomposite. A simple relationship was determined to describe stress-dependent matrix cracking which can then be used to estimate the onset of large, bridged matrix cracks or for material behavior models.
Author
Silicon Carbides; Fiber Composites; Stress-Strain Relationships; Crack Bridging

25
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*.

20040016360 Notre Dame Univ., IN, USA
Supercritical Carbon Dioxide-Soluble Ligands for Extracting Actinide Metal Ions from Porous Solids
Brennecke, J. F.; Jul. 2003; 10 pp.; In English
Report No.(s): DE2003-813489; No Copyright; Avail: Department of Energy Information Bridge

Numerous types of actinide-bearing waste materials are found throughout the DOE complex. Most of these wastes consist of large volumes of non-hazardous materials contaminated with relatively small quantities of actinide elements. Separation of these wastes into their inert and radioactive components would dramatically reduce the costs of stabilization and disposal. For example, the DOE is responsible for decontaminating concrete within 7000 surplus contaminated buildings. The best

technology now available for removing surface contamination from concrete involves removing the surface layer by grit blasting, which produces a large volume of blasting residue containing a small amount of radioactive material. Disposal of this residue is expensive because of its large volume and fine particulate nature. Considerable cost savings would result from separation of the radioactive constituents and stabilization of the concrete dust. Similarly, gas diffusion plants for uranium enrichment contain valuable high-purity nickel in the form of diffusion barriers. Decontamination is complicated by the extremely fine pores in these barriers, which are not readily accessible by most cleaning techniques. A cost-effect method for the removal of radioactive contaminants would release this valuable material for salvage.
NTIS
Radioactive Wastes; Separation; Hazardous Materials

20040016387 Lawrence Livermore National Lab., Livermore, CA
High Dynamic Pressures and Modest Temperatures: A Broad Perspective and Bridging the Gap
Nellis, W. J.; Aug. 30, 2001; 18 pp.; In English
Report No.(s): DE2003-15004698; UCRL-JC-145272; No Copyright; Avail: Department of Energy Information Bridge
Pressures up to a few 100 GPa and temperatures as high as a few 1000 K have been achieved with high dynamic pressures using a two-stage light-gas gun. Results are reviewed for molecular fluids, metallic hydrogen, solids, implications for planetary interiors, and structures and properties of materials recovered intact from high dynamic pressures.
NTIS
Dynamic Loads; Molecular Gases; Metallic Hydrogen; Temperature

20040020067 Iowa State Univ. of Science and Technology, Ames, IA
Investigations of the Electronic Properties and Surface Structures of Aluminum-Rich Quasicrystalline Alloys
Barrow, J. A.; 2003; 138 pp.; In English
Report No.(s): DE2003-816443; No Copyright; Avail: Department of Energy Information Bridge
The work presented in this dissertation has investigated three distinct areas of interest in the field of quasicrystals: bulk structure, transport properties, and electronic structure. First, they have described the results of a study which explored the fundamental interactions between the atomic species of the icosahedral Al-Pd-Mn quasicrystal. The goal of this work was to determine whether the pseudo-MacKay or Bergman type clusters have a special stability or are merely a geometric coincidence. This was carried out by using laser vaporization to produce gas-phase metal clusters, which were analyzed using time-of-flight mass spectrometry. Next, they have reported their investigations of the bulk thermal transport properties of a decagonal Al-Ni-Co two dimensional quasicrystal in the temperature range 373K-873K. The properties of a sample oriented along the periodic axis and another oriented along the aperiodic axis were measured. A high degree of anisotropy was observed between the aperiodic and periodic directions. The third study presented a detailed analysis of the reversible, sputter-induced phase transformation which occurs on the 5-fold surface of an icosahedral Al-Cu-Fe quasicrystal. Reflection high-energy electron diffraction (RHEED), X-ray photoemission spectroscopy (XPS), and ultra-violet photoemission spectroscopy (UPS) data were collected as a function of annealing temperature and were used to probe surface structure, surface composition, and electronic structure, respectively.
NTIS
Aluminum Alloys; Electrical Properties; Surface Layers; Single Crystals; Phase Transformations; Electronic Structure

20040020072 Air Products and Chemicals, Inc., Allentown, PA, USA
Kinetic Understanding of the Syngas-to-DME Reaction System and It's Implications to Process and Economics
Peng, X. D.; Dec. 2002; 58 pp.; In English
Report No.(s): DE2003-816515; No Copyright; Avail: Department of Energy Information Bridge
In a single-step synthesis gas-to-dimethyl ether process, synthesis gas (or syngas, a mixture of H(sub 2) and CO) is converted into dimethyl ether (DME) in a single reactor. The three reactions involved in this process, methanol synthesis, methanol dehydration and water gas shift, form an interesting reaction network. The interplay among these three reactions results in excellent syngas conversion or reactor productivity. A fundamental understanding of this interplay helps to explain many experimental and simulation observations, to identify optimal reaction conditions, and to provide guidelines for process development. The higher syngas conversion or reactor productivity in the syngas-to-DME reaction system, compared to that in the syngas-to-methanol reaction system, is referred to as chemical synergy. The role of the dehydration reaction is to remove the equilibrium barrier for the methanol synthesis reaction. The role of the water gas shift reaction is more complex; it helps

the kinetics of methanol dehydration by keeping the water concentration low, which in turn enhances methanol synthesis.
NTIS
Synthesis Gas; Gas Mixtures; Kinetics

20040020076 Westinghouse Savannah River Co., Aiken, SC, USA
Recovery of Plutonium from Refractory Residues Using a Sodium Peroxide Pretreatment Process
Rudisill, T. S.; 2003; 28 pp.; In English
Report No.(s): DE2003-818269; WSRC-MS-2003-00280; No Copyright; Avail: Department of Energy Information Bridge

The recycle of plutonium from refractory residues is a necessary activity for the nuclear weapon production complex. Traditionally, high-fired plutonium oxide (PuO2) was leached from the residue matrix using a nitric acid/fluoride dissolving flowsheet. The recovery operations were time consuming and often required multiple contacts with fresh dissolving solution to reduce the plutonium concentration to levels where residual solids could be discarded. Due to these drawbacks, the development of an efficient process for the recovery of plutonium from refractory materials is desirable. To address this need, a pretreatment process was developed which utilizes a sodium peroxide (Na2O2) fusion to oxidize plutonium from the 4+ to the 6+ valence forming an acid-soluble ternary oxide. The development program utilized a series of small-scale experiments to optimize processing conditions for the fusion process and demonstrate the plutonium recovery efficiency using ceramic materials developed as potential long-term storage forms for PuO2 and an incinerator ash from the Rocky Flats Environmental Technology Site (Rocky Flats) as test materials.
NTIS
Refractory Materials; Sodium Peroxides; Plutonium

20040020078 Westinghouse Savannah River Co., Aiken, SC, USA
Corrosion of Exhaust and Filtration Equipment in a Radioactive Waste Incinerator
Jenkins, C. F.; Sep. 30, 2003; 22 pp.; In English
Report No.(s): DE2003-817860; WRSC-MS-2002-00493; No Copyright; Avail: Department of Energy Information Bridge

Condensation in the exhaust gas system of an incinerator burning low activity radioactive wastes led to numerous corrosion developments and rapid failure of the discharge filters. The problem was traced to insufficient reheat of the exhaust gases following scrubbing. Rust particulate and moisture loaded the filters, leading to water accumulation, chloride cracking of the filter housings, and plugging and tearing of the filter media itself. To mitigate the problem, the exhaust gas temperature was increased, thermal insulation was installed on the ductwork, and the interiors of the ducts and new filter housings were lined with a protective coating.
NTIS
Incinerators; Radioactive Wastes; Corrosion; Exhaust Gases; Filtration

20040021350 NASA Ames Research Center, Moffett Field, CA, USA
Heterogeneous Interactions of Acetaldehyde and Sulfuric Acid
Michelsen, R. R.; Ashbourn, S. F. M.; Iraci, L. T.; [2004]; 1 pp.; In English; 22nd Annual American Association for Aerosol Research, 21-24 Oct. 2003, Anaheim, CA, USA
Contract(s)/Grant(s): RTOP 622-67-21-10; No Copyright; Avail: Other Sources; Abstract Only

The uptake of acetaldehyde [CH3CHO] by aqueous sulfuric acid has been studied via Knudsen cell experiments over ranges of temperature (210-250 K) and acid concentration (40-80 wt. %) representative of the upper troposphere. The Henry's law constants for acetaldehyde calculated from these data range from 6 x 10(exp 2) M/atm for 40 wt. % H2SO4 at 228 K to 2 x 10(exp 5) M/atm for 80 wt. % H2SO4 at 212 K. In some instances, acetaldehyde uptake exhibits apparent steady-state loss. The possible sources of this behavior, including polymerization, will be explored. Furthermore, the implications for heterogeneous reactions of aldehydes in sulfate aerosols in the upper troposphere will be discussed.
Author
Heterogeneity; Chemical Reactions; Acetaldehyde; Sulfuric Acid

20040021351 NASA Ames Research Center, Moffett Field, CA, USA
Quantum Dynamics Scattering Study of AB+CDE Reactions: A Seven Dimensional Treatment for the H2+C2H Reaction
Wang, Dunyou; October 14, 2003; 17 pp.; In English; Seminar at Dalioun Inst. of Chemical Physics, 14 Oct. 2003, China; Original contains black and white illustrations
Contract(s)/Grant(s): NAS2-00062; No Copyright; Avail: CASI; A03, Hardcopy

A time-dependent wave-packet approach is presented for the quantum dynamics study of the AB+CDE reaction system for zero total angular momentum. A seven-degree-of-freedom calculation is employed to study the chemical reaction of H2+C2H yields H + C2H2 by treating C2H as a linear molecule. Initial state selected reaction probabilities are presented for various initial ro-vibrational states. This study shows that vibrational excitation of H2 enhances the reaction probability, whereas the excitation of C2H has only a small effect on the reactivity. An integral cross section is also reported for the initial ground states of H2 and C2H. The theoretical and experimental results agree with each other very well when the calculated seven dimensional results are adjusted to account for the lower transition state barrier heights found in recent ab initio calculations.
Author
Quantum Mechanics; Scattering; Chemical Reactions; Hydrogen; Acetylene

20040021354 NASA Ames Research Center, Moffett Field, CA, USA, Lockheed Martin Space Operations, Moffett Field, CA, USA
Partitioning of Inorganic Elements Consumed by Humans Between the Various Fractions of Human Wastes: A Review and Analysis of Existing Literature
Wignarajah, K.; Fisher, John W.; Pisharody, Suresh A.; [2003]; 1 pp.; In English; 33nd International Conference on Environmental Systems, 7-10 Jul. 2003, Vancouver, British Columbia, Canada
Contract(s)/Grant(s): NAS2-14263; No Copyright; Avail: Other Sources; Abstract Only

The nutritional requirements of humans and astronauts are well defined and show consistency, but the same cannot be said of human wastes. Nutrients taken up by humans can be considered to fall into two major categories - organic and inorganic fractions. Carbon, hydrogen, oxygen, nitrogen and sulfur are elements that are associated with the organic fraction. These elements are taken up in large amounts by humans and when metabolized released in wastes often in gaseous forms or as water. On the other hand, a large number of the elements are simply exchanged and can be accounted for in the liquid and solid wastes of humans. These elements fall into three major categories - cationic macroelements (e.g. Ca, K, Na, Mg and Si), anionic macroelements (e.g P, S and Cl), 17 essential microelements, (e.g. Fe, Mn, Cr, Co, Cu, Zn, Se and Sr). When provided in the recommended concentrations to an adult human, these elements should not normally accumulate in humans, but will be excreted in the different human wastes. Knowledge of the partitioning of these elements between the different human waste fractions is fundamental to understanding (a) how these elements can be recovered for reuse in space habitats, and (b) to developing the processors for waste management. The current literature is exhaustive but sometimes also conflicting. We have used the existing knowledge of nutrition and waste from medical literature and NASA documentation to develop a consensus to typify and chemically characterize the various human wastes. The partitioning of these elements has been developed into a functional model.
Author
Human Wastes; Nutritional Requirements; Chemical Elements; Astronauts

20040021356 Lockheed Martin Space Operations, Moffett Field, CA, USA
Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems
Pisharody, Suresh A.; Fisher, John W.; Wignarajah, K.; [2002]; 1 pp.; In English; 33rd International Conference on Environmental Systems, 7-10 Jul. 2003, Vancouver, British Columbia, Canada
Contract(s)/Grant(s): NAS2-14263; No Copyright; Avail: Other Sources; Abstract Only

The success of physico-chemical waste processing and resource recovery technologies for life support application depends partly on the ability of gas clean-up systems to efficiently remove trace contaminants generated during the process with minimal use of expendables. Carbon nanotubes promise superior performance over conventional approaches to gas clean-up due to their ability to direct the selective uptake of gaseous species based on their controlled pore size, high surface area, ordered chemical structure that allows functionalization and their effectiveness also as catalyst support materials for toxic gas conversion. We present results and findings from a preliminary study on the effectiveness of metal impregnated single walled nanotubes as catalyst/catalyst support materials for toxic gas contaminate control. The study included the purification of single walled nanotubes, the catalyst impregnation of the purified nanotubes, the experimental characterization of the surface properties of purified single walled nanotubes and the characterization of physisorption and chemisorption of uptake molecules.
Author
Carbon Nanotubes; Contaminants; Impregnating; Life Support Systems; Metals; Gases; Toxicity

20040027555 Rice Univ., Houston, TX, USA
Technology Development of Miniaturized Far-Infrared Sources for Biomolecular Spectroscopy
Kono, Junichiro; [2003]; 6 pp.; In English
Contract(s)/Grant(s): NCC2-1279; No Copyright; Avail: CASI; A02, Hardcopy

The objective of this project was to develop a purely solid-state based, thus miniaturized, far-infrared (FIR) (also known as terahertz (THz)) wave source using III-V semiconductor nanostructures for biomolecular detection and sensing. Many biomolecules, such as DNA and proteins, have distinct spectroscopic features in the FIR wavelength range as a result of vibration-rotation-tunneling motions and various inter- and intra-molecule collective motions. Spectroscopic characterization of such molecules requires narrow linewidth, sufficiently high power, tunable (in wavelength), and coherent FIR sources. Unfortunately, the FIR frequency is one of the least technologically developed ranges in the electromagnetic spectrum. Currently available FIR sources based on non-solid state technology are bulky, inefficient, and very often incoherent. In this project we investigated antimonide based compound semiconductor (ABCS) nanostructures as the active medium to generate FIR radiation. The final goal of this project was to demonstrate a semiconductor THz source integrated with a pumping diode laser module to achieve a compact system for biomolecular applications.
Derived from text
Miniaturization; Spectroscopy; Technology Utilization; Far Infrared Radiation; Biochemistry

20040027591 Naval Research Lab., Bay Saint Louis, MS
Corrosion Mechanisms of UNS N04400 in Sea Water
Lee, Jason S.; Lowe, Kristine; Ray, Richard I.; Jones-Meehan, J.; Little, Brenda J.; Mar. 2003; 24 pp.; In English
Report No.(s): AD-A419657; NRL/PP/7303/02/0009; No Copyright; Avail: CASI; A03, Hardcopy

Pitting and dealloying were observed when 70Ni/30Cu (UNS N04400) welded plates were exposed to artificial seawater containing sulfate-reducing bacteria. Attempts were made to differentiate biotic and abiotic corrosion mechanisms. Experiments were conducted in alternating aerobic/anaerobic conditions in the presence of inorganic sulfide and sulfate-reducing bacteria over the course of five months.
DTIC
Bacteria; Sulfates; Microbiology; Corrosion

20040027593 Air Force Research Lab., Edwards AFB, CA, USA
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids
Drake, Greg W.; Hawkins, Tommy; Tollison, Kerri; Hall, Leslie; Vij, Ashwani; Dec. 2003; 28 pp.; In English
Contract(s)/Grant(s): Proj-2302
Report No.(s): AD-A419654; AFRL-PR-ED-TP-2003-307; No Copyright; Avail: CASI; A03, Hardcopy

New classes of ionic liquids based upon the halide and nitrate salts of 1-alkyl substituted-4 amino-1,2,4- triazolium cations (n-alkyl =methyl -decyl, isopropyl, ally, and methylcylcopropyl) have been synthesized, characterized by vibrational spectra, multinuclear nmr, elemental analysis, and DSC studies. Single crystal x-ray diffraction studies were carried out on 1-isopropyl-4-amino-1,2,4-triazolium bromide, 1 -ethyl-4-amino- 1 ,2,4-triazolium bromide, 1 -n-propyl-4-amino- 1 ,2,4-triazolium bromide, 1-n- hexyl-4-amino-1 ,2,4- triazolium bromide, and 1-n-heptyl-4-amino-1,2,4-triazolium bromide, as well as 1- isopropyl-4-amino-1,2,4-triazolium nitrate and 1-methylcyclopropyl-4-amino-1, 2,4-triazolium nitrate. The details of similarities, differences, and the effects of strong hydrogen bonding in the all of the structures will be discussed.
DTIC
Alkyl Compounds; Liquids; Nuclear Magnetic Resonance; Nitrates; Halides

20040027693 Air Force Research Lab., Kirkland AFB, NM
Spatially Resolved Sub-Doppler Overtone Gain Measurements in a Small Scale Supersonic HF Laser
Wisniewski, Charles F.; Aug. 2003; 276 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-4866
Report No.(s): AD-A419751; AFRL-DE-TR-2003-1115; No Copyright; Avail: CASI; A13, Hardcopy

The overtone gain of a small-scale HF laser was measured using a sub-Doppler tunable diode laser system. Two-dimension spatially resolved small signal gain and temperature maps were generated, which show a highly inhomogeneous gain medium: indicating the dominant role that mixing of the fuel and oxidizer streams has in HF laser performance. The measured gain a temperature data were analyzed with the aid of a two- dimensional computational fluid dynamics code. To reduce uncertainty of important modeling input parameters, novel measurements of reactant concentration, flow velocity and

gain length were made. Results show that reactant mixing mechanisms such as turbulence and large-scale vortex structures have a large effect on the gain averaged over a vertical profile while kinetic rate mechanisms such as reaction rate constants and reactant concentration have a greater effect on the maximum system gain. Overtone gain data measured while operating the laser saturated on the fundamental transitions are compared with fundamental lasing output spectra. In all cases, the data are consistent with an equilibrium rotational distribution.
DTIC
Computational Fluid Dynamics; Flow Velocity; Laser Outputs; Hf Lasers

20040027729 Harvard Univ., Cambridge, MA
Development and Application of Molecular- Resolution Chemically-Sensitive Nanotube Probes
Lieber, Charles M.; Nov. 2002; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-00-1-0084
Report No.(s): AD-A419867; AFRL-SR-AR-TR-03-0464; No Copyright; Avail: CASI; A03, Hardcopy

Carbon nanotubes have been developed as probes for molecular resolution atomic force microscopy imaging. Reproducible methods for the preparation of carbon nanotube probe tips by chemical vapor deposition were demonstrated, and moreover, approaches for the preparation of controlled diameter carbon nanotubes were defined. The utility of nanotubes probes was demonstrated with development of new method of nanofabrication, and with development of novel method for DNA sequence analysis. In addition, semiconductor nanowires have been developed as building blocks for nanophotonics. A new concept for a nanoscale photonic source using crossed nanowires was demonstrated, and the novel photonic properties of modulated nanowire heterostructures were shown for the first time.
DTIC
Nanotechnology; Semiconductors (Materials); Atomic Force Microscopy

20040027740 Montana State Univ., Bozeman, MT
Dynamics of Etching at the Gas-Surface Interface
Minton, Timothy K.; Jan. 19, 2004; 16 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0212
Report No.(s): AD-A419872; AFRL-SR-AR-TR-04-0083; No Copyright; Avail: CASI; A03, Hardcopy

The primary objective of this research project is to elucidate fundamental chemical and physical processes that contribute to the etching of polymers and semiconductors in dry etching environments. This fundamental knowledge should help enable the design of novel etch processes for specialty applications where fine features with high aspect ratios are critical. The new knowledge generated by this project will not only suggest new etch processes, but it will add new understanding to the mechanisms by which materials degrade in the low-Earth orbital environment and, consequently, will (1) enable the definition of more accurate test methods for the prediction of materials durability in low-Earth orbit and (2) help guide the design of new, more durable, spacecraft materials. The pursuit of ever smaller dimensions of circuit patterns for ultralarge scale integration has placed unrelenting demands on plasma etching. Etch rate nonuniformities and peculiar etching topographies hinder the production of very fine structures. Trial-and-error development of process recipes for modern etchers has largely overcome these problems for current technologies, but new solutions are required as targeted device dimensions shrink below 200 nm. A basic understanding of the etching interactions that govern etch rate, profile evolution, and surface roughness is essential to develop the predictive capabilities required for efficient optimization of emerging etch tools and for design of a new generation of reactors.
DTIC
Interfaces; Chemical Reactions; Earth Orbital Environments

20040027742 California Univ., Santa Barbara, CA, USA
Conformations of Macro Molecules
Bowers, Michael T.; Aug. 31, 2003; 3 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0215
Report No.(s): AD-A419807; AFRL-SR-AR-TR-04-0082; No Copyright; Avail: CASI; A01, Hardcopy

This grant was awarded under the Defense University Research Instrumentation Program (DURIP) in support of ongoing research funded by AFOSR and other agencies. These include AFOSR grants F49620-9-1-0048, which was in force at the time the DURIP was funded, the subsequent renewal of that grant F49620-03-1-0046, and a number of grants sponsored by NSF. Our research program, as detailed in the various proposals and annual reports, involves both experiment and extensive

theoretical modeling. At the time the DURIP proposal was written the modeling for a specific system would often lag weeks to months behind experiment due to our limited computing resources. A case was made in the proposal for substantially increasing those computing resources in order to bring experiment and theory/modeling into the same time frame. This would allow them to effectively interact and the research could be more efficiently and expertly completed. The proposal was funded and the system briefly described was purchased.
DTIC
Mathematical Models; Measuring Instruments; Macromolecules

20040027775 Montana State Univ., Bozeman, MT
8TH International Meeting on Hole Burning Single Molecule and Related Spectroscopies: Science and Applications
Jul. 2003; 125 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0417
Report No.(s): AD-A419881; SL-WRB-0401; No Copyright; Avail: CASI; A06, Hardcopy

The 8th International Meeting on Hole Burning, Single Molecule, and Related Spectroscopies: Science and Applications (HBSM 2003) was held in Bozeman, Montana on July 26 to 31, 2003. The Co-Chairs were Wm. Randall Babbitt, Aleksander Rebane, and Ruflis L. Cone of the Montana State University Physics Department and Randy W. Equall of Scientific Materials Corporation. Meetings have been held since 1987 to disseminate the latest developments in fundamental science and applications of site-selective spectroscopies, spectral hole burning and single molecule spectroscopy, photon echoes, and related topics. The 2003 topics included: Hole-burning materials and mechanisms, Photon echoes and coherent transients, Photophysics and photochemistry, Single molecule detection and spectroscopy, Laser frequency stabilization to SHB references, Optical storage and signal processing, Dephasing and spectral diffusion, Time and space domain holography, Biological systems, Nanosystems and nano-optics, Multi-photon and nonlinear effects, and Novel microscopies. The 99 scientists that attended the meeting came from 12 countries around the world. The conference program had 55 talks and 56 posters. Tours of research laboratories at MSU and Scientific Materials were part of the program. The Journal of Luminescence HBSM 2003 Proceedings to be published in 2004 contains 46 papers based on the presentations made at the meeting.
DTIC
Excitation; Spectroscopy; Frequency Stability

20040027864 Indiana Univ., Bloomington, IN, USA
Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties
Bronstein, Lyudmila M.; Karlinsey, Robert L.; Ritter, Kyle; Joo, Chan Gyu; Stein, Barry; Zwanziger, Josef W.; [2003]; 30 pp.; In English
Contract(s)/Grant(s): NAG3-2588; 22-319-20-K1; No Copyright; Avail: CASI; A03, Hardcopy

This paper reports synthesis, structure, and properties of novel hybrid solid polymer electrolytes (SPE's) consisting of organically modified aluminosilica (OM-ALSi), formed within a poly(ethylene oxide)-in-salt (Li triflate) phase. To alter the structure and properties we fused functionalized silanes containing poly(ethylene oxide) (PEO) tails or CN groups.
Author
Solid Electrolytes; Polyethylenes; Electrical Properties

20040028020 Army Armament Research, Development and Engineering Center, Watervliet, NY
Determination of Copper Cadmium and Iron in Metal Cyanide Waste Solutions by Atomic Absorption Spectroscopy
Sopok, Samuel; Apr. 1992; 20 pp.; In English
Report No.(s): AD-A419953; BITR-92-2; No Copyright; Avail: CASI; A03, Hardcopy

The chemical literature lacks a specific analytical method to determine cooper, cadmium, and iron in metal cyanide waste solutions which is needed to optimize the treatment and disposal of these metals. A specific method is presented in this report that provides acceptable analysis of these metals in this treatment process. The concentrations of these metals range from 0 to 500 ppm for these solutions, and the resulting precisions are in the range of 0.5 to 35 ppm. These results are supported by six years of testing.
DTIC
Iron; Copper; Cadmium; Chemical Analysis

20040028059 Army Armament Research, Development and Engineering Center, Watervliet, NY

Determination of Copper Cyanide Plating Solutions and Cadmium in Cadmium Cyanide Plating Solutions by Atomic Absorption Spectrometry

Sopok, Samuel; Apr. 1992; 19 pp.; In English

Report No.(s): AD-A419994; BITR-92-1; No Copyright; Avail: CASI; A03, Hardcopy

The chemical literature lacks specific analytical methods for adequately monitoring copper in copper cyanide plating solutions and cadmium in cadmium cyanide plating solutions during the plating processes. In this report, specific methods are presented that provide acceptable analysis and monitoring of the copper and cadmium in these processes. The optimum operating range of the copper is 16 to 36 g/l in these plating solutions with resulting precisions in the range of 1.3 to 3.0 g/l. The optimum operating range of the cadmium is 17 to 22 g/l in these plating solutions with resulting precisions in the range of 1.3 to 1.8 g/l. Adequate monitoring of these solutions is supported by five years of testing.

DTIC

Copper Compounds; Cadmium; Cyanides; Chemical Analysis; Plating; Atomic Spectra

20040028060 Aerospace Corp., El Segundo, CA

Continuous-Wave Tunable Midwave Infrared Generation Near 4.5 micrometers with an Intracavity Optical Parametric Oscillator and Difference Frequency Generation

Chen, Da Wun; Dec. 30, 2003; 10 pp.; In English

Contract(s)/Grant(s): FA8802-04-C-0001

Report No.(s): AD-A419999; AEROSPACE-TR-2004(8555)-2; SMC-TR-04-07; No Copyright; Avail: CASI; A02, Hardcopy

Continuously tunable cw emission near 4.5 micrometer was generated by difference frequency generation (DFG) within a Nd:YAG pumped optical parametric oscillator (OPO). The periodically poled lithium niobate crystal used for DFG contained eight grating bands that enabled wavelength tuning between 4.25 and 5.65 micrometer. As much as 90 mW of power at 4.48 micrometer was achieved for 16.7 W of pump.

DTIC

Tuning; Infrared Radiation; Continuous Radiation; Crystals

20040028062 Army Armament Research, Development and Engineering Center, Watervliet, NY

Determination of PCB's in Watervliet Arsenal Machine Oils by Gas Chromatography

Sopok, Samuel; Jun. 1991; 15 pp.; In English

Report No.(s): AD-A420001; BITR-91-9; No Copyright; Avail: CASI; A03, Hardcopy

A routine method is described for screening samples of machine oils for possible polychioninated biphenyl contamination. The method uses gas chromatography with electron capture detection. This method has proven useful at the Watervliet Arsenal for routine laboratory PCB analysis of machine oils with about two percent precision by EPA standards.

DTIC

Chemical Analysis; Polychlorinated Biphenyls; Oils; Contamination

20040028109 Army Armament Research, Development and Engineering Center, Watervliet, NY

Utilization of Ion Chromatography and Statistics to Determine Important Acids in Chromium Plating and Electropolishing Solutions

Sopok, Samuel; Jun. 1991; 26 pp.; In English

Report No.(s): AD-A420004; BITR-91-10; No Copyright; Avail: CASI; A03, Hardcopy

Inadequate monitoring of sulfuric and chromic acids in chromium plating solutions and phosphoric and sulfluric acids in electropolishing solutions can cause serious problems for the chromium plating industry, such as poor quality products, wasted human resources, and wasted electrical energy. Current instrumental analysis methods, both offline and online, for these acids either do not result in acceptable precisions or are time consuming. Two similar methods, which are improvements on existing ion chromatographical methods, are presented here that provides acceptable analysis and monitoring of these acids in this chromium plating process.

DTIC

Chromatography; Plating; Sulfuric Acid; Chromic Acid; Phosphoric Acid; Electropolishing

20040028110 Army Armament Research, Development and Engineering Center, Watervliet, NY
Determination of Nickel, Nickel Chloride Hexahydrate and Boric Acid in Nickel Sulfamate Plating Solutions by Titration
Sopok, Samuel; Jun. 1991; 12 pp.; In English
Report No.(s): AD-A420005; BITR-91-8; No Copyright; Avail: CASI; A03, Hardcopy

The chemical literature lacks analysis methods for the determination and adequate monitoring of nickel, nickel chloride hexahydrate and boric acid in nickel sulfamate plating solutions. Methods are given here that provide acceptable analysis and monitoring of these chemical species in this nickel sulfamate plating process. The optimum respective operating range of nickel, nickel chloride hexahydrate and boric acid are 53.0 -94.0 g/l, 6.0- 30.0 g/l, and 30.0-45.0 g/l. The resulting precisions are in the range of 0- 0.3 g/l providing adequate monitoring of these plating solutions supported by two years of testing. chemical analysis, nickel, nickel chloride hexahydrate, boric acid, nickel sulfamate plating solutions, titration
DTIC
Nickel; Chemical Analysis; Boric Acids; Sulfates

20040028116 Army Armament Research, Development and Engineering Center, Watervliet, NY
Laboratory Automatic Titration of Chromium Plating and Electropolishing Solutions
Sopok, Samuel; Jun. 2001; 16 pp.; In English
Report No.(s): AD-A420007; BITR-91-7; No Copyright; Avail: CASI; A03, Hardcopy

Two increasingly important issues for the metal finishing industry are product quality and productivity. This industry is constantly looking for better methods to monitor key chemical components in its metal finishing solutions. The analytical chemistry literature lacks an adequate automatic titration method for the monitoring of chromic acid in chromium plating solutions and the monitoring of phosphoric and sulfuric acids in electropolishing solutions. Automatic titration methods for each of these applications are given here based on previous manual titration methods. The identical experiment was conducted at three different companies who sell this type of instrument and included calibration, standardization and analysis. Although this work has a specific objective related to chromium plating and electropolishing solutions, the general method is applicable to most other types of metal finishing solution titrations. The optimum operating range of chromic acid in these chromium plating solutions is 240-260 g/l while the optimum respective operating ranges of phosphoric and sulfuric acids are 640-730 g/l and 795 - 895 g/l. The resulting automatic titration precisions for each application equal the present manual titration precisions from which these methods were derived.
DTIC
Plating; Titration; Chromic Acid; Phosphoric Acid; Electropolishing

20040028123 Brown Univ., Providence, RI
Highly Ordered Carbon Nanotube Arrays and Nanotube- Polymer Nanocomposite Superlattices for Full-Color Sensing and Coating
Xu, Jimmy; Jan. 2002; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-02-1-0242
Report No.(s): AD-A419875; AFRL-SR-AR-TR-04-0088; No Copyright; Avail: CASI; A02, Hardcopy

The equipment acquired through this grant will add to our capabilities for our collaboration with groups at the Air Force Lab' at Wright-Patterson AFB and at the Kirtland Base. Our ongoing project has been given significant added potential to open up a broad range of new opportunities for further explorations, some of which have already been identified and are to be pursued in our long term plan. In conclusion, the Equinox 55 Bruker FTIR spectrometer with attached Hyperion Microscope is the core of a network of experimental devices which help us work towards this goal. The principal intended result of our efforts with this apparatus is the development and testing of an JR sensitive focal-plane array of carbon nanotubes. Due to the financial support of AFOSR we now have the critical equipment which will enable us to reach this goal.
DTIC
Polymers; Superlattices; Carbon Nanotubes; Infrared Spectra; Nanocomposites; Nanotubes

20040028170 Army Armament Research, Development and Engineering Center, Watervliet, NY
Investigation of Exothermic Grinding Sludge Produced from Watervliet Arsenal Gun Steels, Andersol Water- Based Cutting Fluid and Cincinnati Milacron Aluminum Oxide Resin Bond Grinding Wheels
Sopok, Samuel; Fleszar, Mark; Senick, John; Jul. 1992; 17 pp.; In English
Report No.(s): AD-A419950; BITR-92-3; No Copyright; Avail: CASI; A03, Hardcopy

The Advanced Technology Branch of Benet Laboratories, at the request of the Watervliet Arsenal Fire House, was tasked with the investigation of a Watervliet Arsenal exothermic grinding sludge. An on-site review of this grinding process showed that the grinding sludge apparently smoldered up to twenty-four hours after its production. In addition, within an hour, the sludge quickly reached a surface temperature that would cause a burn upon physical contact. At least one fire directly resulted from the inadvertent mixture of this sludge with a combustible material. Thermogravimetric analysis and x-ray fluorescence spectroscopy were used to chemically and physically characterize the grinding sludge. The data was compared with manufacturer information on the technical grade materials used in the grinding process. The thermogravimetric analysis data suggests the sludge was not smoldering but that it was evolving water in the form of steam as a result of the exothermic heating of the sludge from the oxidation of iron. This presents no immediate fire hazard unless the sludge is inadvertently exposed to combustible materials. It was recommended that an appropriate amount of inert sand or fire retardant powdered material should be well distributed throughout this exothermic grinding sludge as it is cooled and stored for disposal. It was further recommended that the grinding sludge should be stored safely away from combustible materials.
DTIC
X Ray Fluorescence; Thermogravimetry; Exothermic Reactions

20040030446 Army Armament Research, Development and Engineering Center, Watervliet, NY
Determination of Sulfuric Acid in Chromium Plating Solutions Using Gravimetric Analysis
Sopok, Samuel; Nov. 1991; 12 pp.; In English
Report No.(s): AD-A419951; BITR-91-12; No Copyright; Avail: CASI; A03, Hardcopy

The determination of sulfuric acid in chromium plating solutions is studied in the presence of chromic acid. Cr(III) ions. and Fe(III) ions. The control of the concentration of these four chemical components is necessary to optimize the chromium plating process. In the absence of expensive chemical instrumentation. a gravimetric method suitable for this industrial application is developed in this report. This method uses chromic acid reduction and sulfate precipitation and is a modified version of the standard sulfate Precipitation analysis since it allows the presence of chromic acid. The optimum operating range of sulfuric acid is 2.40 to 3.10 all. and the resulting precisions are in the range of 0.24 to 0.31 g/1 providing marginal control of these plating solutions supported by seven years of testing.
DTIC
Sulfuric Acid; Quantitative Analysis

20040030449 Army Armament Research, Development and Engineering Center, Watervliet, NY
X-Ray Fluorescence On-Stream Analysis of Standard Reference Solution Concentrations of Chromium Plating and Polishing Solutions
Sopok, Samuel; Jun. 1991; 18 pp.; In English
Report No.(s): AD-A420009; BITR-91-3; No Copyright; Avail: CASI; A03, Hardcopy

X-ray fluorescence is evaluated as a means to quantitatively analyze standard reference solution concentrations of chromium plating and polishing solutions for chromium, sulfur, phosphorus, and iron in a continuous, on- stream fashion. The identical experiment was conducted at two different manufacturers of this type of instrument and included calibration/ standardization with standard reference chromium plating and polishing solutions, analysis with coded standard reference chromium plating and polishing solutions, calibration/ standardization with standard reference chromium plating and polishing wastewater solutions, and analysis with coded standard reference chromium plating and polishing wastewater solutions. Resultant data and their corresponding precisions show promise for this application and may complement current off-stream laboratory methods now in use. More work will be conducted to further determine the value of this technique.
DTIC
Chromium; Sulfur; Chemical Analysis; Electropolishing; X Ray Fluorescence

20040030451 Army Armament Research, Development and Engineering Center, Watervliet, NY
Automatic Coulometric Titration of Sulfuric Acid in Chromium Plating Solutions
Sopok, Samuel; Jun. 1991; 12 pp.; In English
Report No.(s): AD-A420010; BITR-91-6; No Copyright; Avail: CASI; A03, Hardcopy

No specific chemical analysis method exists in the literature for the offline or online determination of sulfuric acid in chromium plating solutions by automatic coulometer titration. A method is presented here that provides somewhat acceptable analysis and monitoring of the sulfuric acid in this chromium plating process. Due to a subjective data reduction process, online application of this method is unacceptable. The optimum operating range of sulfinic acid is 2.40- 3.10 g/l and the

resulting precisions by this method are in the range of 0.10-0.25 g/I. These resulting offline automatic titration precisions are nearly equal to the presently used automatic ion chromatography precisions which is still the best available method to date. DTIC

Chromium; Chemical Analysis; Plating; Sulfuric Acid; Coulometers

20040030452 Army Armament Research, Development and Engineering Center, Watervliet, NY

Determination of AISI 4340 and 8640 Steels Used in M9 Beretta Pistol Slides by Emission Spectroscopy and X-Ray Fluorescence Spectroscopy

Sopok, Samuel; Jun. 1991; 19 pp.; In English

Report No.(s): AD-A420011; BITR-91-5; No Copyright; Avail: CASI; A03, Hardcopy

Emission spectroscopy and x-ray fluorescence spectroscopy are investigated as chemical analysis techniques for AISI 4340 and 8640 low alloy steels. These steels are used in M9 Beretta pistol slides and were provided by that source. Tellurium, selenium, and calcium are specifically investigated in these types of materials. Emission spectroscopy was demonstrated as a viable offline nondestructive technique for the analysis of Te, Se, Ca, and twenty other elements in these pistol slide materials with regard to precisions and detection limits using certified standard reference materials (SRM's). The disadvantages of the technique are its offline sampling and its ten minute sampling time. This experiment was conducted at Benet. X-ray fluorescence spectroscopy was also demonstrated using these materials as a viable online nondestructive technique for the analysis of Te, Se, and Ca using low alloy steel standard reference materials. Concentration ranges were similar to those used in these pistol slides. Precisions, detection limits and acceptable sampling time were also considered. This original experiment was conducted at Tracor's main applications lab in Ft. Collins, Co. This original x-ray fluorescence experiment was followed by similar but more extensive experiments at Tracor and Benet These latter experiments verify results reported here and used the same set of standard reference materials. As a result of this initial experiment and similar follow-up experiments, the U.S. Army is in the process of adopting online energy dispersive x-ray fluorescence analysis to identify tellurium, selenium, and calcium in these types of materials.

DTIC

X Ray Spectroscopy; High Strength Steels

20040030454 Army Armament Research, Development and Engineering Center, Watervliet, NY

Online Automatic Titration of Chromic Acid in Chromium Plating Solutions and Phosphoric and Sulfuric Acids in Electropolishing Solutions

Sopok, Samuel; Jun. 1991; 17 pp.; In English

Report No.(s): AD-A420012; BITR-91-4; No Copyright; Avail: CASI; A03, Hardcopy

Two increasingly important issues for the metal finishing industry are product quality and productivity. This industry is constantly looking for better online methods to monitor key chemical components in its metal finishing solutions. The analytical chemistry literature lacks an adequate online automatic titration method for the monitoring of chromic acid in chromium plating solutions and the monitoring of phosphoric and sulfuric acids in electropolishing solutions. Online automatic titration methods for each of these applications are given here based on previous manual titration methods. The identical experiment was conducted at two different companies who sell this type of instrument and included calibration, standardization and analysis. Although this work has a specific objective related to chromium plating and electropolishing solutions, the general method is applicable to most other types of metal finishing solution titrations. The optimum operating range of chromic acid in these chromium plating solutions is 240- 260 g/l while the optimum respective operating ranges of phosphoric and sulfuric acids are 640-730 g/l and 795 - 895 g/l. The resulting online automatic titration precisions for each application equal the present manual titration precisions from which these methods were derived.

DTIC

Plating; Chromic Acid; Phosphoric Acid; Electropolishing

20040030458 Army Armament Research, Development and Engineering Center, Watervliet, NY

Determination of Wastewater Acids from Chromium Plating and Electropolishing Solutions

Sopok, Samuel; Apr. 1995; 13 pp.; In English

Report No.(s): AD-A420014; BITR-05-2; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this report is to provide calibration data for the online UV-visible, conductivity, and pH detectors associated with the environmental thrust project, which is part of the Benet Laboratories vessel plating program. The chemical literature provides offline laboratory detection of chromic acid from chromium plating wastewater solutions, as well as

phosphoric and sulfuric acids from electropolishing wastewater solutions. The chemical literature lacks online detection and calibration data for these wastewater acids and this is essential for the reclamation of these three acids. Not only are these chemical resources wasted if they are not reclaimed, but the U.S. Army pays increasingly more to dispose of these hazardous materials. Specific methods are illustrated here that do provide online detection and calibration of these chromium plating and electropolishing wastewater acids. These methods consist of online UV-visible, conductivity, and pH detection. These data and their associated precisions are sufficient to adequately calibrate these three detectors associated with the environmental thrust project.
DTIC
Waste Water; Plating; Electropolishing; Chromic Acid

20040031561 NASA Glenn Research Center, Cleveland, OH, USA
Depth-Penetrating Temperature Measurements of Thermal Barrier Coatings Incorporating Thermographic Phosphors
Eldridge, Jeffrey I.; Bencic, Timothy J..; Allison, Stephen W.; Beshears, David L.; [2003]; 22 pp.; In English; International Thermal Spray Conference 2003, 5-8 May 2003, Orlando, FL, USA
Contract(s)/Grant(s): 22-713-82-52; 22-714-92-06; No Copyright; Avail: CASI; A03, Hardcopy

Thermographic phosphors have been previously demonstrated to provide effective non-contact, emissivity-independent surface temperature measurements. Because of the translucent nature of thermal barrier coatings (TBCs), thermographic phosphor-based temperature measurements can be extended beyond the surface to provide depth-selective temperature measurements by incorporating the thermographic phosphor layer at the depth where the temperature measurement is desired. In this paper, thermographic phosphor (Y2O3:Eu) fluorescence decay time measurements are demonstrated to provide through-the-coating thickness temperature readings up to 1100 C with the phosphor layer residing beneath a 100 micron thick TBC (plasma-sprayed 8wt% yttria-stabilized zirconia). With an appropriately chosen excitation wavelength and detection configuration, it is shown that sufficient phosphor emission is generated to provide effective temperature measurements, despite the attenuation of both the excitation and emission intensities by the overlying TBC. This depth-penetrating temperature measurement capability should prove particularly useful for TBC diagnostics where a large thermal gradient is typically present across the TBC thickness. The fluorescence decay from the Y2O3:Eu layer exhibited both an initial short-term exponential rise and a longer-term exponential decay. The rise time constant was demonstrated to provide better temperature indication below 500 C while the decay time constant was a better indicator at higher temperatures.
Author
Temperature Measurement; Thermal Control Coatings; Thermography; Phosphors

20040031564 NASA Glenn Research Center, Cleveland, OH, USA
Reevaluation of Tetrahydrophthalic Anhydride as an End Cap for Improved Oxidation Resistance in Addition Polyimides
Meador, Mary Ann B.; Frimer, Aryeh A.; Johnston, J. Christopher; [2003]; 27 pp.; In English
Contract(s)/Grant(s): 22-708-31-13; Copyright; Avail: CASI; A03, Hardcopy

Several substituted 1,2,3,6-tetrahydrophthalic anhydride end caps - including the 3-phenyl, 3-methoxy, 3-trimethylsilyloxy, and 3,6-diphenyl analogs - were synthesized via the Diels-Alder condensation of the corresponding butadienes and maleic anhydride. These anhydrides, as well as the commercially available 3-hydro and 4-methyl analogs, were each ground together with methylenedianiline in a 2:1 ratio and heated gradually from 204 C to 371 C, with the thermolysis followed by NMR. Generally speaking, a transformation via monoimide to bisimide was observed in the lower temperature range, followed by competition between crosslinking and aromatization. We believe that this competition produces a substantial percentage of aromatic product, with the concomitant lowering of the relative amount of crosslinking and is responsible for improving both thermal oxidative stability of tetrahydrophthalic end capped polyimides and their substantial frangibility. The thermolysis of the tetrahydrophthalimides under inert atmosphere dramatically lowers the amount of aromatization hence, the mechanism for aromatization is an oxidative one.
Author
Anhydrides; Oxidation Resistance; Polyimides

20040031566 NASA Glenn Research Center, Cleveland, OH, USA
Efficient Synthesis of 4,8-Ditoluoyl-1,5-Dihydroxynaphthalene
Tyson, Daniel S.; Meador, Michael A.; [2003]; 7 pp.; In English
Contract(s)/Grant(s): 22-708-53-05; No Copyright; Avail: CASI; A02, Hardcopy

4,8-Ditoluoyl-1,5-dihydroxynaphthalene was synthesized in quantitative yield from the corresponding methylenequinone via base-catalyzed hydration. Alkaline treatment gives the title compound in one step with a 99% yield, an improvement of 80% compared to the acidic, two step literature method for preparing 4,8-dibenzoyl-1,5-dihydroxynaphthalene.
Author
Synthesis (Chemistry); Naphthalene; Organic Chemistry; Hydroxyl Compounds

20040031568 NASA Glenn Research Center, Cleveland, OH, USA
Measurement and Simulation of Spontaneous Raman Scattering Spectra in High-Pressure, Fuel-Rich H2-Air Flames
Kojima, Jun; Nguyen, Quang-Viet; [2003]; 31 pp.; In English
Contract(s)/Grant(s): WBS 22-714-02-16; No Copyright; Avail: CASI; A03, Hardcopy

Rotational vibrational spontaneous Raman spectra (SRS) of H2, N2, and H2O have been measured in H2-air flames at pressures up to 30 atm as a first stem towards establishing a comprehensive Raman spectral database for temperatures and species in high-pressure combustion. A newly developed high-pressure burner facility provides steady, reproducible flames with a high degree of flow precision. We have obtained an initial set of measurements that indicate the spectra are of sufficient quality in terms of spectral resolution, wavelength coverage, and signal-to-noise ratio for use in future reference standards. The fully resolved Stokes and anti-Stokes shifted SRS spectra were collected in the visible wavelength range (400-700 nm) using pulse-stretched 532 nm excitation and a non-intensified CCD spectrograph with a high-speed shutter. Reasonable temperatures were determined via the intensity distribution of rotational H2 lines at stoichiometry and fuel-rich conditions. Theoretical Raman spectra of H2 were computed using a semi-classical harmonic-oscillator model with recent pressure broadening data and were compared with experimental results. The data and simulation indicated that high-J rotational lines of H2 might interfere with the N2 vibrational Q-branch lines, and this could lead to errors in N2-Raman thermometry based on the line-fitting method. From a comparison of N2 Q-branch spectra in lean H2 low-pressure (1.2 atm) and high-pressure (30 atm) flames, we found no significant line-narrowing or -broadening effects at the current spectrometer resolution of 0.04 nm.
Author
Raman Spectra; High Pressure; Hydrogen; Flames; Rotational Spectra; Vibrational Spectra

26
METALS AND METALLIC MATERIALS

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

20040016275 Lawrence Livermore National Lab., Livermore, CA
Engineering Titanium for Improved Biological Response
Orme, C.; Bearinger, J.; Dimasi, E.; Gilbert, J.; Jan. 23, 2002; 16 pp.; In English
Report No.(s): DE2003-15004644; UCRL-ID-146869; No Copyright; Avail: Department of Energy Information Bridge

The human body and its aggressive environment challenge the survival of implanted foreign materials. Formidable biocompatibility issues arise from biological, chemical, electrical, and tribological origins. The body's electrolytic solution provides the first point of contact with any kind of implant, and is responsible for transport, healing, integration, or attack. Therefore, determining how to successfully control the integration of a biomaterial should begin with an analysis of the early interfacial dynamics involved. We believe that the electrochemical environment dictates the titanium dioxide surface atomic structure and the biological response at an implantation site. To date, most researchers in this area have surgically implanted materials into living organisms and then retrieved the implant after varying amounts of time have elapsed. The virtue of this style of experiment is that the full, correct chemistry of the body acts on the implant. The difficulty with these experiments is that it is then impossible to link cause with effect because too many variables are changing simultaneously. Another difficulty is that changes in the very early times are missed. The purpose of these experiments is to visualize the early time response of oxide films to electric fields and to solution variations found in the body near bone. Specifically these studies are meant to understand how chemical and electric stress effect the corrosion resistance and the formation of a biolayer. Instead of performing in vivo experiments as described above, our strategy uses titanium manufactured for implants and places these samples in controlled, simplified, solutions that mimic the electrolytic environment near the bone.
NTIS
Human Body; Titanium; Tribology; Biocompatibility; Biological Effects

20040016288 Lawrence Livermore National Lab., Livermore, CA

Microbiologically-Facilitated Effects on the Surface Composition of Alloy 22, A Candidate Nuclear Waste Packaging Material

Horn, J. M.; Lian, T.; Martin, S. I.; Dec. 07, 2001; 16 pp.; In English

Report No.(s): DE2003-15004642; UCRL-JC-146506; No Copyright; Avail: Department of Energy Information Bridge

The effects of microbiological activities on the surface composition of Alloy 22 was investigated. Prior studies suggesting microbially-generated selective dissolution of chromium from Alloy 22 were based solely on analyzing solubilized Alloy 22 elements. These and other investigations point to the insufficiencies of analyzing solubilized (or solubilized and reprecipitated) alloying elements to discern between homogeneous/stoichiometric dissolution and selective/non-stoichiometric dissolution of alloying elements. Therefore, an approach using X-ray Photoelectron Spectroscopy (XPS) to interrogate the surface layers of treated Alloy 22 specimens was taken to resolve this issue. Sputtering into the surface of the samples, coupled with XPS analysis at given intervals, allowed a high resolution quantitative elemental evaluation of the alloy as a function of depth. Biotically-incubated Alloy 22 show a region that could be depleted of chromium. Surfacial XPS analysis of these same coupons did not detect the presence of re-precipitated Alloy 22 component elements, also supporting the possible occurrence of non-stoichiometric dissolution. Thus, these preliminary data do not exclude the possibility of selective dissolution. It also appears that this experimental approach shows promise to unequivocally resolve this issue. Further tests using smoother-surface, more highly polished coupons should allow for better resolution between surface layers to permit a decisive determination of the mode of Alloy 22 dissolution using sputtering XPS analysis.

NTIS

Radioactive Wastes; Alloys; Microbiology; Packaging

20040016328 NASA Marshall Space Flight Center, Huntsville, AL, USA

Process for Producing a Cast Article from a Hypereutectic Aluminum-Silicon Alloy

Lee, Jonathan A., Inventor; Chen, Po-Shou, Inventor; December 30, 2003; 6 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 2 Mar. 2001; US-Patent-6,669,792; US-Patent-Appl-SN-800312; US-Patent-Appl-SN-152469; NASA-Case-MFS-31294-7-CIP; No Copyright; Avail: CASI; A02, Hardcopy

A process for making a cast article from an aluminum alloy includes first casting an article from an alloy having the following composition, in weight percent: Silicon (Si) 14.0-25.0, Copper (CU) 5.5-8.0, Iron (Fe) 0-0.8, Magnesium (Mg) 0.5-1.5, Nickel (Ni) 0.05-1.2, Manganese (Mn) 0-1.0, Titanium (Ti) 0.05-1.2, Zirconium (Zr) 0.12-1.2, Vanadium (V) 0.05-1.2, Zinc (Zn) 0-0.9, Phosphorus (P) 0.001-0.1, Aluminum, balance. In this alloy the ration of Si:Mg is 15-35, and the ratio of Cu:Mg is 4-15. After an article is cast from the alloy, the cast article is aged at a temperature within the range of 400 F to 500 F for a time period within the range of four to 16 hours. It has been found especially advantageous if the cast article is first exposed to a solutionizing step prior to the aging step. This solutionizing step is carried out by exposing the cast article to a temperature within the range of 875 F to 1025 F for a time period of fifteen minutes to four hours. It has also been found to be especially advantageous if the solutionizing step is followed directly with a quenching step, wherein the cast article is quenched in a quenching medium such as water at a temperature within the range of 120 F to 300 F. The resulting cast article is highly suitable in a number of high temperature applications, such as heavy-duty pistons for internal combustion engines. Author

Casting; Aluminum Alloys; Silicon Alloys

20040016391 Lawrence Livermore National Lab., Livermore, CA

Atomistic Simulation of Dislocation-Defet Interactions in Cu

Wirth, B. D.; Bulatov, V. V.; Diaz de la Rubia, T.; Jan. 01, 2001; 12 pp.; In English

Report No.(s): DE2003-15004760; UCRL-JC-134732; No Copyright; Avail: Department of Energy Information Bridge

The mechanisms of dislocation-defect interactions are of practical importance for developing quantitative structure-property relationships, mechanistic understanding of plastic flow localization and predictive models of mechanical behavior in metals under irradiation. In copper and other face centered cubic metals, high-energy particle irradiation produces hardening and shear localization. Post-irradiation microstructural examination in Cu reveals that irradiation has produced a high number density of nanometer sized stacking fault tetrahedra. Thus, the resultant irradiation hardening and shear localization is commonly attributed to the interaction between stacking fault tetrahedra and mobile dislocations, although the mechanism of this interaction is unknown. In this work, we present a comprehensive molecular dynamics simulation study that characterizes the interaction and fate of moving dislocations with stacking fault tetrahedra in Cu using an EAM interatomic potential. This

work is intended to produce atomistic input into dislocation dynamics simulations of plastic flow localization in irradiated materials.
NTIS
Atoms; Irradiation; Metals; Mathematical Models; Simulation

20040016456 Lawrence Livermore National Lab., Livermore, CA
Microstructure and Fracture Behavior of Tungsten Heavy Alloys
Sunwoo, A.; Jun. 2003; 18 pp.; In English
Report No.(s): DE2003-15004934; UCRL-ID-154021; No Copyright; Avail: Department of Energy Information Bridge

The 93% W-5.6% Ni-1.4% Fe and 93.1% W-4.7% Ni-2.2% Co alloys (WHA) provided by Army Research Laboratory (ARL), Aberdeen are characterized to determine the effects of matrix alloying and swaging on the microstructure and fracture behavior. The W particles are oblong with respect to the swaging direction. The microstructure of the W-Ni-Fe alloy reveals good cohesive bonding between W particles, but there is W-matrix interface separation and matrix alloy cracking. The microstructure of the W-Ni-Co alloy reveals regions of good cohesive bonding between W particles, but also regions where some wetting has not occurred by the liquid. No evidence was observed of matrix alloy cracking. The fracture characteristic of WHA is dominantly cleavage of W particles.
NTIS
Fracture Mechanics; Microstructure; Tungsten Alloys; Metal Working

20040020048 Lawrence Livermore National Lab., Livermore, CA
Numerical Modeling of Enhanced Nitrogen Dissolution During Gas Tungsten Welding
Palmer, T. A.; Aug. 17, 2001; 20 pp.; In English
Report No.(s): DE2003-15005118; UCRL-JC-140386-R1; No Copyright; Avail: Department of Energy Information Bridge

No quantitative means for predicting the nitrogen concentration in the weld metal currently exists. In developing a quantitative model, it must be recognized that nitrogen dissolution into the weld pool is intimately tied to several simultaneously occurring physical processes. These processes include the formation of various nitrogen species in the plasma phase above the weld pool, reactions at the interface between the plasma phase and the weld pool surface, and the transport of nitrogen within the weldment by convection and diffusion. A mathematical model, which combines calculations describing each of these processes into a single model, has been developed here. The validity of this model has also been tested by comparing the modeling results with those from a series of GTA welding experiments with pure iron.
NTIS
Gas Tungsten Arc Welding; Nitrogen; Numerical Analysis; Dissolving

20040020114 NASA Glenn Research Center, Cleveland, OH, USA
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems
Nathal, M. V.; Ellis, D. L.; Loewenthal, W. S.; Raj, S. V.; Thomas-Ogbuji, L. U.; Ghosn, J.; Greenbauer-Seng, L. A.; Gayda, J.; Barrett, C. A.; [2003]; 13 pp.; In English; JANNAF Meeting, 4 Dec. 2003
Contract(s)/Grant(s): 22-794-20-77; No Copyright; Avail: CASI; A03, Hardcopy

GRCop-84 is a new copper base alloy with an excellent combination of strength and conductivity and has been developed to the point that it is a strong candidate for near term rocket engine applications. This work sought to establish the feasibility of new alloys with capabilities beyond GRCop-84. The use of coatings as environmental and thermal barriers adds further capability into the Copper base structure. Finally, Nickel-Aluminum based systems have also been explored.
Author (revised)
Copper Alloys; Nickel Alloys; Aluminum Alloys; Chromium Alloys; Niobium Alloys

20040021413 NASA Glenn Research Center, Cleveland, OH, USA
Evaluation of Candidate Materials for a High-Temperature Stirling Convertor Heater Head
Bowman, Randy; Ritzert, Frank; Freedman, Marc; December 2003; 13 pp.; In English; Space Technology and Applications International Forum, 8-12 Feb. 2004, Albuquerque, NM, USA
Contract(s)/Grant(s): WBS 319-20-R1
Report No.(s): NASA/TM-2003-212734; E-14259; No Copyright; Avail: CASI; A03, Hardcopy

The Department of Energy (DOE) and NASA have identified Stirling Radioisotope Generators (SRG) as a candidate power system for use on long-duration, deep-space science missions and Mars rovers. One of the developments planned for

an upgraded version of the current SRG design is to achieve higher efficiency by increasing the overall operating temperature of the system. Currently, the SRG operates with a heater head temperature of 650 C and is fabricated from the nickel base superalloy 718. This temperature is at the limit of Alloy 718's capability, and any planned increase in temperature will be contingent on identifying a more capable material from which to fabricate the heater head. To this end, an assessment of material candidates was performed assuming a range of heater head temperatures. The chosen alternative material candidates will be discussed, along with the development efforts needed to ensure that these materials can meet the demanding system requirements of long-duration operation in hostile environments.
NASA
High Temperature; Stirling Cycle; Heat Resistant Alloys; Roving Vehicles

20040027107 NASA Glenn Research Center, Cleveland, OH, USA
High Temperature Burst Testing of a Superalloy Disk With a Dual Grain Structure
Gayda, J.; Kantzos, P.; January 2004; 16 pp.; In English
Contract(s)/Grant(s): WBS 22-728-30-09
Report No.(s): NASA/TM-2004-212884; E-14298; No Copyright; Avail: CASI; A03, Hardcopy

Elevated temperature burst testing of a disk with a dual grain structure made from an advanced nickel-base superalloy, LSHR, was conducted. The disk had a fine grain bore and coarse grain rim, produced using NASA's low cost DMHT technology. The results of the spin testing showed the disk burst at 42 530 rpm in line with predictions based on a 2-D finite element analysis. Further, significant growth of the disk was observed before failure which was also in line with predictions.
NASA
High Temperature; Finite Element Method; Heat Resistant Alloys

20040027767 Air Force Research Lab., Wright-Patterson AFB, OH, USA
Investigation of the Effect of Corrosion Pitting on Fatigue Life of Aluminum Structure
Tuegel, Eric J.; Oct. 2003; 141 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2401
Report No.(s): AD-A419879; AFRL-VA-WP-TR-2003-3088; No Copyright; Avail: CASI; A07, Hardcopy

This report presents the results of testing to obtain data on the effect of pitting corrosion on the fatigue life of aluminum specimens. Forty-one coupons of 7075-T6 that had previously been exposed at various USAF bases around the world for up to a year were fatigue tested. The amount of corrosion on each had been previously characterized in terms of mass lost per unit of surface area. Additional characterization of the corrosion with surface roughness traces was done after the fatigue tests. After a threshold level of corrosion was reached, fatigue life generally decreased with increasing mass loss. Surface roughness generally increased with increasing mass loss as well. However, strong relationships could not be established in either case because of the limited amount of data and the scatter inherent in both fatigue and corrosion.
DTIC
Corrosion; Fatigue Life; Aluminum; Aluminum Alloys

20040028007 NASA Marshall Space Flight Center, Huntsville, AL, USA
Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation
Engelhaupt, Darell; Ramsey, Brian; [2003]; 1 pp.; In English; American Electroplaters and Surface Finishers Society Week 2004, 26-30 Jan. 2004, Lake Buena Vista, FL, USA; No Copyright; Avail: Other Sources; Abstract Only

NASA and the University of Alabama in Huntsville have developed ecologically friendly, versatile nickel and nickel cobalt phosphorous electroplating processes. Solutions show excellent performance with high efficiency for vastly extended throughput. Properties include, clean, low temperature operation (40 - 60 C), high Faradaic efficiency, low stress and high hardness. A variety of alloy and plating speed options are easily achieved from the same chemistry using soluble anodes for metal replacement with only 25% of the phosphorous additions required for electroless nickel. Thick deposits are easily achieved unattended, for electroforming freestanding shapes without buildup of excess orthophosphate or stripping of equipment.
Author
Electrodeposition; Energy Conservation; Nickel Alloys; Pollution; Cobalt; Phosphorus; Nickel

20040028027 NASA Glenn Research Center, Cleveland, OH, USA
Durability Assessment of Gamma TiAl
Draper, Susan L.; Lerch, Bradley A.; Pereira, J. Michael; Miyoshi, Kazuhisa; Arya, Vinod K.; Zhuang, Wyman; January 2004; 137 pp.; In English
Contract(s)/Grant(s): WBS 22-708-24-06
Report No.(s): NASA/TM-2004-212303; E-13659; No Copyright; Avail: CASI; A07, Hardcopy

Gamma TiAl was evaluated as a candidate alloy for low-pressure turbine blades in aeroengines. The durability of g-TiAl was studied by examining the effects of impact or fretting on its fatigue strength. Cast-to-size Ti-48Al-2Cr-2Nb was studied in impact testing with different size projectiles at various impact energies as the reference alloy and subsequently fatigue tested. Impacting degraded the residual fatigue life. However, under the ballistic impact conditions studied, it was concluded that the impacts expected in an aeroengine would not result in catastrophic damage, nor would the damage be severe enough to result in a fatigue failure under the anticipated design loads. In addition, other gamma alloys were investigated including another cast-to-size alloy, several cast and machined specimens, and a forged alloy. Within this Ti-48-2-2 family of alloys aluminum content was also varied. The cracking patterns as a result of impacting were documented and correlated with impact variables. The cracking type and severity was reasonably predicted using finite element models. Mean stress affects were also studied on impact-damaged fatigue samples. The fatigue strength was accurately predicted based on the flaw size using a threshold-based, fracture mechanics approach. To study the effects of wear due to potential applications in a blade-disk dovetail arrangement, the machined Ti-47-2-2 alloy was fretted against In-718 using pin-on-disk experiments. Wear mechanisms were documented and compared to those of Ti-6Al-4V. A few fatigue samples were also fretted and subsequently fatigue tested. It was found that under the conditions studied, the fretting was not severe enough to affect the fatigue strength of g-TiAl.
Author
Aluminum Alloys; Durability; Titanium Alloys; Mechanical Properties; Intermetallics; Titanium Aluminides; Fracture Mechanics

20040028121 Georgia Inst. of Tech., Atlanta, GA, USA
Extrusion Based Processing of Ti Alloys: Feasibility Study
Cochran, Joe; McDowell, Dave; Lee, Kon J.; Dec. 2003; 19 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0317
Report No.(s): AD-A419851; AFRL-SR-AR-TR-04-0091; No Copyright; Avail: CASI; A03, Hardcopy

This project was a feasibility study to explore the viability of using metal honeycomb technology developed at Georgia Tech as an economical alternative to processing titanium structures of relevance to aerospace applications. In the first part of this program, honeycombs with square prismatic cells were fabricated by extrusion of titanium oxide powder and experiments were conducted to convert the sintered honeycomb to metallic titanium through electrolytic reduction. This approach was pursued to explore extension of the FFC process 1 to electrolysis of this wall (300 m) Ti02 structures as the reduction stage of our proposed process. These tests focused on kinetics of titanium reduction because high specific surface area oxide performs can be fabricated using technology developed by the lightweight structures group at Georgia Tech2-4 via extrusion of thin walled, small cell size, honeycomb structures from powders/binder mixtures. During the honeycomb reduction studies, dendritic electrodeposition of titanium was observed to be occurring similar to the Hall process for aluminum. Thus, a series of tests were conducted to determine if high purity titanium could be electrodeposited from a molten salt saturated with titanium ore. Our conclusion was that this process is occurring and because this approach has potential for being of significant economic value, a provisional patent application has been filed.
DTIC
Extruding; Titanium Alloys

20040028131 Army Research Lab., Aberdeen Proving Ground, MD
Suppression of Material Failure Modes in Titanium Armors
Bruchey, William J.; Dec. 2003; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419912; ARL-TR-3124; No Copyright; Avail: CASI; A03, Hardcopy

Previous research by the U.S. Army Research Laboratory (ARL) has shown that the most common titanium alloy, Ti-6Al-4V, provides weight-effective protection against small- arms projectiles. In armor applications, titanium is susceptible to adiabatic shear and spall failure at the back surface. The large spall plugs that form can be a significant factor in behind-armor vulnerability and lethality. As the U.S. Army moves towards lighter and lighter Future Combat Systems class vehicles, thinner and lighter armors and structural elements will be needed. Particularly, the rear structural element in an armor

must provide protection producing minimal behind-armor debris. ARL, in cooperation with PM-Combat Systems, has undertaken a program to address this problem. Two- layer titanium composites were investigated. The initial or impact facing layer consisted of Ti-6Al-4V, with a backing layer of a nonplugging/spalling material. Backing layers consisted of commercially pure titanium, rolled homogeneous armor, steel, or aluminum. For each material combination, the two layers were either metallurgically bonded using explosive welding or diffusion bonded using hot isostatic pressing.
DTIC
Projectiles; Titanium Alloys

20040031555 Lawrence Livermore National Lab., Livermore, CA
Theory of Positron Annihilation in Helium-filled Bubbles in Plutonium
Sterne, P. A.; Pask, J. E.; Feb. 13, 2003; 8 pp.; In English
Report No.(s): DE2003-15005039; UCRL-JC-152127; No Copyright; Avail: Department of Energy Information Bridge

Positron annihilation lifetime spectroscopy is a sensitive probe of vacancies and voids in materials . This non-destructive measurement technique can identify the presence of specific defects in materials at the part-per-million level. First-principles calculations of positron lifetimes are now used extensively to guide the interpretation of positron lifetime data. At Livermore, we have developed a first-principles finite-element-based method for calculating positron lifetimes for defects in metals. This method is capable of treating system cell sizes of several thousand atoms, allowing us to model defects in plutonium ranging in size from a mono-vacancy to helium-filled bubbles of over 1 nm in diameter. In order to understand the variation of positron lifetime with vacancy cluster size and helium density in the defect, we have performed over 60 positron lifetime calculations with vacancy cluster sizes ranging fi-om 1 to 55 vacancies and helium densities ranging from zero to five helium atoms per vacancy. The results indicate that the experimental lifetime of 182 ps is consistent with the theoretical value of 190 ps for a mono-vacancy with a single helium atom, but that slightly better agreement is obtained for larger clusters of 6 or more vacancies containing 2-3 helium atoms per vacancy.
NTIS
Plutonium; Nondestructive Tests; Voids

20040031573 NASA Glenn Research Center, Cleveland, OH, USA
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy
Chen, Jun; Tewari, S. N.; Magadi, G.; DeGroh, H. C., III; [January 2003]; 6 pp.; In English
Contract(s)/Grant(s): NCC8-199; RTOP 22-101-15-04; No Copyright; Avail: CASI; A02, Hardcopy

The Pb-2.2 wt pct Sb alloy has been directionally solidified in 1-, 2-, 3-, and 7-mm-diameter crucibles with planar and dendritic liquid-solid interface orphology. For plane front solidification, the experimentally observed macrosegregation along the solidified length follows the relationship proposed by Favier. Application of a 0.4 T transverse magnetic field has no effect on the extent of convection. Reducing the ampoule diameter appears to decrease the extent of convection. However, extensive convection is still present even in the 1-mm-diameter crucible. An extrapolation of the observed behavior indicated that nearly diffusive transport conditions require ampoules that are about 40 microns in diameter. Reduction of the crucible diameter does not appear to have any significant effect on the primary dendrite spacing. However, it results in considerable distortion of the dendrite morphology and ordering. This is especially true for the 1-mm diameter samples.
Author
Crucibles; Antimony Alloys; Dendritic Crystals; Binary Alloys; Separation; Diameters; Convection; Directional Solidification (Crystals); Crystal Morphology; Lead Alloys

20040031591 Lawrence Livermore National Lab., Livermore, CA
Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge
Murphy, M. J.; Randers-Pehrson, G.; Kuklo, R. M.; Rambur, T. A.; Switzer, L. L.; Jul. 27, 2003; 12 pp.; In English
Report No.(s): DE2003-15004703; UCRL-JC-150459; No Copyright; Avail: Department of Energy Information Bridge

This paper describes experimental results and numerical simulations of jet penetration into granite from an aluminum lined shaped charge. Several penetration versus standoff experiments were conducted into an in-situ granite formation located in the Climax Ridge region of the Nevada Test Site. Simulations of the jet penetration were modeled with a two dimensional arbitrary lagrange eulerian hydrocode. The effects of variations in the granite flow stress, porosity, and EOS have been

evaluated. The work described in this paper is a continuation of our studies on jet penetration and modeling into high strength concrete.
NTIS
Aluminum; Granite; Penetration; Shaped Charges; Computerized Simulation

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*.

20040020057 Auburn Univ., AL, USA
Water Recycling/Removal Using Temperature-Sensitive Hydrogels
Gupta, R. M.; Oct. 2002; 50 pp.; In English
Report No.(s): DE2003-816026; No Copyright; Avail: Department of Energy Information Bridge

The overall objective of this project was to study the proposed Water Recycling/Removal Using Temperature-Sensitive Hydrogels. The main element of this technology is the design of a suitable hydrogel that can perform needed water separation for pulp and paper industry.
NTIS
Gels; Polymers

20040020074 NASA Marshall Space Flight Center, Huntsville, AL, USA
X-37 C-Sic CMC Control Surface Components Development [Status of the NASA/Boeing/USAF Orbital Vehicle and Related Efforts]
Valentine, Peter G; Rivers, H. Kevin; Chen, Victor L.; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Carbon/Silicon-Carbide (C-Sic) ceramic matrix composite (CMC) flaperon and ruddervator control surface components are being developed for the X-37 Orbital Vehicle (OV). The results of the prior NASA LaRC led work, aimed at developing C-Sic flaperon and ruddervator components for the X-37, will be reviewed. The status of several on-going and/or planned NASA, USAF, and Boeing programs that will support the development of control surface components for the X-37 OV will also be reviewed. The overall design and development philosophy being employed to assemble a team(s) to develop both: (a) C-Sic hot structure control surface components for the X-37 OV, and (b) carbon-carbon (C-C) hot structure components (a risk-reduction backup option for the OV), will be presented.
Author
Ceramic Matrix Composites; Carbon; Silicon Carbides; Product Development

20040020082 Swedish Defence Research Establishment, Tumba
Ceramic Armour against Heavy KE-Threats
Lundberg, P.; Oct. 2002; 22 pp.; In Swedish
Report No.(s): PB2004-101762; FOI-R-0596-SE; No Copyright; Avail: CASI; A03, Hardcopy

Armours where the main protective mechanism is to erode the projectile (not fracture or rotate it, as in e.g. reactive armours) are usually called consuming armours. The materials used for this type of armour are mainly metals or ceramics: metals since they are construction materials with good protection properties and ceramics since they, used in a proper way, are very weight-effective protection materials. Ceramic armours against KE-projectiles are discussed and two potentially very important development-trends are presented: (1) ceramic armours for where the projectile is defeated on the surface of the ceramic material without any notable penetration, interface defeat or dwell; (2) ceramic armours where the virgin strength of the ceramic can be sustained even during penetration, enhanced penetration resistance.
NTIS
Armor; Ceramics; Projectiles

20040020086 Swedish Defence Research Establishment, Tumba
Gun Barrel Erosion and Coating of Gun Barrels: A Literature Review
Magnusson, P.; Oct. 2002; 22 pp.; In Swedish
Report No.(s): PB2004-101764; FOI-R-0606-SE; No Copyright; Avail: CASI; A03, Hardcopy

Erosion is the main contributing factor to the decrease in lifetime of gun barrels. The precision, muzzle velocity and fire range deteriorate when the surface inside the gun tube is eroded. This study deals with gun barrel material, what happens in the barrel during firing and different methods to decrease the erosion. The erosion process can be divided into three different groups: Thermal, chemical and mechanical factors. There are many different means of how to improve or protect the gun barrel material; this study mainly deals with modifications of the gun barrel material and coatings on the inside of the tube. The focus of this study is on different coating alternatives and coating techniques.
NTIS
Coating; Erosion; Gun Launchers

20040027699
Mechanisms of Photorefractivity in Polymeric Materials
Siegel, Jay S.; Moerner, W. E.; Jan. 27, 2004; 6 pp.; In English
Contract(s)/Grant(s): F49620-98-1-0459
Report No.(s): AD-A419854; AFRL-SR-AR-TR-04-0073; No Copyright; Avail: CASI; A02, Hardcopy
To develop advanced photorefractive (PR) polymers for future optical processing applications with higher speed, larger response, and infrared sensitivity, we will utilize organic synthesis and physical measurements to understand and thereby control the properties of photoinduced charge generation, photo conduction, optical nonlinearity, and trapping dynamics.
DTIC
Photorefractivity; Infrared Radiation; Dimensional Measurement; Polymers

20040027723 Imperial Coll. of Science and Technology, London, UK
Predicting the Effect of Defect Distributions in the Bulk and on Surfaces of Ceramic Materials
Levy, Mark R.; Grimes, Robin W.; Oct. 31, 2003; 25 pp.; In English
Contract(s)/Grant(s): F61775-01-WE064
Report No.(s): AD-A419756; EOARD-SPC-01-4064; No Copyright; Avail: CASI; A03, Hardcopy
This report results from a contract tasking Imperial College, London as follows: The contractor will investigate and ultimately develop ways to select optimum compositions for materials using atomic scale computer simulation. The particular material systems to be studied are: pyrochiores and fluorites (important in fuel cell and oxygen generator applications and as thermal barrier coatings on turbine blades in jet engines), and the perovskites, important electronic ceramics that also act as catalysts. The work proposed here falls into two categories: those associated with the behavior of defects within the bulk or interior, and those associated with surface structures. The contractor shall: Investigate solution of aliovalent dopant ions in pyrochlore oxides. Predict the extent of disorder in pyrochlore oxides. - Identify compositions that exhibit complex defect behavior in perovskite oxides. Predict surface hydroxylation of yttria stabilized ZrO2. Investigate how surface tension is changed by hydroxylation of ZrO2 surfaces.
DTIC
Computerized Simulation; Zirconium Oxides; Yttrium Oxides; Ceramics

20040028128 Massachusetts Univ., Amherst, MA
Electro Optical Properties of Copolymer Blends
Karasz, Frank E.; Sep. 2003; 47 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0022
Report No.(s): AD-A419829; AFRL-SR-AR-TR-04-0074; No Copyright; Avail: CASI; A03, Hardcopy
A number of investigations concerning the synthesis, characterization and properties of electro-optical macromolecules has been completed. A wide range of structures mostly based on a conjugated main chain and focused on providing high photo-luminescent and electroluminescent quantum yields, were produced and fabricated into opto- electronic devices. Parallel investigations have continued the long established study of polymer blends by various physical means. Amongst others, a dielectric relaxation study has compared the properties of a prototypical blend with that of a statistical copolymer of equal overall composition to probe the dimensions of micro-heterogeneity in such systems. Further studies of the below-(-) temperature collapse (coil-globule) transition in solvated polymer chains has included polyelectrolyte systems. Some 46 papers were published or were in press during the grant period.
DTIC
Optics; Copolymers

20040030467 Institute of Industrial Technology TNO, Eindhoven, Netherlands
Performance of Low-VOC Paint for Vehicles of the Dutch Army
Hoeflaak, M.; Meertens, R. M.; January 15, 2003; 29 pp.; In Dutch
Contract(s)/Grant(s): A00/KL/158; TNO Proj. 007.60099
Report No.(s): TD-2003-0174; TNO-42/03.007058/sec; Copyright; Avail: Other Sources

Due to the legislation on working conditions and environmental pollution the army has to use new high solids camouflage coatings. Five high solids camouflage coating systems are tested according to a draft specification of the Dutch army. The systems are suitable on steel and aluminum, for new military equipment and for equipment repair. The test program is focused on mechanical properties, chemical resistance and corrosion protection. None of the tested high solids paint systems meet all requirements. The results are a basis for consulting the paint industry on the possibilities for a further improvement of high solids camouflage paint systems for military use.
Author
Paints; Camouflage; Volatile Organic Compounds

20040030520 Semenov (N. N.) Inst. for Chemical Physics, Moscow, Russia
Physics of Combustion of New Oxidizer/Polymer Mixtures
Zenin, Anatoli A.; Oct. 2003; 38 pp.; In English
Report No.(s): AD-A420008; XB-NAREGCOC/2W; No Copyright; Avail: CASI; A03, Hardcopy

Combustion of mixtures of CL-20 (hexanitrohexaazaisowurtzitane - HNIW) with thermoplastics BAMO-AMMO, and GAP, and mixtures of GAP/HMX and (BAMO- ANMO)/HMX is investigated by methods of thermocouple technique in a bomb of constant pressure at sample temperature and pressure variations. The main burning wave parameters are determined. Macrokinetics of gasifications are evaluated and positions of burning rate control stages are established. Temperature and pressure sensitivities of burning rates and surface temperatures were found, and criteria of stable combustion were estimated. Burning rate response functions to oscillatory pressure in linear and nonlinear approximations were found, and influence of elevated pulsating pressures was estimated.
DTIC
Polymers; Combustion

20040031579 Lawrence Livermore National Lab., Livermore, CA
Carbon Nanotube Atomic Force Microscopy for Proteomics and Biological Forensics
Noy, A.; De Yoreo, J. J.; Malkin, A. J.; Jan. 01, 2002; 20 pp.; In English
Report No.(s): DE2003-15004647; UCRL-ID-147221; No Copyright; Avail: Department of Energy Information Bridge

The global spread of modern technology has brought with it an increasing threat from biological agents such as viruses. As a result, developing techniques for identifying and understanding the operation of such agents is becoming a major area of forensic research for DOE. Our results show that the limitation on the applicability of this technique to structural studies of viruses and proteins is the size of the AFM tip which currently restricts the lateral resolution to about 10nm at best. The advent of carbon nanotube AFM probes made it possible to achieve unprecedented resolution in AFM imaging. Because single walled nanotubes have a radius of curvature of about 1nm, their use as AFM tips provides an order of magnitude improvement in lateral resolution. The purpose of this project was to use carbon nanotube tips to develop a new methodology for both determination of macromolecular structures and investigation of macromolecular crystallization. Our intent was to establish this methodology within the LLNL Directorates responsible for proteomics and biological forensics.
NTIS
Carbon; Microscopy; Proteins

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*.

20040016452 Swedish Defence Research Establishment, Tumba
Stimulation of Propellant Burning by Supplying Electric Energy in the Flame
Andreasson, S.; Bemm, E.; Skoglund, M.; Nov. 2002; In Swedish; In English
Report No.(s): PB2004-101791; FOI-R-0640-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Experiments with the objective to stimulate the combustion of solid propellants by conducting an electric current through the reaction zone are reported. The current is conducted through the flame and will supply energy via resistive heating, which is added to the chemical energy release of the flame and thus increases the heat feedback to the unburnt propellant. The electric conductivity of the flame needs to be increased in order to reduce random delay and to increase control of the electric discharge. Thermochemical calculations indicate that substantial increase in conductivity can be obtained by doping the propellants with alkali compounds, provided that the flame temperature is high enough. The experiments are performed in a closed vessel where a propellant slab is pinched between two copper plates connected to a pulsed power supply. By suitable pulse forming the experimental results indicate that it is possible to stimulate the propellant burn rate by conducting an electric current through the flame.
NTIS
Propellants; Flames

20040021317 Swedish Defence Research Establishment, Tumba
Preparation of Propellants Adapted for ETC and Polymeric Matrix for ADN-Based Propellants
Bemm, E.; Borong, M.; Wanhatalo, M.; Sep. 2002; In Swedish
Report No.(s): PB2004-101792; FOI-R-0572-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Experiments have been performed with the aim to prepare propellants adapted for ETC, a polymeric matrix for ADN-based propellants and a propellant with a very high burn rate to be used as a component in progressively burning propellants. The propellants adapted for ETC are based on the energetic polymers GAP and polyNIMMO with HMX used as oxidizer. To increase the electric conductivity in the flame, 5% potassium nitrate was added. Installation of new equipment for processing the casting have made possible an increase in percentage of HMX from 55 to 65% in the compositions, which resulted in a propellant with improved properties. It is known that AND is incompatible with isocyanates that is included in traditional binder systems for preparation of composite propellants. Thermoplastic elastomers (TPE) have been proposed as a conceivable alternative. Attempts have therefore been made on FOI of preparing an energetic TPE to be used together with ADN in composite propellants. Syntheses, analyses and characterizations of energetic thermoplastic elastomers prepared are reported on.
NTIS
Polymerization; Composite Propellants; Binders (Materials); Thermoplasticity

20040027573 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]; 8 pp.; In English; 42nd AIAA Aerospace Sciences Meeting, 5-8 Jan. 2004, Reno, NV, USA; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2004-1335; No Copyright; Avail: CASI; A02, Hardcopy

An experimental investigation of hypergolicity and ignition delay of fuel mixtures with hydrogen peroxide is presented. Example results of high speed photography and schleiren from drop tests are shown. Also, a discussion of the sensitivity to experimental parameters such as drop size and subsequent uncertainty considerations of ignition delay results is presented. It is shown that using the described setup on the mixtures presented, the precision uncertainty is on the order of 6% of average ignition delay and 5% of average decomposition delay. This represents sufficient repeatability for first order discrimination of ignition delay for propellant development and screening. Two mixtures, each using commonly available amines and transition metal compounds, are presented as examples that result in ignition delays on the order of 10 milliseconds.
Author
Hydrogen Peroxide; Ignition; Hypergolic Rocket Propellants; Hydrocarbon Fuels; Delay; Liquid-Gas Mixtures

20040028140 Air Force Research Lab., Tyndall AFB, FL
Logistic Fuel Processor Development
Salavani, Reza; Shaaban, Aly H.; Campbell, Timothy; Sawyer, Mikel; Trotta, Richard; Jan. 2004; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08637-98-C-6001
Report No.(s): AD-A419925; AFRL-ML-TY-TR-2004-4506; No Copyright; Avail: CASI; A03, Hardcopy

The Air Base Technologies Division of the Air Force Research Laboratory has developed a logistic fuel processor that removes the sulfur content of the fuel and in the process converts logistic fuel to light gases then steam reform the light gases into hydrogen rich stream. This report documents the efforts in developing a fuel processor capable of providing hydrogen to

a 3kW fuel cell stack. The technical challenges in the development of this technology included development of a fractionation device to reduce the size of sulfur scrubber beds, a cracking process with high conversion efficiency, and the reduction of cocking potential of fuel reforming. The rapid evolution of fuel cell technology as a replacement for conventional electric power generators has provided a gateway to future power systems using hydrogen as the primary fuel. With their high cycle efficiencies, in excess of 60%, and simplicity of operation, fuel cells afford the user high reliability and efficient use of primary energy in the form of hydrogen. The major drawback to militarize the use of fuel cells has been the inability to effectively use battlefield fuels as the primary energy source. The ability to reform battlefield fuels to hydrogen would allow use of fuel cells in place of conventional generators. This would result in power generation systems with higher efficiency, lower emissions, lower IR signature, and lower noise levels. The Air Base Technologies Division of the Air Force Research Laboratory has developed a logistic fuel processor that removes the sulfur content of the fuel and in the process converts logistic fuel to light gases then steam reform the light gases into hydrogen rich stream. This report documents the efforts in developing a fuel processor capable of providing hydrogen to a 3kW fuel cell stack.
DTIC
Cracks; Sulfur; Fractionation; Fabrication; Fuels; Processing

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*.

20040021341 NASA Dryden Flight Research Center, Edwards, CA, USA
Development and Testing of the Phase 0 Autonomous Formation Flight Research System
Petersen, Shane; Fantini, Jay; Norlin, Ken; Theisen, John; Krasiewski, Steven; January 2004; 25 pp.; In English; AIAA First Conference on Unmanned Aerospace Vehicles, Systems, Technologies, and Operations, 20-22 May 2002, Portsmouth, VA, USA
Contract(s)/Grant(s): 706-35-00
Report No.(s): NASA/TM-2004-212040; H-2503; No Copyright; Avail: CASI; A03, Hardcopy

The Autonomous Formation Flight (AFF) project was initiated in 1995 to demonstrate at least 10-percent drag reduction by positioning a trailing aircraft in the wingtip vortex of a leading aircraft. If successful, this technology would provide increased fuel savings, reduced emissions, and extended flight duration for fleet aircraft flying in formation. To demonstrate this technology, the AFF project at NASA Dryden Flight Research Center developed a system architecture incorporating two F-18 aircraft flying in leading-trailing formation. The system architecture has been designed to allow the trailing aircraft to maintain station-keeping position relative to the leading aircraft within +/-10 ft. Development of this architecture would be directed at the design and development of a computing system to feed surface position commands into the flight control computers, thereby controlling the longitudinal and lateral position of the trailing aircraft. In addition, modification to the instrumentation systems of both aircraft, pilot displays, and a means of broadcasting the leading aircraft inertial and global positioning system-based positional data to the trailing aircraft would be needed. This presentation focuses on the design and testing of the AFF Phase 0 research system.
Author
F-18 Aircraft; Formation Flying; Automatic Flight Control

20040027865 NASA Glenn Research Center, Cleveland, OH, USA
Cryogenic Transfer Line Chilldown
VanDresar, Neil T.; Siegwarth, James D.; October 28, 2003; 8 pp.; In English; Cryogenic Engineering Conference, 22-26 Sep. 2003, Anchorage, AK, USA
Contract(s)/Grant(s): 22-708-87-36; Copyright; Avail: CASI; A02, Hardcopy

The transient behavior of a small scale cryogenic transfer line was investigated during chilldown to cryogenic temperatures. The vacuum-jacketed apparatus consisted of a vertical tube followed by a near horizontal tube. The apparatus was equipped with view ports in the near horizontal section to allow visual observation of the flow patterns. Wall temperatures were measured at various locations along the length of the transfer line. Each test was conducted at a constant liquid volumetric flowrate at the transfer line inlet until saturation temperatures were obtained throughout the system.
Author (revised)
Cryogenic Fluids; Flow Velocity

20040027950 Prediction Systems, Inc., Spring Lake, NJ
Global Information Enterprise Simulation Laboratory (GIESIM LAB)
Fikuf, John; Nov. 2003; 43 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-03-C-0080; Proj-GIEP
Report No.(s): AD-A419839; AFRL-IF-RS-TR-2003-284; No Copyright; Avail: CASI; A03, Hardcopy

The GIESim project is a simulation development program to define, design and implement a Modeling and Simulation (M&S) framework for the GIE. Within the GIESim framework, users will be able to execute, via a common interface, multiple communications and network M&S tools to most effectively and efficiently analyze candidate communications architectures and technologies. The GIESim will interface with other M&S tools (e.g.,force-level simulations and detailed hardware system models) to provide the appropriate level of M&S fidelity and processing speed for the broad spectrum of M&S tasks. The GIESim user base will span from advanced technology researchers to communications network architects to mission planners.
DTIC
Simulation; Models; Communication Networks

20040028008 NASA Marshall Space Flight Center, Huntsville, AL, USA
Requirements Development for the NASA Advanced Engineering Environment (AEE)
Rogers, Eric; Hale, Joseph P.; Zook, Keith; Gowda, Sanjay; Salas, Andrea O.; [2003]; 6 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NASA Order H-35925-D; No Copyright; Avail: CASI; A02, Hardcopy

The requirements development process for the Advanced Engineering Environment (AEE) is presented. This environment has been developed to allow NASA to perform independent analysis and design of space transportation architectures and technologies. Given the highly collaborative and distributed nature of AEE, a variety of organizations are involved in the development, operations and management of the system. Furthermore, there are additional organizations involved representing external customers and stakeholders. Thorough coordination and effective communication is essential to translate desired expectations of the system into requirements. Functional, verifiable requirements for this (and indeed any) system are necessary to fulfill several roles. Requirements serve as a contractual tool, configuration management tool, and as an engineering tool, sometimes simultaneously. The role of requirements as an engineering tool is particularly important because a stable set of requirements for a system provides a common framework of system scope and characterization among team members. Furthermore, the requirements provide the basis for checking completion of system elements and form the basis for system verification. Requirements are at the core of systems engineering. The AEE Project has undertaken a thorough process to translate the desires and expectations of external customers and stakeholders into functional system-level requirements that are captured with sufficient rigor to allow development planning, resource allocation and system-level design, development, implementation and verification. These requirements are maintained in an integrated, relational database that provides traceability to governing Program requirements and also to verification methods and subsystem-level requirements.
Author
Systems Engineering; Product Development; Project Management; NASA Programs; Requirements

20040028187 Harvard Univ., Cambridge, MA
The Design and Control of Smart Structures
Brockett, Roger W.; Krishnaprasad, P. S.; Baillieul, John; Jan. 2004; 23 pp.; In English
Contract(s)/Grant(s): DAAG55-97-1-0114
Report No.(s): AD-A419932; 37252-MA-MUR; No Copyright; Avail: CASI; A03, Hardcopy

This is the final report of the Boston University, Harvard University and University of Maryland MURI on Design and Control of Smart Structures. The report contains a summary of results obtained from the inception of the program in May 1997 until its conclusion in August, 2003. Over this period the researchers involved produced new and useful results in the areas of micromechanical devices (fabricated and used at ARL), micro fluidics, work on the control of boundary layer flows, work on modeling micromagnetics, and a range of patented devices including a 1024 segment controllable MEMS mirror and a novel 1000 Hz optical switch based on the control of a fluid interface. More than 60 students at undergraduate, graduate and postdoctoral levels were supported under this project and over 160 papers have appeared acknowledging support from the grant.
DTIC
Microstructure; Micromechanics; Boundary Layer Flow

20040030469 Pennsylvania Univ., Philadelphia, PA
The Role of Haptics in Service Manual Task Validation
Badler, Norman; Bloomfield, Aaron; Vincent, Patrick J.; Abshire, Kevin; Wampler, Jeffrey L.; Feb. 2002; 73 pp.; In English
Contract(s)/Grant(s): F33615-99-D-6001; Proj-1710
Report No.(s): AD-A419936; AFRL-HE-WP-TR-2003-0140; No Copyright; Avail: CASI; A04, Hardcopy

The primary objective of this research was to explore the role and feasibility of using haptics simulation for validating aircraft Service Maintenance Manual instructions. A task taxonomy was developed to facilitate understanding specific haptic simulation benefits, experiment designs, errors, and limitations. Alternative simulation approaches were investigated that might be used in combination with, substitution for, or augmentation of haptics to provide more realistic haptic action simulations. in general, haptic feedback for maintenance tasks requiring strength or constrained body configurations is strongly limited by present equipment capabilities. Manipulations requiring low force precision hand movements are somewhat better served by haptic feedback. A demonstration system explores haptic interaction with finger force feedback and hand force and torque feedback. Further research could be conducted to empirically test user abilities with haptic feedback against both non-haptic and actual physical manipulation. Recommendations may be used to guide or further focus efforts in the Service Manual Generation program and related efforts.
DTIC
Simulation; Aircraft Maintenance; Feedback; Feasibility Analysis; Substitutes; Taxonomy

20040031556 Department of the Navy, Washington, DC
Rotating Feeler Gage
Moody, Paul E., Inventor; Sep. 29, 2003; 20 pp.; In English
Patent Info.: Filed 29 Sep. 2003; US-Patent-Appl-SN-10672963
Report No.(s): AD-D020121; No Copyright; Avail: Other Sources

This patent application discloses a feeler gage that has, a pin member having a first end and an opposing end with the gage connected to the opposing end. The gage has a first end connected to the pin and a free end projecting past a peripheral dimension of the pin. An indicator is formed on the first end of the pin member in alignment with a longitudinal axis of the gage for determining the position of the gage upon rotation of the pin member. The gage is of a predetermined thickness and is aligned with the indicator formed at the first end of the pin member. Rotation of the pin member correspondingly rotates the gage of the pin member. If the gage rotates freely, then a gap is determined to be present in the area where the gage is rotated through. If the gage does not rotate freely, then no gap exists. (10 figures)
DTIC
Submarines; Gaskets; Hatches

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*.

20040016446 Swedish Defence Research Establishment, Stockholm, Sweden
Web-Based HLA Federations and Simulations: Methods and Possibilities
Moradi, F.; Ekloef, M.; Ulriksson, J.; Dec. 2002; In Swedish
Report No.(s): PB2004-101789; FOI-R-0739-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Modeling and Simulation (M&S) is a vital part of the Network-Centric Warfare (NCW) concept, adapted by the Swedish Armed Forces (SwAF). However, simulation model development, implementation, testing and execution are time consuming and expensive processes. Hence, it is of great interest to combine the web and Internet technologies, and M&S in order to e.g. utilize the simulation models and computing resources more efficiently. This report presents the results from research conducted within the area of Web-based M&S. The project 'Web-based HLA Federations and Simulations' was carried out during 2001 and 2002 on behalf of the SwAF. The main objective of the project was to investigate and study the benefits and advantages on the impact of networking technologies and distributed computing techniques on M&S for the SwAF. During the first year the potential of the combination of Web-technology and HLA federations, and Web-technology and legacy simulations was investigated. The focus of the project during 2002 was on component-based model development, distributed

computing techniques, particularly Peer-to-peer computing, and collaborative model development and execution.
NTIS
Computerized Simulation; Computation

20040016461 Swedish Defence Research Establishment, Stockholm, Sweden
Design of a System for Active Echo-Cancellation
Slunga, R.; Brage, A.; Stahlsten, T.; Nov. 2002; In Swedish
Report No.(s): PB2004-101783; FOI-R-0659-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The acoustic echo from an underwater-object can be reduced by transmission of a phase-shifted copy of the object's response. In this report the realization of a system for echo-cancellation and technical requirements are discussed. Trials performed in a water-tank are also reported. The electrical and mechanical connections between receiver and transmitter need to be further reduced for optimal echo-cancellation.
NTIS
Echoes; Cancellation; Electric Connectors; Sound Waves

20040020054 Lawrence Livermore National Lab., Livermore, CA
Wireless Link Design Using a Patch Antenna
Hall, E.; Aug. 11, 2000; 18 pp.; In English
Report No.(s): DE2003-15005120; UCRL-ID-140596; No Copyright; Avail: Department of Energy Information Bridge

A wireless link was designed using a patch antenna. In the process, several different models were tested. Testing proved a patch antenna was a viable solution for building a wireless link within the design specifications. Also, this experimentation provided a basis for future patch antenna design.
NTIS
Telemetry; Wireless Communication; Performance Tests

20040020055 Lawrence Livermore National Lab., Livermore, CA
Low-Power Direct-Sequence Spread-Spectrum Modem Architecture for Distributed Wireless Sensor Networks
Chien, C.; Elgorriaga, I.; McConaghy, C.; Jul. 03, 2001; 10 pp.; In English
Report No.(s): DE2003-15005126; UCRL-JC-1404619; No Copyright; Avail: Department of Energy Information Bridge

Emerging CMOS and MEMS technologies enable the implementation of a large number of wireless distributed microsensors that can be easily and rapidly deployed to form highly redundant, self-configuring, and ad hoc sensor networks. To facilitate ease of deployment, these sensors should operate on battery for extended periods of time. A particular challenge in maintaining extended battery lifetime lies in achieving communications with low power. This paper presents a direct-sequence spread-spectrum modem architecture that provides robust communications for wireless sensor networks while dissipating very low power. The modem architecture has been verified in an FPGA implementation that dissipates only 33 mW for both transmission and reception. The implementation can be easily mapped to an ASIC technology with an estimated power performance of less than 1 mW.
NTIS
Modems; Spread Spectrum Transmission; Modulation; Wireless Communication

20040020070
Quality of Service Routing in Tactical Mobile Ad Hoc Networks
Persson, K.; Jun. 2003; 64 pp.; In Swedish
Report No.(s): PB2004-102707; FOI-R-0886-SE; No Copyright; Avail: CASI; A04, Hardcopy

Wireless communications will in the future be an important part of the tactical operations. Requirements on the network are robustness, security, mobility and guaranteed quality of service, QoS. It is important that the capacity or a maximum allowed delay of a connection can be assured. Mobile ad hoc networks are infrastructureless networks with no centralized administration which today can fulfill some of the demands. The nodes in the network can communicate over multiple hops using a routing protocol. The method for routing is of major importance for the grade of utilization of the capacity in the network. Routing in a mobile ad hoc network is difficult because the network topology may change constantly which gives us imprecise information about the links. QoS routing is one way to make it possible to give guarantees about capacity in ad hoc network. A study and an evaluation of the existing routing protocols for ad hoc networks and their adaptability to guarantee QoS have been done. The conclusion is that little work has been done in this area, but a lot of methods are under

development. Proactive protocols are best suited to use all information in the network and create good routes.
NTIS
Computer Networks; Military Operations; Robustness (Mathematics); Routes; Adaptation

20040027596 Texas Univ., Arlington, TX, USA
Energy Efficient Wireless Sensor Networks Using Fuzzy Logic
Liang, Qilian; Dec. 9, 2003; 30 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0466
Report No.(s): AD-A419061; No Copyright; Avail: CASI; A03, Hardcopy

During the period 8/1/2003-11/30/2003, we have made lots of progress on energy efficiency of wireless sensor networks. We investigated the optimal number of clusters for a given number of sensors. Based on this theoretical result, we proposed a Fuzzy Energy Aware Topology Updated with REconfiguration for sensor-networks (FEATURES) scheme. This scheme provides a methodology on how to partition a sensor network to the desired number of clusters using fuzzy c-means, how to elect a clusterhead using fuzzy logic system via combining different descriptors of a sensor: distance of a node to the cluster centroid, its remaining battery capacity, and its degree of mobility. We also proposed an Access-Based Low Energy Hierarchy (ABLEH) to clustering protocols more adaptive to the dynamic nature of sensor networks. Besides, we studied energy efficient protocol design for large-scale wireless sensor network. Four papers were produced during these six months, and are attached to this report.
DTIC
Communication Networks; Fuzzy Systems; Energy Conservation

20040027704
Experimental Investigations on the Distortion of ISAR Images Using Different Radar Waveforms
Wong, S.; Riseborough, E.; Duff, G.; Sep. 2003; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419722; DRDC-TM-2003-196; No Copyright; Avail: CASI; A03, Hardcopy

The Inverse Synthetic Aperture Radar (ISAR) image of a target can be distorted as a result of a small perturbing motion possessed by the target. This has been observed regularly in radar imaging of moving targets such as in-flight aircraft, ships sailing on high seas and maneuvering ground vehicles. A Target Motion Simulator apparatus that simulates a target with small perturbing motion has been designed and built to study the ISAR distortion experimentally. A series of measurements under controlled conditions have been conducted to collect the distorted ISAR image data. The experimental results show that severe distortion in the ISAR image can occur as a result of small perturbing motion from the target. Two different radar waveform types, pulse compression and stepped frequency, are used in the investigation. The purpose is to determine whether the radar waveform plays a role in the distortion of ISAR images. A systematic analysis has been carried out to characterize the ISAR distortion. Results indicate that the distortion is independent of the radar waveform used. This information will be useful for developing image refocusing procedures to restore distorted ISAR images for target identification applications.
DTIC
Waveforms; Synthetic Aperture Radar; Radar Imagery

20040027764 Vanu, Inc., Cambridge, MA, USA
Algorithmic Advances for Software Radios
Frigo, Matthew; May 21, 2003; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419766; No Copyright; Avail: CASI; A03, Hardcopy

Software radios replace most communication hardware with software. Software radios require new algorithms. Demodulation is the bottleneck in a software 802. 11b implementation. Standard maximum-likelihood demodulator based on the fast Walsh-Hadamard transform (FHT). Majority-logic demodulations are efficient but suboptimal. Our hybrid algorithm is almost as fast as majority logic and almost as 'optimal' as the FHT. Noise-adaptive algorithms can save power and improve battery life. The flexibility of software radios allows the best algorithms to be chosen at run time.
DTIC
Computer Programs; Radio Equipment; Demodulation

20040027833 Naval War Coll., Newport, RI
Risk-Based Decision-Making and the Use of Operational Risk Management in Developing a Course of Action (COA) for the Joint Task Force (JTF)
Faherty, Denis M.; May 16, 2003; 30 pp.; In English
Report No.(s): AD-A419825; No Copyright; Avail: CASI; A03, Hardcopy

Uncertainty and risk are inherent in the nature of military action. The success of any joint military operation is based upon a willingness to balance risk with opportunity in taking bold, decisive action necessary to triumph in war. At the same time, commanders have a fundamental responsibility to safeguard personnel and material resources, and to accept the level of controlled risk necessary to accomplish the assigned mission. Operational Risk Management (ORM) is the process that assists the military commander in reducing or offsetting risk and helps him think through his options when faced with force employment and the requirement for risk control for mission success. By systematically identifying, assessing, and controlling risk arising from operational factors, the commander can evaluate all the elements that affect the employment of forces and assets. While ORM terminology is discussed in joint operational doctrine and planning publications, there exists no clear application and integration in developing the Commander's Estimate of the Situation (CES) through the Course of Action (COA) process. This paper will illustrate how ORM fits into the existing Joint Operation Planning and Execution System (JOPES) process to assist leadership in identifying the optimum COA for mission success. Included in the ORM application is a quantifiable evaluation process that prioritizes the threat, vulnerability, and criticality for joint commanders to apply limited resources to enhance operational capability. No longer will the Commander Joint Task Force (CJTF) have to rely exclusively on his intuition and experience in calculating the increased levels of risk he can accept for mission success.
DTIC
Command and Control; Military Operations; Risk; Decision Making

20040028032 Massachusetts Inst. of Tech., Lexington, MA
Preliminary Design Review: GMTI Processing for the PCA Integrated Radar-Tracker Application
Reuther, A. I.; Feb. 6, 2004; 33 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A419852; PR-PCA-IRT-2; DARPA-ESC-TR-2003-070; No Copyright; Avail: CASI; A03, Hardcopy

This report describes ground moving target indicator (GMTI) processing to be done for the PCA (polymorphous 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 wideband signal for improved resolution. This signal is decomposed via subband filtering into many narrowband signals for easier processing. Each of these subbanded data sets must then be processed as a distinct radar data cube. For each data set, adaptive processing is used to null interference patterns and ground clutter noise. These operations incur a high computational cost. Subband filtering requires many parallel modulators and filters, while adaptive processing requires the calculation of an adaptive filter (involving a QR decomposition and forward/backsolving) at run time for each subband data cube.
DTIC
Radar Tracking; Moving Target Indicators

20040028041 Naval Postgraduate School, Monterey, CA
Closing the Gaps A Strategy for Gaining the Initiative in the War on Terror
Jan. 2003; 19 pp.; In English
Report No.(s): AD-A419907; NPS-DA-01-03; No Copyright; Avail: CASI; A03, Hardcopy

The following is a collective effort by Special Operations I Low Intensity Conflict (SO/LIC) students at the Naval Postgraduate School (NPS) in Monterey, California. We represent a cross section from each service, minus the USMC, who were in operational assignments during the first phases of the Global War On Terror (GWOT). Most of us have served in, or in support of, Operation Enduring Freedom (OEF) in the CENTCOM, PACOM, EUCOM, and SOUTHCOM areas. The purpose of this document is to propose a new way of operating for special operations forces. In a time when small units of action can accomplish incredible feats if given the opportunity, it is time to change from an organization that deploys large joint task forces to one that is capable of self synchronizing at the lowest levels and acting without the presence of large command and control structures. In short, this proposal is about optimizing human resources and creating new economies of force.
DTIC
Command and Control; Warfare

20040028169 Space and Naval Warfare Systems Center, San Diego, CA
Multi-h CPM Synchronization in Military Channels Phase 2: A Simulation Framework
Allen, J. C.; Wahlen, B. E.; Sep. 2003; 78 pp.; In English
Report No.(s): AD-A419930; TR-1909; No Copyright; Avail: CASI; A05, Hardcopy

Continuous phase modulation (CPM) is a well- established signaling technology that attains spectral efficiency by smoothing the phase signal. The spectral efficiency of CPM makes it a natural candidate for communications where bandwidth is limited, such as the non- SATCOM channels in the littoral environments. However, CPM receivers require synchronization with respect to data, timing, phase, and frequency. Research on various CPM synchronizers has been undertaken at Space and Naval Warfare Systems Command (SPAWAR). This report sets out a simulation framework that allows these synchronizers to be swapped in and out of a CPM receiver model to assess performance in a credible end-to-end RF simulation.
DTIC
Synchronism; Military Spacecraft; Phase Modulation

20040031357 Analex Corp., Cleveland, OH, USA
A CDMA Spotbeam Architecture for the Next Generation Satellite System (NGSS) for the Aeronautical Telecommunications Network (ATN)
Raghavan, Rajesh S.; Shamma, Mohammed A.; [2003]; 8 pp.; In English; 9th Ka and Broadband Conference, 5-7 Nov. 2003, Island of Ischia, Italy; Original contains black and white illustrations
Contract(s)/Grant(s): NAS3-01145; 727-01-03; No Copyright; Avail: CASI; A02, Hardcopy

This paper will present work being done to model and simulate a CDMA based Mobile Satellite System architecture for providing all or part of the future Air Traffic Management (ATM) services. Such a system, will help in relieving the dependence on ground based networks, if not eliminate it. Additionally such an architecture can be used in parallel or as a supplementary service along with ground based links to help alleviate any capacity bottlenecks, or in areas where such services are difficult to make available such as in oceanic, remote areas outside the jet highways, or in developing countries where ground services are less available.
Author
Satellite Networks; Air Traffic Control; Architecture (Computers)

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*.

20040016325 ASRC Aerospace Corp., Cocoa Beach, FL, USA
The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring
Kolody, Mark; Calle, Luz-Marina; Zeitlin, Nancy P., Technical Monitor; September 2003; 40 pp.; In English
Report No.(s): NASA/TM-2003-211191; No Copyright; Avail: CASI; A03, Hardcopy

An initial investigation into the response of the individual galvanic couples was conducted using potentiodynamic polarization measurements of solutions under conditions of varying corrosivity. It is hypothesized that the differing electrodes may provide a means to further investigate the corrosive nature of the analyte through genetic algorithms and pattern recognition techniques. The robust design of the electrochemical sensor makes its utilization in space exploration particularly attractive. Since the electrodes are fired on a ceramic substrate at 900 C, they may be one of the most rugged sensors available for the anticipated usage.
Author
Electrolytic Cells; Sensors; Arrays; Polarization; Potentiometers (Instruments); Feasibility Analysis; Corrosion Tests

20040016329 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Leak and Pipe Detection Method and System
Youngquist, Robert C., Inventor; November 18, 2003; 6 pp.; In English
Patent Info.: Filed 6 Dec. 2001; US-Patent-6,650,125; US-Patent-Appl-SN-007487; NASA-Case-KSC-12255; No Copyright; Avail: CASI; A02, Hardcopy

A method and system for locating leaks of conductive fluids from non-conductive pipes and other structures or for locating non-conductive pipes or structures having conductive fluid contained therein, employ a charge generator to apply a time varying charge to the conductive fluid, and a capaci- tive type detector that can detect the variable charge that is induced in the fluid. The capacitive detector, which prefer- ably includes a handheld housing, employs a large conduc- tive pickup plate that is used to locate the pipe or leak by scanning the plate over the ground and detecting the induced charge that is generated

when the plate comes in close proximity to the pipe or leak. If a leak is encountered, the resulting signal will appear over an area larger than expected for a buried pipe, assuming the leak provides an electrically conductive path between the flow and the wet surrounding ground. The detector uses any suitable type of indicator device, such as a pair of headphones that enable an operator to hear the detected signal as a chirping sound, for example.
Author
Capacitors; Conducting Fluids; Signal Detectors

20040016334 GPD Optoelectronics Corp., Salem, NH, USA
Ge Semiconductor Devices for High-Performance Cryogenic Power Electronics
Ward, Rufus R.; Kirschman, Randall K.; January 15, 2004; 4 pp.; In English
Contract(s)/Grant(s): NAS3-01050; No Copyright; Avail: CASI; A01, Hardcopy
No abstract available
Germanium; Cryogenics; Semiconductors (Materials); Silicon Compounds; Gallium Arsenides; Energy Gaps (Solid State)

20040016434 Lawrence Livermore National Lab., Livermore, CA
Electrochemical Hydrogen Sensor for Safety Monitoring
Martin, L. P.; Pham, A. Q.; Glass, R. S.; Apr. 25, 2003; 16 pp.; In English
Report No.(s): DE2003-15004873; UCRL-JC-151802; No Copyright; Avail: Department of Energy Information Bridge
A hydrogen safety sensor is presented which provides high sensitivity and fast response time when operated in air. The target application for the sensor is external deployment near systems using or producing high concentrations of hydrogen. The sensor is composed of a catalytically active metal- oxide sensing electrode and a noble metal reference electrode attached to an yttria-stabilized zirconia (YSZ) electrolyte. The sensing approach is based on the difference in oxidation rate of hydrogen on the different electrode materials. Results will be presented for a sensor using a sensing electrode of tin-doped indium oxide (ITO). Response to Hz, and cross-sensitivity to hydrocarbon and H20 are discussed.
NTIS
Electrode Materials; Electrolytes; Hydrogen; Yttria-Stabilized Zirconia; Indium Compounds

20040020053 Lawrence Livermore National Lab., Livermore, CA
Microrelay
Bernhardt, A.; Cooper, G.; Malba, V.; Sep. 08, 2000; 10 pp.; In English
Report No.(s): DE2003-15005119; UCRL-ID-140400; No Copyright; Avail: Department of Energy Information Bridge
Our goals in this project were to (1) develop a new design concept for a high reliability microrelay, (2) build a prototype, and (3) demonstrate high force relay closure in the prototype.
NTIS
Design Analysis; Prototypes; Electric Contacts

20040020117 NASA Glenn Research Center, Cleveland, OH, USA
NASA Efforts on Nanotechnology
Miranda, Felix A.; [2003]; 18 pp.; In English; 21st Century Science: Technology, Creativity and Innovation, 21-23 Nov. 2003, San Juan, Puerto Rico; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 22-334-10-01; No Copyright; Avail: CASI; A03, Hardcopy
An overview of the field of nanotechnology within the theme of 'New efforts in Nanotechnology Research,' will be presented. NASA's interest, requirements and current efforts in this emerging field will be discussed. In particular, NASA efforts to develop nanoelectronic devices, fuel cells, and other applications of interest using this novel technology by collaborating with academia will be addressed. Progress on current collaborations in this area with the University of Puerto Rico will be highlighted.
Author
Nanotechnology; NASA Programs; Aerospace Systems; Research and Development; General Overviews

20040021337
Design of an L-Band Microwave Radiometer with Active Mitigation of Interference
Ellingson, Steven W.; Hampson, G. A.; Johnson, J. T.; April 2003; 3 pp.; In English; IGARSS 2003, 21-25 Jul. 2003, Toulouse, France
Contract(s)/Grant(s): NAS5-02001; NSF AST-01-38263; No Copyright; Avail: CASI; A01, Hardcopy

For increased sensitivity in L-band radiometry, bandwidths on the order of 100 MHz are desirable. This will likely require active countermeasures to mitigate RFI. In this paper, we describe a new radiometer which coherently samples 100 MHz of spectrum and applies real-time RFI mitigation techniques using FPGAs. A field test of an interim version of this design in a radio astronomy observation corrupted by radar pulses is described.
Author
Microwave Radiometers; Ultrahigh Frequencies; Radio Frequency Interference; Radio Astronomy; Design Analysis

20040021410 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Wireless Temperature-Monitoring System
Solano, Wanda; Thurman, Chuck; July 23, 2002; 2 pp.; In English
Report No.(s): NASA/NP-2002-08-00031-SSC; No Copyright; Avail: CASI; A01, Hardcopy

A relatively inexpensive instrumentation system that includes units that are connected to thermocouples and that are parts of a radio-communication network has been developed to enable monitoring of temperatures at multiple locations. Because there is no need to string wires or cables for communication, the system is well suited for monitoring temperatures at remote locations and for applications in which frequent changes of monitored or monitoring locations are needed. The system can also be adapted to monitoring of slowly varying physical quantities, other than temperature, that can be transduced by solid-state electronic sensors. electronic sensors. The system comprises any number of transmitting units and a single receiving unit. Each transmitting unit includes connections for as many as four external thermocouples, a signal-conditioning module, a control module, and a radio-communication module. The signal-conditioning module acts as an interface between the thermocouples and the rest of the transmitting unit and includes a built-in solid ambient temperature sensor that is in addition to the external thermocouples. The control module is a system-on-chip embedded processor that includes analog-to-digital converters, serial and parallel data ports, and an interface for local connection to an analog meter that is used during installation to verify correct operation. The radio-communication module contains a commercial spread-spectrum transceiver that operates in the 900-MHz industrial, scientific, and medical (ISM) frequency band. This transceiver transmits data to the receiving unit at a rate of 19,200 baud. The receiving unit includes a transceiver like that of a transmitting unit, plus a control module that contains a system-on-chip processor that includes serial data port for output to a computer that runs monitoring and/or control software, a parallel data port for output to a printer, and a seven-segment light-emitting-diode display. Each transmitting unit is battery-powered and can operate for at least seven days continuously while reporting temperatures every half hour. The receiving unit is powered by a wall-mounted transformer source. The receiving unit responds to each transmitting unit and reports the readings of each of the four thermocouples and of the ambient-temperature sensor of the transmitting unit. The end-to-end accuracy of the system is plus or minus 0.2 C over the temperature range from 0 to 100 C. The radio-communication range between the receiving and transmitting units is approximately equal to 0.5 mile (approximately equal to 0.8 km).
Derived from text
Temperature Sensors; Wireless Communication; Temperature Measuring Instruments; Communication Networks; Electronic Equipment

20040021411 Tulane Univ., New Orleans, LA, USA
Small Signal Modelling and Control of the Hydrogen Mixer for Facility E1
Barbieri, Enrique; September 30, 2003; 19 pp.; In English
Report No.(s): NASA/NP-2002-02-00005-SSC; No Copyright; Avail: CASI; A03, Hardcopy

We have undertaken the theoretical modelling of an existing liquid hydrogen (LH2) and gas hydrogen (GH2) mixer subsystem of the E1 Ground Test Facility at NASA John C. Stennis Space Center. The E1 test facility carries out comprehensive ground-based testing and certification of various liquid rocket engines and their components. The mixer described in this work is responsible for combining high pressure LH2 and GH2 to produce a hydrogen flow that meets certain thermodynamic properties before it is fed into a test article. The desired properties are maintained by precise control of the mixture of LH2 and GH2 flows. The mixer is modelled as a general multi-flow lumped volume for single constituent fluids using density and internal energy as states. The set of nonlinear differential equations is linearized about an equilibrium point and the resulting two-state, 3-input linear model is analyzed as a possible candidate for control design.
Author
Liquid Hydrogen; Mathematical Models; Test Facilities; Control Systems Design; Signal Transmission; Liquid-Gas Mixtures

20040027610 Texas A&M Univ., College Station, TX, USA
Diagnostic Instrumentation
Freeman, Bruce L.; Mar. 31, 2002; 5 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0246
Report No.(s): AD-A419685; AFRL-SR-AR-TR-04-0062; No Copyright; Avail: CASI; A01, Hardcopy

The requested image converter camera is a state-of- the-art camera that is able to capture frames as short as 5-to- 10 nanoseconds with a resolution of 1, 024 x 1,024 pixels. It will be primarily used on an AFOSR-supported research program on explosive driven power generation. It also may be used to enhance research on the SpearTIP program, the ATLAS switch development project, and plasma focus studies. A critical aspect of the author's general research effort is the training of students, both at the undergraduate and graduate levels. The total request from AFOSR was $160,000, with a matching grant from the Texas Engineering Experiment Station of $30,000. This grant will greatly enhance the Plasma Science/Pulsed Power research capability within the Nuclear Engineering Department at Texas A&M University. The proposed and actual equipment pricing information is presented.
DTIC
Cameras; Image Converters; Electro-Optical Photography

20040027727 Southwest Missouri State Univ., Springfield, MO
Biosensors Made from Carbon and Polymer Composite Micro-Electromechanical Systems (MEMS)
Giedd, Ryan; Curry, Matt; Durham, Paul; Dobson, Norm; Dec. 21, 2003; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0893
Report No.(s): AD-A419760; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this project is to develop a new class of biosensors using carbon and polymer based micro- electromechanical systems (MEMS). This interim report discusses the progress to date on the individual tasks outlined in the proposal. Progress has included a study to engineer the appropriate carbon/ polymerimetal cluster compositions which have vibration sensitive electronic properties. Initial imaging of structures created using microlithography and imaging of the carbon composite, biocompatible surface were done with SEM and AFM respectively. The methodology used for building antibody microarrays to detect specific molecular binding events was demonstrated. Preliminary work on a prototype for an antigen collection system has been accomplished.
DTIC
Detectors; Microelectromechanical Systems; Bioinstrumentation; Carbon

20040027754 National Chiao Tung Univ., Hsinchu, Taiwan, Province of China
Design and Implementation for the Prototype of a Microstimulator
Chiang, Cheng-Ta; Journal of the Chinese Institute of Engineers; 2003; Volume 26, No. 3, pp. 361-365; In English; Copyright; Avail: Other Sources

In this paper, the first domestic implementation of an implantable microstimulator utilizing HDL and ASIC methodologies is presented. We implement the digital part of the microstimulator by writing the hardware description language for the digital circuits, synthesizing them and downloading them into a field programmable gate array. The analog part is designed by using full-custom IC design flow, implemented by CMOS 0.35 pm technology, and fabricated by TSMC. It generates a maximum current of 2.77 mA through l kR load while the stimulation frequency is 20Hz and the stimulation current pulse width is 300 ps, and the maximum power consumption is evaluated at 14 mW based on a 5 V voltage supply.
Author
Application Specific Integrated Circuits; Field-Programmable Gate Arrays

20040027774 California Univ., Davis, CA
A Workshop on Vacuum Electronics Research for the DoD
Luhmann, N. C., Jr; Jul. 2003; 19 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0377
Report No.(s): AD-A419880; AFRL-SR-AR-TR--04-0085; No Copyright; Avail: CASI; A03, Hardcopy

The University of California, Davis hosted the workshop and publication working group from July 27-30, 2002 at the Royal Kona Resort in Kailua-Kona, Hawaii and a March 11- 13, 2003, Las Vegas, Nevada, Treasure Island. The purpose was to bring together researchers from Academia, the Air Force Research Laboratory (Phillips Site), other government scientific

organizations as well as from industry, to discuss the role of Innovative Vacuum Electronics in the frontiers of microwave/millimeter wave power electronics.
DTIC
Electronic Equipment; Millimeter Waves; Microwaves; Organizations

20040027776 University of Southern California, Los Angeles, CA, USA
MONARCH: A Morphable Networked micro-ARCHitecture
Granacki, John; Vahey, Mike; Sep. 2002; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419882; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs of a presention on MONARCH: a morphable networked micro-architecture.
DTIC
Microprocessors; Architecture (Computers)

20040027781 Kansas Univ. Center for Research, Inc., Lawrence, KS
Multi-Dimensional Signal Processing for Sparse Radar Arrays
Stiles, James M.; Nov. 2002; 10 pp.; In English
Contract(s)/Grant(s): F49620-99-1-0172
Report No.(s): AD-A419885; RSL-TR-18221-4; AFRL-SR-AR-TR-04-0067; No Copyright; Avail: CASI; A02, Hardcopy
No abstract available
Signal Processing; Algorithms; Phased Arrays

20040027783 Paravant, Inc., Palm Bay, FL, USA
A Comparison of Two Computational Technologies for Digital Pulse Compression
Bonato, Michael J.; Sep. 2002; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419798; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs on presentation of comparisons between two computational technologies for digital pulse compression.
DTIC
Pulse Compression; Integrated Circuits

20040027791 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting
Tanikawa, Masaki; Ikeda, Takashi; Ushijima, Shigehiko; Mikami, Hirohide; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 58-62; In English; See also 20040027787; Copyright; Avail: Other Sources
Although there are high hopes for broadband stream broadcasting, there are many problems to be solved, such as how to increase the capacity of the delivery server and how to reduce the operation cost, before high-quality broadcasting can be provided on a large scale and at a low cost. This article reviews stream broadcasting technologies and introduces the Live Streaming Switch being developed in NTT Laboratories, which enables a low-cost, stable-delivery, automated streaming service.
Author
Broadband; Cost Reduction

20040027802 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Monolithically Integrated 64-channel WDM Channel Selector
Kikuchi, Nobuhiro; Shibata, Yasuo; Tohmori, Yuichi; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 43-49; In English; See also 20040027787; Copyright; Avail: Other Sources
Wavelength division multiplexing (WDM) channel selectors will be key devices in future photonic net- works. In this paper, we describe a novel WDM channel selector configuration that lets the selector handle a large number of WDM channels. The selector consists of two arrayed waveguide gratings, two stages of semiconductor optical amplifier gates, and a coupler. Based on this configuration, we developed the first monolithically integrated 64-channel WDM channel selector on an InP substrate. Loss-less operation was achieved for all channels. The typical sensitivity penalty for a 10-Gbit/s NRZ (non-return to zero) signal was measured to be 1.3 dB. Fast switching of less than 1.5 ns was obtained.
Author
Wavelength Division Multiplexing; Switching

20040027803 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications
Hanano, Shinya; Miura, Norihiro; Ushijima, Shigehiko; Mikami, Hirohide; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 63-67; In English; See also 20040027787; Copyright; Avail: Other Sources

As broadband services become widespread, various types of Internet broadcasting are emerging, such as the broadcasting of music concerts, market information, stock market news, and radio programs, especially in the business-to-business area. To meet such demands, we aim to deliver TV-like high-quality and economical video over the best-effort broadband network by applying the peer-to-peer delivery scheme. The system we have developed, which is the first of its kind in the industry, uses set-top boxes to connect TV sets to NTT's B-FLET's network, allowing easy delivery of live programs to shops or terminals on the street.
Author
Broadband; Video Data

20040027808
Coaxial-Type Resistance Sensor for HPM Applications
Kancleris, Zilvinas; Jan. 2003; 31 pp.; In English
Contract(s)/Grant(s): F61775-02-WE030
Report No.(s): AD-A419777; SPC-02-4030; No Copyright; Avail: CASI; A03, Hardcopy

This report results from a contract tasking Semiconductor Physics Institute as follows: The contractor will investigate resistive sensors for measuring high power microwave pulses. At the end of this investigation, the contractor will develop a prototype unit of the coaxial-type resistive sensor and test it in a wide frequency and power range.
DTIC
Waveguides; Microwaves; Resistors; Electromagnetic Pulses

20040027817 University of Southern California, Los Angeles, CA
Compact High Power Repetitive Pulsed Power Instrumentation
Gundersen, Martin A.; Jan. 2004; 6 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0228
Report No.(s): AD-A419891; AFRL-SR-AR-TR-04-0086; No Copyright; Avail: CASI; A02, Hardcopy

The vacuum system, pulse generator and oscilloscopes are used for pseudospark-BLT switch research. The pumping system is for achieving necessary high vacuum conditions. Observations of cell membrane perturbation in real time with sub-nanosecond time resolution is made possible by the PicoStar HR-12 CCD camera system and its custom table purchased under this AFOSR Grant. This High-Speed CCD camera system is a component of AFOSR-supported Transient Plasma Ignition research as well. The scopes and pulse generator provide diagnosis, analysis, and control of experiments requiring accurate, fast diagnostics. Implementation of these systems has enabled results in pulsed power switching, and applications of pulsed power to biology, and ignition and combustion. Switching research includes investigation of small BLT switches for compact pulse generation, which will reported this year at an AFOSR MURI review, and technical meetings including the Intl. Conf. on Plasma Science. Biology includes real-time observation of Ca bursts in human lymphocytes, reported in Biophysical and Biochemical Research Communications, and at other reviews and conferences. Ignition includes development of transient plasma ignition, which reduces delays to ignition in applications such as pulse detonation engines.
DTIC
Pulse Generators; Instruments

20040027823 National Chiao Tung Univ., Hsinchu, Taiwan, Province of China
New High-Speed Low-Power Current-Mode CMOS Sense Amplifier
Wang, Shang-Ming; Wu, Ching-Yuan; Journal of the Chinese Institute of Engineers; 2003; Volume 26, No. 3, pp. 367-370; In English; Copyright; Avail: Other Sources

A novel low-power current-mode sense amplifier for fast CMOS SRAM applica- tions is presented. It is based on the current mode approach. The sensing speed is independent of the bit-line and data-line capacitances and a separated positive feed- back technique is employed to give the circuit high-speed, low-power operation. Based on the new current-mode sense amplifier, a 32Kx8 SRAM chip was designed and fabricated. The access time is 9ns at a supply voltage of 3V and the active current is 28mA at 100MHz.
Author
Cmos; Electric Potential

20040027825 Stanford Univ., Stanford, CA
Stream Processing for High-Performance Embedded Systems
Dally, William J.; Sep. 2002; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419812; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs from presentation on stream processing for high performance embedded systems.
DTIC
Image Processing; Ratings

20040027836 Massachusetts Inst. of Tech., Cambridge, MA
Computer Microvision for Microelectromechanical Systems (MEMS)
Freeman, Dennis M.; Nov. 2003; 54 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0106; DARPA ORDER-E117; Proj-E117
Report No.(s): AD-A419775; AFRL-IF-RS-TR-2003-270; No Copyright; Avail: CASI; A04, Hardcopy
This effort successfully addressed a critical need related to the early design and evaluation of Microelectromechanical systems (MEMS) by developing tools and methods for testing and characterizing MEMS devices that enabled in situ visualization of the motions of internal structures in MEMS by combining light microscopy, video imaging, and machine vision. A series of MEMS test bed platforms were developed under this project that used stroboscopic illumination to produce temporal sequences of images of microelectromechanical systems that were magnified with a microscope, projected onto a CCD camera, and recorded at multiple planes of focus. These images could be viewed at playback speeds chosen to facilitate human interpretation of the motions, and they could be analyzed using methods originally conceived for robot vision to determine quantitative device performance parameters. One platform was replicated at a number of major MEMS research Universities, and another was transitioned as a commercial product. A number of collaborations with MEMS developers provided critical measurements and functional MEMS performance evaluations. Additional work developed a patented multi-beam interferometric method for imaging MEMS, launched a collaborative Computer Microvision Remote Test Facility using DARPA's Next Generation Internet, and produced a high-end animation to communicate the complexity and importance of MEMS fabrication.
DTIC
Microelectromechanical Systems; Interferometry; Test Stands

20040027844 Zagreb Univ., Zagreb, Croatia
Analysis of Curved Microstrip Antennas
Sipus, Zvonimir; Burum, Niksa; Zentner, Radovan; Apr. 18, 2003; 107 pp.; In English
Contract(s)/Grant(s): F61775-01-W-E024
Report No.(s): AD-A419903; EOARD-SPC 01-4024; No Copyright; Avail: CASI; A06, Hardcopy
This report results from a contract tasking University of Zagreb as follows: The contractor will investigate simulation tools for analyzing single-curved and double-curved microstrip patch antennas. These tools will overcome a key limitation in existing laboratory computer simulations, which are unable to approximate the electromagnetic characteristics of dual curvature conformal arrays.
DTIC
Curvature; Microstrip Antennas; Patch Antennas

20040027847 NASA Glenn Research Center, Cleveland, OH, USA
A High Efficiency DC Bus Regulator/RPC for Spacecraft Applications
Birchenough, Arthur G.; [2003]; 8 pp.; In English; Space Technology and Applications International Forum, 8-12 Feb. 2004, Albuquerque, NM, USA
Contract(s)/Grant(s): WBS 22-982-10-03; No Copyright; Avail: CASI; A02, Hardcopy
DC bus voltage regulation may be required in future high powered spacecraft due to the length of the busses or because they are not generated at precise voltage levels. In these cases the regulation range is often only a few percent increase or decrease, but conventional DC voltage regulators switch all the power passing through them, and this level of power switched determines the size and losses in the regulator. A recently developed concept used a low power DC-DC converter in series with the bs to raise or lower the bus voltage over a small range. This partial power processing technique combines the small size and power losses of the low power converter with the ability to regulate, (over a small range) a high power bus. The Series Connected Buck Boost Regulator (SCBBR) described herein provides bus regulation with an efficiency of 98%. The circuit

also provides bus switching and overcurrent limiting functions of a Remote Power Controller (RPC). This paper described the circuit design and performance of a breadboard SCBBR configured as a bus voltage regulator providing plus of minus 40% voltage regulation range, bus switching, and overload limiting.
Author
Voltage Converters (Dc to Dc); Voltage Regulators; Technology Utilization; Aerospace Engineering; Remote Control; Power Efficiency

20040028034 Pennsylvania State Univ., University Park, PA
Modeling and Control of the ARCP in Power and Drive Systems
Mayer, Jeffrey; Hofmann, Heath; Feb. 2004; 46 pp.; In English
Contract(s)/Grant(s): N00014-99-1-1004
Report No.(s): AD-A419969; No Copyright; Avail: CASI; A03, Hardcopy

Three methods have been developed for assessing the stability of dc-to dc converters and converter-based power systems. The first of these methods is based on a state-space representation of an average-value model of a dc-to-dc buck converter with an LC input filter. It is shown that filter- converter combination is completely controllable through state feedback. The second method is based on an exact expression for the input impedance of the buck converter. This expression may be used in conjunction with the Nyquist criterion applied to the minor loop at the interface between the converter and a power system; it is valid at all frequencies, even those above the switching frequency. The third method is based on an analysis of the Floquet multipliers for the periodic solution to a general class of piecewise- linear systems operated with a switching surface that includes state and input variables as well as time. Software for computing the Floquet multipliers given an arbitrary state-space model of the piece-wise linear system and switching surface has been developed. It has been used to show regions of instability for the dc-to-dc buck converter.
DTIC
Models; Active Control; Voltage Converters (Dc to Dc); Mechanical Drives

20040028047 Michigan Univ., Ann Arbor, MI
Solid State THz Sources
Pavlidis, Dimitris; Sep. 23, 2003; 37 pp.; In English
Report No.(s): AD-A419976; No Copyright; Avail: CASI; A03, Hardcopy

High layer quality GaN NDR layers have been grown in house by newly setup MOCVD facility. Record quality AIN layers were grown for high thermal conductivity substrateless diodes with improved thermal management. GaN Gunn diodes were designed and fabricated on Si substrates with high thermal conductivity. Combined with the use of small size devices they allowed to bias GaN NDR diodes under electric fields suitable for oscillation. Liquid Nitrogen Characterization of GaN NDR diodes manifested clear increase of current handling as necessary for establishment of NDR conditions. Planar GaN NDR diodes have been investigated as an alternative to vertical designs. InGaN/GaN superlattice designs have been theoretically and experimentally investigated for THz signal generation. Pulse generation setups have been developed to respond to high power, nsec time needs of GaN NDR diodes. On wafer probe techniques with built-in resonators have been investigated for high frequency testing of NDR diodes. Experimental micromachining technology was developed for silicon. Waveguide, probes, transitions and flanges developed and tested in W band. Excellent experimental results were obtained in W band. Nearly finished with corresponding GaAs process technology. Technology demonstration was made with complete W band multiplier.
DTIC
Gunn Diodes; Thermal Conductivity; Solid State; Gallium Nitrides; Coatings

20040030461 Army Research Lab., Adelphi, MD
High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes
Tipton, C. W.; Bayne, Stephen B.; Scozzie, Charles J.; Griffin, Timothy; Geil, Bruce; Oct. 2003; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420015; ARL-TR-3111; No Copyright; Avail: CASI; A03, Hardcopy

A high-temperature, 400 W, DC-to-AC inverter has been developed using silicon carbide gate turn-off thyristors and p-i-n diodes. We demonstrate the inverter driving a three- phase, inductive motor up to 580 W and device case temperatures up to 150 deg C. The inverter circuit was constructed to perform the first characterization of these SiC devices under significant electrical and thermal stresses, investigate the parametric operating space of the SiC devices, and uncover circuit-related

failure modes. We discuss our electrical screening criteria of the SiC components, electrical stresses brought about by circuit topology, component failure modes, and inverter performance. We will use the results of this work in the development of future SiC components.
DTIC
Thyristors; Silicon Carbides; Digital to Analog Converters; P-I-N Junctions; Failure Modes

20040031518 Lawrence Livermore National Lab., Livermore, CA
Proposed Specification of EUVL Mask Substrate Roughness
Gullikson, E.; Walton, C.; Taylor, T.; Sep. 26, 2003; 10 pp.; In English
Report No.(s): DE2003-15005021; UCRL-JC-155485; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Lithography; Masking; Substrates; Surface Roughness; Masks

20040031552 Department of the Navy, Washington, DC
Confined Plasma Resonance Antenna and Plasma Resonance Antenna Array
Anderson, Theodore R., Inventor; Apr. 12, 2002; 19 pp.; In English
Patent Info.: Filed 12 Aug. 2002; US-Patent-Appl-SN-10124704
Report No.(s): AD-D020118; No Copyright; Avail: Other Sources
No abstract available
Antenna Arrays; Plasma Resonance

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*.

20040016359 NASA Marshall Space Flight Center, Huntsville, AL, USA
Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved?
Lapenta, William M.; Bradshaw, Tom; Burks, Jason; Darden, Chris; Dembek, Scott; [2003]; 1 pp.; In English; 20th Conference on Weather Analysis and Forecasting, 11-15 Jan. 2004, Seattle, WA, USA; No Copyright; Avail: Other Sources; Abstract Only

It is well known that numerical warm season quantitative precipitation forecasts lack significant skill for numerous reasons. Some are related to the model--it may lack physical processes required to realistically simulate convection or the numerical algorithms and dynamics employed may not be adequate. Others are related to initialization-mesoscale features play an important role in convective initialization and atmospheric observation systems are incapable of properly depicting the three-dimensional stability structure at the mesoscale. The purpose of this study is to determine if a mesoscale model initialized with a diabatic initialization scheme can improve short-term (0 to 12h) warm season quantitative precipitation forecasts in the Southeastern USA. The Local Analysis and Prediction System (LAPS) developed at the Forecast System Laboratory is used to diabatically initialize the Pennsylvania State University/National center for Atmospheric Research (PSUNCAR) Mesoscale Model version 5 (MM5). The SPORT Center runs LAPS operationally on an hourly cycle to produce analyses on a 15 km covering the eastern 2/3 of the USA. The 20 km National Centers for Environmental Prediction (NCEP) Rapid Update Cycle analyses are used for the background fields. Standard observational data are acquired from MADIS with GOES/CRAFT Nexrad data acquired from in-house feeds. The MM5 is configured on a 140 x 140 12 km grid centered on Huntsville Alabama. Preliminary results indicate that MM5 runs initialized with LAPS produce improved 6 and 12h QPF threat scores compared with those initialized with the NCEP RUC.
Author
Mesoscale Phenomena; Prediction Analysis Techniques; Stability; Weather; Atmospheric Models; Forecasting; Heat Transfer

20040020071 Iowa State Univ. of Science and Technology, Ames, IA
VE-Suite: Coupling Visualization and Computational Environments to Support on-the-fly Engineering Design
Li, S.; 2003; 70 pp.; In English
Report No.(s): DE2003-816446; No Copyright; Avail: Department of Energy Information Bridge

CFD (Computational Fluid Dynamics) is a widely used technique in engineering design field. It uses mathematical

methods to simulate and predict flow characteristics in a certain physical space. Since the numerical result of CFD computation is very hard to understand, VR (virtual reality) and data visualization techniques are introduced into CFD post-processing to improve the understandability and functionality of CFD computation. In many cases CFD datasets are very large (multi-gigabytes), and more and more interactions between user and the datasets are required. For the traditional VR application, the limitation of computing power is a major factor to prevent visualizing large dataset effectively. This thesis presents a new system designing to speed up the traditional VR application by using parallel computing and distributed computing, and the idea of using hand held device to enhance the interaction between a user and VR CFD application as well. Techniques in different research areas including scientific visualization, parallel computing, distributed computing and graphical user interface designing are used in the development of the final system. As the result, the new system can flexibly be built on heterogeneous computing environment, dramatically shorten the computation time.
NTIS
Computational Fluid Dynamics; Computer Graphics; Flow Visualization; Flow Characteristics

20040021333 QSS Group, Inc., Cleveland, OH, USA
Wind-US Flow Calculations for the M2129 S-Duct Using Structured and Unstructured Grids
Mohler, Stanley R., Jr.; December 2003; 22 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NAS3-00145; WBS 22-708-93-21
Report No.(s): NASA/CR-2003-212736; AIAA Paper 2004-0525; E-14261; No Copyright; Avail: CASI; A03, Hardcopy

Computational Fluid Dynamics (CFD) flow solutions for the M2129 diffusing S-duct with and without vane effectors were computed by the Wind-US flow solver. Both structured and unstructured 3-D grids were used. Without vane effectors, the duct exhibited massive flow separation in both experiment and CFD. With vane effectors installed, the flow remained attached and aerodynamic losses were reduced. Total pressure recovery and distortion near the duct outlet were computed from the solutions and compared favorably to experimental values. These calculations are part of a validation effort for the Wind-US code. They also provide an example case to aid engineers in learning to use the Wind-US software.
Author
Computational Fluid Dynamics; Ducts; Structured Grids (Mathematics); Unstructured Grids (Mathematics); Three Dimensional Flow; Aerodynamic Configurations

20040021349 NASA Ames Research Center, Moffett Field, CA, USA
Advances in High Performance Computational Methods for Large Scale Fluid/Structure Interaction
Guruswamy, Guru P.; November 30, 2003; 14 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this viewgraph presentation is to present a summary of computational methods developed at Ames Research Center for large scale fluid/structure interaction.
Author (revised)
Computational Fluid Dynamics; Fluid-Solid Interactions

20040027545 Pittsburgh Univ., Pittsburgh, PA, USA
A Novel Strategy for Numerical Simulation of High-speed Turbulent Reacting Flows
Sheikhi, M. R. H.; Drozda, T. G.; Givi, P.; [2003]; 21 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG1-03010; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this research is to improve and implement the filtered mass density function (FDF) methodology for large eddy simulation (LES) of high-speed reacting turbulent flows. We have just completed Year 1 of this research. This is the Final Report on our activities during the period: January 1, 2003 to December 31, 2003. 2002. In the efforts during the past year, LES is conducted of the Sandia Flame D, which is a turbulent piloted nonpremixed methane jet flame. The subgrid scale (SGS) closure is based on the scalar filtered mass density function (SFMDF) methodology. The SFMDF is basically the mass weighted probability density function (PDF) of the SGS scalar quantities. For this flame (which exhibits little local extinction), a simple flamelet model is used to relate the instantaneous composition to the mixture fraction. The modelled SFMDF transport equation is solved by a hybrid finite-difference/Monte Carlo scheme.
Author
Turbulent Flow; High Speed; Large Eddy Simulation; Reacting Flow

20040027743 California Inst. of Tech., Pasadena, CA, USA

Experiment and Theory for Active Control of Nonlinear Dynamics in Compression/Combustion Systems

Culick, F. E. C.; Dec. 12, 2003; 34 pp.; In English

Contract(s)/Grant(s): F49620-99-1-0118

Report No.(s): AD-A419805; AFRL-SR-AR-TR-04-0081; No Copyright; Avail: CASI; A03, Hardcopy

This report is the final report of a three-year program with a 9-month NCE comprising both theoretical and experimental work on problems arising with unsteady combustion of gases intended for use in propulsion systems. The experimental work comprises two main efforts: (I) measurements providing the basis for inferring the local response function of a reacting mixture: and, (2) accurate determination of the behavior of a Rijke tube. Part (1) is based on greatly extended equipment purchased before this program began, with a DURIP grant from AFOSR. The basic part of the facility is apparatus for PLIF (planar laser induced fluorescence) measurements of a combustion system exposed to a sinusoidally varying pressure field, p' with q, the local fluctuation of heat release, appropriate measurements allow inference of q'/p', proportional to the response function and q'p', the integral over volume is proportional to the Rayleigh factor. In principal, knowledge of these two quantities permits deduction of all important dynamical properties of a dynamical system in the second part of this program, a particularly simple combustion system, the Rijke tube, has been investigated. We believe that we have produced the most accurate data ever obtained to confirm quantitatively much of basic behavior of the device. This result does much to solidify the basis for theoretically and practically treating the dynamics of time-dependent combustion systems.

DTIC

Active Control; Combustion Physics; Nonlinearity; Compression Loads; Dynamic Characteristics

20040027954 Stanford Univ., Stanford, CA, USA

New Type of the Interface Evolution in the Richtmyer-Meshkov Instability

Abarzhi, S. I.; Herrmann, M.; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 173-183; In English

Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

We performed systematic theoretical and numerical studies of the nonlinear large-scale coherent dynamics in the Richtmyer-Meshkov instability for fluids with contrast densities. Our simulations modeled the interface dynamics for compressible and viscous uids. For a two-fluid system we observed that in the nonlinear regime of the instability the bubble velocity decays and its surface attens, and the attening is accompanied by slight oscillations. We found the theoretical solution for the system of conservation laws, describing the principal influence of the density ratio on the motion of the nonlinear bubble. The solution has no adjustable parameters, and shows that the attening of the bubble front is a distinct property universal for all values of the density ratio. This property follows from the fact that the RM bubbles decelerate. The theoretical and numerical results validate each other, describe the new type of the bubble front evolution in RMI, and identify the bubble curvature as important and sensitive diagnostic parameter.

Derived from text

Numerical Analysis; Stability; Fluid Flow; Two Dimensional Flow; Liquid-Liquid Interfaces

20040027957 Stanford Univ., Stanford, CA, USA

'Hypothetical' Heavy Particles Dynamics in LES of Turbulent Dispersed Two-Phase Channel Flow

Gorokhovski, M.; Chtab, A.; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 205-211; In English

Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A02, Hardcopy

The extensive experimental study of dispersed two-phase turbulent flow in a vertical channel has been performed in Eaton's research group in the Mechanical Engineering Department at Stanford University. In Wang & Squires (1996), this study motivated the validation of LES approach with Lagrangian tracking of round particles governed by drag forces. While the computed velocity of the flow have been predicted relatively well, the computed particle velocity differed strongly from the measured one. Using Monte Carlo simulation of inter-particle collisions, the computation of Yamamoto et al. (2001) was specifically performed to model Eaton's experiment. The results of Yamamoto et al. (2001) improved the particle velocity distribution. At the same time, Vance & Squires (2002) mentioned that the stochastic simualtion of inter-particle collisions is too expensive, requiring significantly more CPU resources than one needs for the gas flow computation. Therefore, the need comes to account for the inter-particle collisions in a simpler and still effective way. To present such a model in the framework of LES/Lagrangian particle approach, and to compare the calculated results with Eaton's measurement and modeling of Yamamoto is the main objective of the present paper.

Author

Two Phase Flow; Channel Flow; Turbulent Flow; Particles; Fluid Dynamics

20040027958 Stanford Univ., Stanford, CA, USA

Grid-Independent Large-Eddy Simulation in Turbulent Channel Flow using Three-Dimensional Explicit Filtering

Gullbrand, Jessica; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 331-342; In English

Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

In this paper, turbulence-closure models are evaluated using the 'true' LES approach in turbulent channel flow. The study is an extension of the work presented by Gullbrand (2001), where fourth-order commutative filter functions are applied in three dimensions in a fourth-order finite-difference code. The true LES solution is the grid-independent solution to the filtered governing equations. The solution is obtained by keeping the filter width constant while the computational grid is refined. As the grid is refined, the solution converges towards the true LES solution. The true LES solution will depend on the filter width used, but will be independent of the grid resolution. In traditional LES, because the filter is implicit and directly connected to the grid spacing, the solution converges towards a direct numerical simulation (DNS) as the grid is refined, and not towards the solution of the filtered Navier-Stokes equations. The effect of turbulence-closure models is therefore difficult to determine in traditional LES because, as the grid is refined, more turbulence length scales are resolved and less influence from the models is expected. In contrast, in the true LES formulation, the explicit filter eliminates all scales that are smaller than the filter cutoff, regardless of the grid resolution. This ensures that the resolved length-scales do not vary as the grid resolution is changed. In true LES, the cell size must be smaller than or equal to the cutoff length scale of the filter function. The turbulence-closure models investigated are the dynamic Smagorinsky model (DSM), the dynamic mixed model (DMM), and the dynamic reconstruction model (DRM). These turbulence models were previously studied using two-dimensional explicit filtering in turbulent channel flow by Gullbrand & Chow (2002). The DSM by Germano et al. (1991) is used as the USFS model in all the simulations. This enables evaluation of different reconstruction models for the RSFS stresses. The DMM consists of the scale-similarity model (SSM) by Bardina et al. (1983), which is an RSFS model, in linear combination with the DSM. In the DRM, the RSFS stresses are modeled by using an estimate of the unfiltered velocity in the unclosed term, while the USFS stresses are modeled by the DSM. The DSM and the DMM are two commonly used turbulence-closure models, while the DRM is a more recent model.

Author

Large Eddy Simulation; Turbulence Models; Turbulent Flow; Channel Flow; Three Dimensional Models

20040027960 Stanford Univ., Stanford, CA, USA

A Cartesian Adaptive Level Set Method for Two-Phase Flows

Ham, F.; Young, Y.-N.; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 227-237; In English

Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

In the present contribution we develop a level set method based on local anisotropic Cartesian adaptation as described in Ham et al. (2002). Such an approach should allow for the smallest possible Cartesian grid capable of resolving a given flow. The remainder of the paper is organized as follows. In section 2 the level set formulation for free surface calculations is presented and its strengths and weaknesses relative to the other free surface methods reviewed. In section 3 the collocated numerical method is described. In section 4 the method is validated by solving the 2D and 3D drop oscilation problem. In section 5 we present some results from more complex cases including the 3D drop breakup in an impulsively accelerated free stream, and the 3D immiscible Rayleigh-Taylor instability. Conclusions are given in section 6.

Author

Cartesian Coordinates; Two Phase Flow; Anisotropy

20040027966 Stanford Univ., Stanford, CA, USA

On the Computation of Space-Time Correlations by Large-Eddy Simulation

He, Guo-Wei; Wang, Meng; Lele, Sanjiva K.; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 319-330; In English

Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

Numerical comparisons in decaying isotropic turbulence suggest that there exist discrepancies in time correlations evaluated by DNS and LES using eddy-viscosity-type SGS models. This is consistent with the previous observations in forced isotropic turbulence. Therefore, forcing is not the main cause of the discrepancies. Comparisons among different SGS models in the LES also indicate that the model choice affects the time correlations in the LES. The multi-scale LES method using the dynamic Smagorinsky model on the small scale equation is the most accurate of the all models, the classic Smagorinsky model is the least accurate and the dynamic Smagorinsky model and spectral eddy viscosity model give intermediate results with small differences. The generalized sweeping hypothesis implies that time correlations in decaying isotropic turbulence are mainly determined by the instantaneous energy spectra and sweeping velocities. The analysis based on the sweeping

hypothesis explains the discrepancies in our numerical simulations: the LES overpredicts the decorrelation time scales because the sweeping velocities are smaller than the DNS values, and underpredicts the magnitudes of time correlations because the energy spectrum levels are lower than the DNS ones. Since the sweeping velocity is determined by the energy spectra, one concludes that an accurate prediction of the instantaneous energy spectra guarantees the accuracy of time correlations. An analytical expression of sound power spectra based on Lighthill's theory and the quasi-normal closure assumption suggests that the sound power spectra are sensitive to errors in time correlations. Small errors in time correlations can cause significant errors in the sound power spectra, which exhibit a sizable drop at moderate to high frequencies accompanied by a shift of the peaks to lower frequencies. Based on the above analysis, two possible ways to improve the acoustic power spectrum predictions can be considered. The first is to construct better SGS models to improve the LES accuracy for time correlations. The second is to remedy the temporal statistics of the Lighthill stress tensor in order to 'recover' the contribution from the unresolved scales in LES to time correlations.
Derived from text
Large Eddy Simulation; Space-Time Functions; Direct Numerical Simulation; Mathematical Models; Flow Distribution

20040027967 Stanford Univ., Stanford, CA, USA
A Self-Contained Mapping Closure Approximation for Scalar Mixing
He, Guo-Wei; Zhang, Zi-Fan; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 277-284; In English
Contract(s)/Grant(s): G20000773-05; NCC2-1371; No Copyright; Avail: CASI; A02, Hardcopy

Scalar turbulence exhibits interplays of coherent structures and random fluctuations over a broad range of spatial and temporal scales. This feature necessitates a probabilistic description of the scalar dynamics, which can be achieved comprehensively by using probability density functions (PDFs). Therefore, the challenge is to obtain the scalar PDFs (Lundgren 1967; Dopazo 1979). Generally, the evolution of a scalar is governed by three dynamical processes: advection, diffusion and reaction. In a PDF approach (Pope 1985), the advection and reaction can be treated exactly but the effect of molecular diffusion has to be modeled. It has been shown (Pope 1985) that the effect of molecular diffusion can be expressed as conditional dissipation rates or conditional diffusions. The currently used models for the conditional dissipation rates and conditional diffusions (Pope 1991) have resisted deduction from the fundamental equations and are unable to yield satisfactory results for the basic test cases of decaying scalars in isotropic turbulence, although they have achieved some success in a variety of individual cases. The recently developed mapping closure approach (Pope 1991; Chen, Chen & Kraichnan 1989; Kraichnan 1990; Klimenko & Pope 2003) provides a deductive method for conditional dissipation rates and conditional di usions, and the models obtained can successfully describe the shape relaxation of the scalar PDF from an initial double delta distribution to a Gaussian one. However, the mapping closure approach is not able to provide the rate at which the scalar evolves. The evolution rate has to be modeled. Therefore, the mapping closure approach is not closed. In this letter, we will address this problem.
Derived from text
Approximation; Scalars; Mathematical Models; Isotropic Turbulence; Turbulent Mixing; Conformal Mapping

20040027989 Stanford Univ., Stanford, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
Unfolding of Proteins: Thermal and Mechanical Unfolding
Hur, Joe S.; Darve, Eric; January 2004; 14 pp.; In English
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

We have employed a Hamiltonian model based on a self-consistent Gaussian appoximation to examine the unfolding process of proteins in external - both mechanical and thermal - force elds. The motivation was to investigate the unfolding pathways of proteins by including only the essence of the important interactions of the native-state topology. Furthermore, if such a model can indeed correctly predict the physics of protein unfolding, it can complement more computationally expensive simulations and theoretical work. The self-consistent Gaussian approximation by Micheletti et al. has been incorporated in our model to make the model mathematically tractable by signi cantly reducing the computational cost. All thermodynamic properties and pair contact probabilities are calculated by simply evaluating the values of a series of Incomplete Gamma functions in an iterative manner. We have compared our results to previous molecular dynamics simulation and experimental data for the mechanical unfolding of the giant muscle protein Titin (1TIT). Our model, especially in light of its simplicity and excellent agreement with experiment and simulation, demonstrates the basic physical elements necessary to capture the mechanism of protein unfolding in an external force field.
Derived from text
Proteins; Mathematical Models; Field Theory (Physics); Molecular Dynamics; Electric Fields; Temperature Distribution

20040027990 Stanford Univ., Stanford, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
Simulation of Inviscid Compressible Multi-Phase Flow with Condensation
Kelleners, Philip; [2003]; 19 pp.; In English
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

Condensation of vapours in rapid expansions of compressible gases is investigated. In the case of high temperature gradients the condensation will start at conditions well away from thermodynamic equilibrium of the fluid. In those cases homogeneous condensation is dominant over heterogeneous condensation. The present work is concerned with development of a simulation tool for computation of high speed compressible flows with homogeneous condensation. The resulting ow solver should preferably be accurate and robust to be used for simulation of industrial flows in general geometries.
Author
Inviscid Flow; Multiphase Flow; Simulation; Condensation; Mathematical Models; Liquid-Gas Mixtures

20040028005 Stanford Univ., Stanford, CA, USA
Transition in Hypersonic Flows Including High-temperature Gas Effects
Stemmer, Christian; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 475-479; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A01, Hardcopy

Hypersonic transition poses a special challenge for direct numerical simulations. Comparable data from Wind-tunnel tests or free-flight testing are not available or not accurate enough for comparison. The wind-tunnel testing does not allow for the exact match to the free-flight conditions at such high Mach-numbers. Flat-plate boundary-layer transition at high Mach-numbers is investigated in this work. A simulation case was chosen where chemical non-equilibrium plays an important role but ionization can be neglected. The chosen case at an altitude of H=50Km lies close to one point on the descent path of the Space Shuttle. The failure of the Space Shuttle has shown that an improved vehicle for space transportation is imperative in the close future. Transition research for an improved space-transportation vehicle is crucial in order to estimate the heat load during re-entry.
Derived from text
High Temperature Gases; Hypersonic Flow; Boundary Layer Transition; Numerical Analysis

20040028035 Ohio Aerospace Inst., Brook Park, OH, USA
Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures
Yungster, S.; Radhakrishnan, K.; Perkins, High D., Technical Monitor; December 2003; 19 pp.; In English; 33rd Fluid Dynamics Conference and Exhibit, 23-26 Jun. 2003, Orlando, FL, USA
Contract(s)/Grant(s): GSN-003-049; WBS 22-708-48-01
Report No.(s): NASA/CR-2003-212586; AIAA Paper 2003-4248; E-14143; No Copyright; Avail: CASI; A03, Hardcopy

The propagation of one-dimensional detonations in ethylene-air mixtures is investigated numerically by solving the one-dimensional Euler equations with detailed finite-rate chemistry. The numerical method is based on a second-order spatially accurate total-variation-diminishing scheme and a point implicit, first-order-accurate, time marching algorithm. The ethylene-air combustion is modeled with a 20-species, 36-step reaction mechanism. A multi-level, dynamically adaptive grid is utilized, in order to resolve the structure of the detonation. Parametric studies over an equivalence ratio range of 0.5 less than phi less than 3 for different initial pressures and degrees of detonation overdrive demonstrate that the detonation is unstable for low degrees of overdrive, but the dynamics of wave propagation varies with fuel-air equivalence ratio. For equivalence ratios less than approximately 1.2 the detonation exhibits a short-period oscillatory mode, characterized by high-frequency, low-amplitude waves. Richer mixtures (phi greater than 1.2) exhibit a low-frequency mode that includes large fluctuations in the detonation wave speed; that is, a galloping propagation mode is established. At high degrees of overdrive, stable detonation wave propagation is obtained. A modified McVey-Toong short-period wave-interaction theory is in excellent agreement with the numerical simulations.
Author
Detonation Waves; Ethylene; Gas Mixtures; Stability; Air; Numerical Analysis; Propagation

20040028094 Rensselaer Polytechnic Inst., Troy, NY, USA
Theoretical and Experimental Investigation of the Stability of an Evaporating Constrained Vapor Bubble
Wayner, P. C., Jr.; Plawsky, J. L.; Wong, Harris; February 10, 2004; 5 pp.; In English
Contract(s)/Grant(s): NAG3-2351; No Copyright; Avail: CASI; A01, Hardcopy

The major accomplishments of the experimental portion of the research were documented in Ling Zheng's doctoral dissertation. Using Pentane, he obtained a considerable amount of data on the stability and heat transfer characteristics of an evaporating meniscus. The important points are that experimental equipment to obtain data on the stability and heat transfer characteristics of an evaporating meniscus were built and successfully operated. The data and subsequent analyses were accepted by the Journal of Heat Transfer for publication in 2004 [PU4]. The work was continued by a new graduate student using HFE-7000 [PU3] and then Pentane at lower heat fluxes. The Pentane results are being analyzed for publication. The experimental techniques are currently being used in our other NASA Grant. The oscillation of the contact line observed in the experiments involves evaporation (retraction part) and spreading. Since both processes occur with finite contact angles, it is important to derive a precise equation of the intermolecular forces (disjoining pressure) valid for non-zero contact angles. This theoretical derivation was accepted for publication by Journal of Fluid Mechanics [PU5]. The evaporation process near the contact line is complicated, and an idealized micro heat pipe has been proposed to help in elucidating the detailed evaporation process [manuscripts in preparation].
Author
Bubbles; Stability; Vapors; Mathematical Models; Evaporation

20040028122 Massachusetts Inst. of Tech., Cambridge, MA
Active Control of Integrated Inlet/Compression Systems
Paduano, James P.; Ahsun, U.; Braddom, S.; Brear, M. J.; Bryanston-Cross, P. J.; Oct. 6, 2003; 117 pp.; In English
Contract(s)/Grant(s): F49620-00-C-0035
Report No.(s): AD-A419853; AFRL-SR-AR-TR-04-0090; No Copyright; Avail: CASI; A06, Hardcopy
This report describes the work done during the period between July 1, 2000 and June 30, 2003 on two topics: active control of separation and distortion in high subsonic supersonic inlets, and active control of inlet unstart in supersonic inlets. The report is divided into a summary, which highlights the major accomplishments of the program, and a set of papers describing the technical details.
DTIC
Supersonic Inlets; Active Control

20040030411 George Mason Univ., Fairfax, VA
Application of New Algorithms for the Simulation of Multidisciplinary Problems: Fluid Structure Thermal and Control Coupling
Lohner, Rainald; Yang, Chi; Dec. 2002; 21 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0015
Report No.(s): AD-A419909; 5-25024; AFRL-SR-AR-TR-04-0092; No Copyright; Avail: CASI; A03, Hardcopy
The overall objective of the research carried out over the last three years was the development of new algorithms for the efficient simulation of multidisciplinary problems that require the simulation of viscous, conducting, compressible flows around or within moving, structurally and thermally responding structures. The development was based on current 3-D Euler/Navier-Stokes capabilities, and encompassed flow solvers, grid generation, CFD-CSD-CTD integration, optimal shape design, and the efficient use of emerging super computer hardware. The research carried out over the last three years significantly advanced the state of the art in this are CFD.
DTIC
Computerized Simulation; Compressible Flow; Viscous Flow; Grid Generation (Mathematics)

20040030501 National Taiwan Univ., Taipei, Taiwan, Province of China
Moored Observations of Internal Solitions in the Northeastern South China Sea
Ramp, Steven R.; Tang, David; Lynch, Jim; Chiu, Ching-Santg; Duda, Tim; Dec. 2002; 42 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0275
Report No.(s): AD-A419938; No Copyright; Avail: CASI; A03, Hardcopy
No abstract available
Mooring; Seas

20040031482 Stanford Univ., Stanford, CA, USA

Numerical Simulation of High Drag Reduction in a Turbulent Channel Flow with Polymer Additives

Dubief, Yves; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 439-448; In English

Contract(s)/Grant(s): MDA972-01-C-0041; DARPA Order K042/31; DARPA Order K042/13; DARPA Order N115/00; NCC2-1371; No Copyright; Avail: CASI; A02, Hardcopy

The addition of small amounts of long chain polymer molecules to wall-bounded flows can lead to dramatic drag reduction. Although this phenomenon has been known for about fifty years, the action of the polymers and its effect on turbulent structures are still unclear. Detailed experiments have characterized two distinct regimes (Warholic et al. 1999), which are referred to as low drag reduction (LDR) and high drag reduction (HDR). The first regime exhibits similar statistical trends as Newtonian flow: the log-law region of the mean velocity profile remains parallel to that of the Newtonian ow but its lower bound moves away from the wall and the upward shift of the log-region is a function of drag reduction, DR. Although streamwise fluctuations are increased and transverse ones are reduced, the shape of the rms velocity profiles is not qualitatively modified. At higher drag reductions, of the order of 40-50%, the ow enters the HDR regime for which the slope of the log-law is dramatically augmented and the Reynolds shear stress is small (Warholic et al. 1999; Ptasinski et al. 2001). The drag reduction is eventually bounded by a maximum drag reduction (MDR) (Virk & Mickley 1970) which is a function of the Reynolds number. While several experiments report mean velocity profiles very close to the empirical profile of Virk & Mickley (1970) for MDR conditions, the observations regarding the structure of turbulence can differ significantly. For instance, Warholic et al. (1999) measured a near-zero Reynolds shear stress, whereas a recent experiment (Ptasinski et al. 2001) shows evidence of non-negligible Reynolds stress in their MDR flow. To the knowledge of the authors, only the LDR regime has been documented in numerical simulations (Sureshkumar et al. 1997; Dimitropoulos et al. 1998; Min et al. 2001; Dubief & Lele 2001; Sibilla & Baron 2002). This paper discusses the simulation of polymer drag reduced channel ow at HDR using the FENE-P (Finite Elastic non-linear extensibility-Peterlin) model which was used for the first LDR simulation by Sureshkumar et al. (1997). Flow and polymer parameters are close to realistic polymer drag reducing conditions. High drag reductions are achieved by using finite differences and a robust time stepping technique. A minimal channel flow is also used as a numerical experiment to investigate the effect of the outer region turbulent structures on the overall drag at HDR. The drag reducing action of the model is finally studied through the structure of energy transfers from the polymers to the velocity components. This investigation sheds some light on the details of polymer drag reduction.

Derived from text

Additives; Energy Transfer; Drag Reduction; Channel Flow; Turbulent Flow

20040031524 Stanford Univ., Stanford, CA, USA

Rough-Wall Channel Analysis Using Suboptimal Control Theory

Flores, O.; Jimenez, J.; Tenpleton, J.; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 413-424; In English

Contract(s)/Grant(s): NCC2-1371; CICyT-BFM2000-1468; No Copyright; Avail: CASI; A03, Hardcopy

The original aim of this work was to shed some light on the physics of turbulence over rough walls using large-eddy simulations and the suboptimal-control wall boundary conditions introduced by Nicoud et al. It was hoped that, if that algorithm was used to fit the mean velocity profile of the simulations to that of a rough-walled channel, instead of to a smooth one, the wall stresses introduced by the control algorithm would give some indication of what aspects of rough walls are most responsible for the modification of the flow in real turbulence. It was similarly expected that the structure of the resulting velocity fluctuations would share some of the characteristics of rough-walled flows, thus again suggesting what is intrinsic and what is accidental in the effect of geometric wall roughness. A secondary goal was to study the effect of 'unphysical' boundary conditions on the outside flow by observing how a relatively major change of the target velocity profile, and therefore presumably of the applied wall stresses, modifies properties such as the dominant length scales of the velocity fluctuations away from the wall. As will be seen below, this secondary goal grew more important during the course of the study, which was carried out during a short summer visit of the first two authors to the CTR. It became clear that there are open questions about the way in which the control algorithm models the boundary conditions, even for smooth walls, and that these questions make the physical interpretation of the results difficult. Considerable more work in that area seems to be needed before even relatively advanced large-eddy simulations, such as these, can be used to draw conclusions about the physics of wall-bounded turbulent flows. The numerical method is the same as in Nicoud et al. The modifications introduced in the original code are briefly described in section 2, but the original paper should be consulted for a full description of the algorithm. The results are presented in section 3 and summarized in section 4. The elementary properties of turbulence over rough walls which are

used in the text have been taken from recent reviews such as Raupach et al. or Jimenez.
Author
Turbulent Flow; Large Eddy Simulation; Walls; Surface Roughness

20040031530 Stanford Univ., Stanford, CA, USA
The Effect of the Density Ratio on the Nonlinear Dynamics of the Unstable Fluid Interface
Abarzhi, S. I.; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 251-260; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A02, Hardcopy

Here we report multiple harmonic theoretical solutions for a complete system of conservation laws, which describe the large-scale coherent dynamics in RTI and RMI for fluids with a finite density ratio in the general three-dimensional case. The analysis yields new properties of the bubble front dynamics. In either RTI or RMI, the obtained dependencies of the bubble velocity and curvature on the density ratio differ qualitatively and quantitatively from those suggested by the models of Sharp (1984), Oron et al. (2001), and Goncharov (2002). We show explicitly that these models violate the conservation laws. For the first time, our theory reveals an important qualitative distinction between the dynamics of the RT and RM bubbles.
Author
Bubbles; Flow Velocity

20040031532 Georgia Inst. of Tech., Atlanta, GA, USA
GSRP/David Marshall: Fully Automated Cartesian Grid CFD Application for MDO in High Speed Flows
November 14, 2003; 254 pp.; In English
Contract(s)/Grant(s): NGT2-52266; GT Proj. 1606R84; No Copyright; Avail: CASI; A12, Hardcopy

With the renewed interest in Cartesian gridding methodologies for the ease and speed of gridding complex geometries in addition to the simplicity of the control volumes used in the computations, it has become important to investigate ways of extending the existing Cartesian grid solver functionalities. This includes developing methods of modeling the viscous effects in order to utilize Cartesian grids solvers for accurate drag predictions and addressing the issues related to the distributed memory parallelization of Cartesian solvers. This research presents advances in two areas of interest in Cartesian grid solvers, viscous effects modeling and MPI parallelization. The development of viscous effects modeling using solely Cartesian grids has been hampered by the widely varying control volume sizes associated with the mesh refinement and the cut cells associated with the solid surface. This problem is being addressed by using physically based modeling techniques to update the state vectors of the cut cells and removing them from the finite volume integration scheme. This work is performed on a new Cartesian grid solver, NASCART-GT, with modifications to its cut cell functionality. The development of MPI parallelization addresses issues associated with utilizing Cartesian solvers on distributed memory parallel environments. This work is performed on an existing Cartesian grid solver, CART3D, with modifications to its parallelization methodology.
Author
Cartesian Coordinates; Computational Fluid Dynamics; Viscous Flow

20040031534 Stanford Univ., Stanford, CA, USA
Modeling Primary Breakup: A Three-Dimensional Eulerian Level Set/Vortex Sheet Method for Two-Phase Interface Dynamics
Herrmann, M.; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 185-196; In English
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

This paper is divided into four parts. First, the level set/vortex sheet method for three-dimensional two-phase interface dynamics is presented. Second, the LSS model for the primary breakup of turbulent liquid jets and sheets is outlined and all terms requiring subgrid modeling are identified. Then, preliminary three-dimensional results of the level set/vortex sheet method are presented and discussed. Finally, conclusions are drawn and an outlook to future work is given.
Author
Three Dimensional Models; Vortex Sheets; Two Phase Flow; Fluid Boundaries

20040031537 Stanford Univ., Stanford, CA, USA
Fragmentation under the Scaling Symmetry and Turbulent Cascade with Intermittency
Gorokhovski, M.; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 197-203; In English
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A02, Hardcopy

Fragmentation plays an important role in a variety of physical, chemical, and geological processes. Examples include atomization in sprays, crushing of rocks, explosion and impact of solids, polymer degradation, etc. Although each individual action of fragmentation is a complex process, the number of these elementary actions is large. It is natural to abstract a simple 'effective' scenario of fragmentation and to represent its essential features. One of the models is the fragmentation under the scaling symmetry: each breakup action reduces the typical length of fragments, r (right arrow) alpha r, by an independent random multiplier alpha (0 < alpha < 1), which is governed by the fragmentation intensity spectrum q(alpha), integral(sup 1)(sub 0) q(alpha)d alpha = 1. This scenario has been proposed by Kolmogorov (1941), when he considered the breakup of solid carbon particle. Describing the breakup as a random discrete process, Kolmogorov stated that at latest times, such a process leads to the log-normal distribution. In Gorokhovski & Saveliev, the fragmentation under the scaling symmetry has been reviewed as a continuous evolution process with new features established. The objective of this paper is twofold. First, the paper synthesizes and completes theoretical part of Gorokhovski & Saveliev. Second, the paper shows a new application of the fragmentation theory under the scale invariance. This application concerns the turbulent cascade with intermittency. We formulate here a model describing the evolution of the velocity increment distribution along the progressively decreasing length scale. The model shows that when the turbulent length scale gets smaller, the velocity increment distribution has central growing peak and develops stretched tails. The intermittency in turbulence is manifested in the same way: large fluctuations of velocity provoke highest strain in narrow (dissipative) regions of flow.
Author
Fragmentation; Scaling Laws; Symmetry

20040031593 Lawrence Livermore National Lab., Livermore, CA
Numerical Simulations of Shock-Induced Mixing and Combustion
Bell, J.; Day, M.; Kuhl, A.; Apr. 22, 2003; 10 pp.; In English
Report No.(s): DE2003-15004708; UCRL-JC-152256; No Copyright; Avail: Department of Energy Information Bridge
In this paper we use numerical simulation to investigate shock-induced ignition and combustion of a hydrocarbon gas. The focus of this paper is on quantifying the effect of fidelity in the chemical kinetics on the overall solution. We model the system using the compressible Navier Stokes equations for a reacting mixture. These equations express conservation of species mass, momentum, total energy.
NTIS
Combustion; Ignition; Shock Waves; Mixing; Reaction Kinetics

20040031597 Lawrence Livermore National Lab., Livermore, CA
Modeling of Building Scale Flow and Disperson
Lee, R. L.; Calhoun, R. J.; Chan, S. T.; Leone, J.; Stevens, D. E.; Jul. 10, 2001; 14 pp.; In English
Report No.(s): DE2003-15004713; UCRL-JC-142235; No Copyright; Avail: Department of Energy Information Bridge
Predictions of airflows around buildings and the associated thermal and dispersion phenomena continue to be challenging because of the presence of extremely heterogeneous surface structures within urban areas. Atmospheric conditions can induce local winds to flow around structures rather than over them. Thus pollutants that are released at or near the ground tend to persist at relatively low levels with only minimal ventilation of the airborne material away from the ground surface. While flow and dispersion phenomena can be studied within wind tunnel settings, recent advances in numerical modeling have enabled computational fluid dynamics (CFD) to evolve into an important tool in the simulation of building scale flows. The focus of this paper is to describe LLNL's effort in the development of a high-performance CFD model for simulating transport and diffusion of hazardous releases around buildings and building complexes. A number of new physics features have been implemented in order to customize the CFD model for the urban application. These include surface heating, vegetation canopy, heat and mass transfer and atmospheric stratification. Among the other issues considered are ingestion of urban data bases, grid nesting (coupling with large scale meteorological models), assimilation of meteorological or gridded data, and initial and boundary conditions.
NTIS
Air Flow; Buildings; Computational Fluid Dynamics; Mathematical Models; Wind Tunnel Tests

35
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*.

20040016447 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Instrument for Measuring Temperature of Water
Ryan, Robert; Nixon, Thomas; Pagnutti, Mary; Zanoni, Vicki; March 27, 2002; 2 pp.; In English
Report No.(s): NASA/NP-2002-07-00028-SSC; No Copyright; Avail: CASI; A01, Hardcopy

A pseudo-Brewster angle infrared radiometer has been proposed for use in noncontact measurement of the surface temperature of a large body of water (e.g., a lake or ocean). This radiometer could be situated on a waterborne, airborne, or spaceborne platform. The design of the pseudo-Brewster angle radiometer would exploit the spectral emissivity and polarization characteristics of water to minimize errors attributable to the emissivity of water and to the reflection of downwelling (e.g., Solar and cloud-reflected) infrared radiation.
Author (revised)
Water Temperature; Temperature Measuring Instruments; Infrared Radiometers

20040021328 Akron Univ., Akron, OH, USA
Manipulation of Micro Scale Particles in Optical Traps Using Programmable Spatial Light Modulation
Seibel, Robin E.; Decker, Arthur J., Technical Monitor; December 2003; 10 pp.; In English
Contract(s)/Grant(s): NAG3-2896; WBS 22-708-90-42
Report No.(s): NASA/CR-2003-212726; E-14250; No Copyright; Avail: CASI; A02, Hardcopy

1064 nm light, from an Nd:YAG laser, was polarized and incident upon a programmable parallel aligned liquid crystal spatial light modulator (PAL-SLM), where it was phase modulated according to the program controlling the PAL-SLM. Light reflected from the PAL-SLM was injected into a microscope and focused. At the focus, multiple optical traps were formed in which 9.975 m spheres were captured. The traps and the spheres were moved by changing the program of the PAL-SLM. The motion of ordered groups of micro particles was clearly demonstrated.
Author
Polarized Light; Light Modulators; Liquid Crystals; Manipulators; Traps

20040021363 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II
Moseley, Samuel H.; Allen, Christine; Benford, Dominic; Silverberg, Robert; Staguhn, Johannes; Dowell, Darren; Phillips, Tom; [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

We report on the performance of the SHARC II detector, a 12 x 32 array of ion implanted Si pop-up bolometers. This 384 element detector array was built as a prototype for the High Angular Resolution Widefield Camera (HAWC) for the Stratospheric Observatory for Infrared Astronomy (SOFIA). We will discuss the design process, the characterization of the detectors, and the performance of the array in the SHARC II instrument. SHARC II is now a facility instrument on the Caltech Submillimeter Observatory, providing background-limited imaging at 350 and 450 microns.
Author
Submillimeter Waves; Detectors; Astronomical Observatories; Imaging Techniques; Arrays; Design Analysis

20040021368 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Precision Metrology System for the Hubble Space Telescope Wide Field Camera 3 Instrument
Toland, Ronald W.; [2003]; 1 pp.; In English; SPIE-Optical Science and Technoogy Annual Meeting, 3-8 Aug. 2003, San Diego, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Wide Field Camera 3 (WFC3) instrument for the Hubble Space Telescope (HST) will replace the current Wide Field and Planetary Camera 2 (WFPC2). By providing higher throughput and sensitivity than WFPC2, and operating from the near-IR to the near-UV, WFC3 will once again bring the pefiormance of HST above that from ground-based observatories. Crucial to the integration of the WFC3 optical bench is a pair of 2-axis cathetometers used to view targets which cannot be seen by other means when the bench is loaded into its enclosure. The setup and calibration of these cathetometers is described, along with results from a comparison of the cathetometer system with other metrology techniques. Finally, the use of the

cathetometers on the flight optical bench and measurement results are given.
Author
Cameras; Hubble Space Telescope; Metrology; Spaceborne Photography

20040021408 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Radiant Temperature Nulling Radiometer
May 02, 2002; 3 pp.; In English
Report No.(s): NASA/NP-2002-06-00025-SSC; No Copyright; Avail: CASI; A01, Hardcopy

A nulling, self-calibrating infrared radiometer is being developed for use in noncontact measurement of temperature in any of a variety of industrial and scientific applications. This instrument is expected to be especially well-suited to measurement of ambient or near-ambient temperature and, even more specifically, for measuring the surface temperature of a natural body of water. Although this radiometer would utilize the long-wavelength infrared (LWIR) portion of the spectrum (wavelengths of 8 to 12 m), its basic principle of operation could also be applied to other spectral bands (corresponding to other temperature ranges) in which the atmosphere is transparent and in which design requirements for sensitivity and temperature-measurement accuracy could be satisfied. The underlying principle of nulling and self-calibration is the same as that of a typical microwave radiometer, but because of differences between the characteristics of signals in the infrared and microwave spectral regions, the principle must be implemented in a different way. A detailed description of the instrument including an infrared photodetector equipped with focusing input optics [e.g., lens(es) and/or mirrors] and an input LWIR band-pass filter is presented.
Derived from text
Infrared Radiometers; Calibrating; Temperature Measuring Instruments; Photometers; Radiance

20040027565 Droplet Measurement Technologies, Inc., Boulder, CO, USA
Black Carbon Measurements in SOLVE-2
Kok, Gregory L.; Baumgardner, Darrel R.; January 14, 2004; 64 pp.; In English
Contract(s)/Grant(s): NASW-03007; No Copyright; Avail: CASI; A04, Hardcopy

Droplet Measurement Technologies (DMT), under funding from NASA s Radiation Sciences Program, participated in the SOLVE II field campaign with measurements of light absorbing particles (black carbon and metals). These measurements were made with the Single Particle Soot Photometer (SP-2) on the NASA DC-8. The SP-2 is a new measurement technique that was developed under the SBIR program with funding from the Office of Naval Research. The original instrument suite for the DC-8 did not include the SP-2 and its addition and operation during SOLVE II was intended solely as a means to test its functionality and prepare it for future flight operations. For this reason it required several flights in the early stages of the project to tune its operation and fix some problems that arose. During the flights of January 26, 29, and 30, and February 2, 4 and 6, however, it worked as designed and acquired credible data.
Derived from text
Carbon; Soot; Metals; Measurement; Light (Visible Radiation); Absorption

20040027566 Space Telescope Science Inst., Baltimore, MD, USA
Comparative NIR Detector Characterization for NGST
Greenhouse, Matthew, Technical Monitor; Figer, Donald; February 02, 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-10430; STScI Proj. J0302; No Copyright; Avail: Other Sources; Abstract Only

List of publications for final perfomance report are: Detectors for the JWST Near-Infrared Spectrometer Rauscher, B.J., Strada, P., Regan, M.W., Figer, D.F., Jakobsen, P., Moseley, H.S., & Boeker, T. 2004, SPIE Detectors for the JWST Near-Infrared Spectrometer Rauscher, B.J., Strada, P., Regan, M.W., Figer, D.F., Jakobsen, P., Moseley, H.S., & Boeker, T. 2004, AAS, 203, 124.07 Independent Testing of JWST Detector Prototypes Figer, D.F., Rauscher, B. J., Regan, M. W., Morse, E., Balleza, J., Bergeron, L., & Stockman, H. S. 2003 , SPIE, 5 167 The Independent Detector Testing Laboratory and the NGST Detector Program Figer, D.F., Agronin, M., Balleza, J., Barkhouser, R., Bergeron, L., Greene, G. R., McCandliss, S. R., Rauscher, B. J., Reeves, T., Regan, M. W., Sharma, U., Stockman, H. S. 2003, SPIE, 4850,981 Intra-Pixel Sensitivity in NIR Detectors for NGST Sharma, U., Figer, D.F., Sivaramakrishnan, A., Agronin, M., Balleza, J., Barkhouser, R., Bergeron, L., Greene, G. R., McCandliss, S. R., Rauscher, B. J., Reeves, T., Regan, M. W., Stockman, H. S. 2003, SPIE, 4850,1001 NIRCAM Image Simulations for NGST Wavefiont SensinglPS A. Sivaramakrishnan, D. Figer, H. Bushouse, H. S. Stockman (STScI),C. Ohara , D. Redding (JPL), M. Im (IPAC), & J. Offenberg (Raytheon) 2003, SPIE, 4850,388 Ultra-Low Background Operation of Near-Infrared Detectors for NGS Rauscher, B. J., Figer, D. F., Agronin, M., Balleza, J., Barkhouser, R., Bergeron,

L., Greene, G. R., McCandliss, S. R., Reeves, T., Regan, M. W., Sharma, U., Stockman, H. S. 2003, SPIE, 4850,962 The Independent Detector Testing Laboratory and the JWST Detector Program Figer, D.F. et a1.2003, AAS201, #131.05
CASI
Spectrometers; Sensitivity; Detonators

20040027599 Vanguard Research, Inc., Scotts Valley, CA, USA
Irradiance Calibration of Space-Based Infrared Sensors
Walker, Russell G.; Cohen, Martin; Jul. 2000; 101 pp.; In English
Contract(s)/Grant(s): F19628-98-C-0047; Proj-MSX8
Report No.(s): AD-A419677; VRISV-1130-AR02; AFRL-VS-TR-2001-1608; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this work is to develop a basis for irradiance calibration of space-based infrared sensors. It is an extension of previous work that fully defines the context of the calibration, and the concepts of spectral composites and templates. We discuss four major accomplishments during the past year and our plans for the future. The accomplishments are: 1) Data from the MSX/SPIRIT III CBO6 celestial background calibration experiments have been reduced, validated and analyzed to produce a sub-network of calibration stars that are now integrated into the current calibration network. 2) The absolute calibration of the infrared radiometry of the MSX Point Source Catalog, Version 1. 2 (PSC1.2) has been validated. 3) An Air Force Bright Spectral Catalog (AFBSC) Version 1 has been developed and delivered that offers a new set of spectral (2-35micrometers) irradiance calibrators selected from the IR-brightest sources in the sky. 4) ASTCAT Version 2.0 was completed and delivered to the PL DAC in support of the MSX Point Source Catalog.
DTIC
Infrared Detectors; Calibrating; Irradiance

20040027675 Stanford Univ., Stanford, CA
The Light Field Video Camera
Wilburn, Bennett; Smulski, Michal; Lee, Kelin; Horowitz, Mark A.; Aug. 2000; 8 pp.; In English
Report No.(s): AD-A419717; No Copyright; Avail: CASI; A02, Hardcopy

We present the Light Field Video Camera, an array of CMOS image sensors for video image based rendering applications. The device is designed to record a synchronized video dataset from over one hundred cameras to a hard disk array using as few as one PC per fifty image sensors. It is intended to be flexible, modular and scalable, with much visibility and control over the cameras. The Light Field Video Camera is a modular embedded design based on the 1EEE1394 High Speed Serial Bus, with an image sensor and MPEG2 compression at each node. We show both the flexibility and scalability of the design with a six camera prototype.
DTIC
Image Processing; Cameras; Cmos

20040027700 Anro Engineering, Inc., Maynard, MA
Batteryless Sensor for Intrusion Detection and Assessment of Threats
Ross, Gerald F.; Cain, Lee R.; Ciccarelli, Steven M.; Aug. 2003; 206 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DNA001-95-C-0175; Proj-AE
Report No.(s): AD-A419859; DSWA-TR-98-47; No Copyright; Avail: CASI; A10, Hardcopy

A new series of security sensors has been sucessfully developed by ANRO engineering, Inc. (ANRO) to detect intruders, and signal a remote alarm without batteries, external power or wiring. These wireless and self-powered (WASP) sensors are inherently covert both in the installation and presence of the sensor, and the low probability of intercept/detection (LPI/D) wireless link. Demonstration models have been constructed for hidden placement in existing doorknobs, doorjambs and windows. The operation of the sensors is not discernible to an intruder, and does not depend upon the speed of activation. A wireless link was developed that operates within the FCC Part 15 for unlicensed oepration, as well as within the guidelines for frequency allocation for many government facilities. The wireless link uses a coded signal to discriminate between more than 1024 sensors within an area. ANRO was particularly successful in keeping the cost of the sensors as low as possible. The cost of the components that are added to the lockset in a doorknob, for example, is estimated to be under $5. This new WASP sensor technology can be applied to keyless lock systems used in secure facilities and storage containers, and for commercial applications such as keyless hotel doors.
DTIC
Threat Evaluation; Frequency Assignment; Security

20040027702 Air Force Research Lab., Wright-Patterson AFB, OH
Signal Processing Architectures for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Applications
Mitra, Atindra; Germann, Joe; Nehrbass, John; Sep. 2002; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419864; No Copyright; Avail: CASI; A03, Hardcopy

Presentation of signal processing architectures for ultra-wideband wide-angle synthetic aperture radar applications.
DTIC
Image Processing; Synthetic Aperture Radar; Architecture (Computers)

20040027765 Texas Univ., Austin, TX, USA
A Simple Transverse Motion Detector for Railguns
Levinson, S. J.; Bless, Stephan; Jan. 2004; 5 pp.; In English
Contract(s)/Grant(s): DAAD17-01-D-0001
Report No.(s): AD-A419772; IAT.R-0326; No Copyright; Avail: CASI; A01, Hardcopy

This paper addresses the accurate measurement of the transverse armature-sabot motion during a railgun shot. One way to make such measurements is to use three orthogonally arranged piezorestive accelerometers made by ENDEVCO. Model 7270A-200k is a tiny unit rated for measurements up to 200 kGee. Each unit costs about $ 1,500 and has a specified 4-kGee uncertainty due to 'non-linearity and hysteresis' and a 5 percent 'transverse sensitivity.' There are 'Zero shifts' -an output voltage corresponding to 0 acceleration, and the unit can be highly susceptible to electromagnetic interference (EMI). Assuming a railgun-launched armature experiences a 10 percent transverse/longitudinal acceleration ratio, a 100-kGee axial launch will result in a transverse measurement uncertainty on the same order of magnitude as the measurement itself. Expense and measurement uncertainty are the principal liabilities of the piezorestive-accelerometer method for measuring transverse acceleration. The new method, below, addresses these liabilities.
DTIC
Sabot Projectiles; Tracking (Position); Railgun Accelerators

20040027770
SiGe Quantum Well Infrared Photodetectors (QWIPs) for Remote Sensing Applications
Harrison, Paul; Nov. 11, 2002; 17 pp.; In English
Contract(s)/Grant(s): F61775-01-W-E088
Report No.(s): AD-A419724; SPC-01-4088; No Copyright; Avail: CASI; A03, Hardcopy

This report results from a contract tasking University of Leeds as follows: The contractor will investigate SiGe photodetectors. These photodetectors support simpler manufacturing, greater reliability, improved ruggedness and reduced cost when compared with more exotic photodetectors (such as HgTe). The contractors research will focus on p-type material, which allows for normal incidence absorption of the light and again the possibility of reducing the number of steps in the fabrication, which could lead to greater pixel utilization. The contractor's investigation will also evaluate the potential for Increasing the detection wavelength of SiGe devices. The mid- and long-wave infrared regions of the spectrum contain many molecular absorption lines; the extension of this to beyond 30 microns will encompass more chemical species and opens up a route for remote gas sensing.
DTIC
Germanides; Silicon Compounds; Quantum Wells; Photometers; Infrared Detectors

20040027846 Mercury Computer Systems, Inc., Chelmsford, MA, USA
Real-Time Geo-Registration on High-Performance Computers
Chao, Alan; Burke, Monica; Kurien, Thomas; Cico, Luke; Sep. 24, 2002; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419810; No Copyright; Avail: CASI; A03, Hardcopy

Viewgraphs on presentation of real-time geo- registration on high performance computers.
DTIC
Computers; Real Time Operation; Image Resolution

20040027955 NASA Langley Research Center, Hampton, VA, USA

L-C Measurement Acquisition Method for Aerospace Systems

Woodard, Stanley E.; Taylor, B. Douglas; Shams, Qamar A.; Fox, Robert L.; [2003]; 11 pp.; In English; AIAA 3rd Annual Aviation Technology, Integration and Operations Technical Forum, 17-19 Nov. 2003, Denver, CO, USA; Original contains black and white illustrations

Contract(s)/Grant(s): 23-762-60-61

Report No.(s): AIAA Paper 2003-6842; Copyright; Avail: CASI; A03, Hardcopy

This paper describes a measurement acquisition method for aerospace systems that eliminates the need for sensors to have physical connection to a power source (i.e., no lead wires) or to data acquisition equipment. Furthermore, the method does not require the sensors to be in proximity to any form of acquisition hardware. Multiple sensors can be interrogated using this method. The sensors consist of a capacitor, C(p), whose capacitance changes with changes to a physical property, p, electrically connected to an inductor, L. The method uses an antenna to broadcast electromagnetic energy that electrically excites one or more inductive-capacitive sensors via Faraday induction. This method facilitates measurements that were not previously possible because there was no practical means of providing power and data acquisition electrical connections to a sensor. Unlike traditional sensors, which measure only a single physical property, the manner in which the sensing element is interrogated simultaneously allows measurement of at least two unrelated physical properties (e.g., displacement rate and fluid level) by using each constituent of the L-C element. The key to using the method for aerospace applications is to increase the distance between the L-C elements and interrogating antenna; develop all key components to be non-obtrusive and to develop sensing elements that can easily be implemented. Techniques that have resulted in increased distance between antenna and sensor will be presented. Fluid-level measurements and pressure measurements using the acquisition method are demonstrated in the paper.

Author

Aerospace Systems; Multisensor Applications

20040030401 Missouri Univ., Rolla, MO, USA

Multidisciplinary Research in Mine Detection and Neutralization Systems: Missouri-Led Muri

Mitchell, Robert; Agarwal, Sanjeev; Dec. 15, 2003; 29 pp.; In English

Contract(s)/Grant(s): DAAG55-97-1-0014

Report No.(s): AD-A419934; ARO-36258.23-EV-MUR; No Copyright; Avail: CASI; A03, Hardcopy

The primary purpose of our MURI project was to explore and quantify the basic scientific and mathematical phenomena which can be exploited to detect, locate, and identify landmines, buried or on the earth's surface. Basic research projects was aimed at supporting the Army missions of airborne screening for minefields, forward-looking mine detection from vehicle-mounted systems, and mine detection with hand-held systems. Basic research projects were undertaken in the areas of signal processing and detection algorithms for Ground Penetrating Radar (GPR), multi-algorithm and multi-sensor fusion, image processing and detection algorithms for lightweight airborne mine detection, concepts for designing and fielding new OPR based mine detection systems, human in the loop analysis of operator pefformance and virtual reality systems for training for hand- held mine detection, detection of EMI from printed circuit boards in land mines, and development of new sensing strategies based on chemical vapor sniffing. Oood improvements in probabilities of detection and false alarm rates have been achieved in the algorithm work. Significant improvement in training effectiveness was demonstrated with virtual reality training. Very sensitive chemical detectors have been evaluated in laboratory settings.

DTIC

Mine Detectors; Neutralizers; Multidisciplinary Research; Applications of Mathematics

20040030457 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Mass Calculations from X-Ray Shadowgraphs Using Image Processing, Phase 3

vanderWulp, C. J. M.; April 2003; 49 pp.; In Dutch

Contract(s)/Grant(s): B96/KL/497; TNO Proj. 014.10661

Report No.(s): PML-2002-A100; TD-2002-0174; Copyright; Avail: Other Sources

In this repot (Phase 3) two other important aspects with respect to the calculation of the mass of shell fragments from X-ray shadowgraphs have been investigated. The first aspect deals with the dislocation of the maximum grey value in cylindrical objects. The cause is omnidirectional X-ray scattering against the concrete floor. This effect can be overcome by adequate shielding of the source and applying a collimator in front of the radiating electrode. Once these precautions are taken the maximum attenuation and grey value coincide with the geometric center of the object. Next the building up of the grey values inside cylindrical, square and wedge shaped objects has been investigated extensively. It is shown that the grey value

is determined not only by the sheer thickness of the object but the geometric shape of the object plays an important role as well. Not only the grey values in the images themselves but also the derivative of the grey values have to be taken into account in order to calculate the mass of a fragment most accurately. From this study it can be concluded that calculation of the fragment mass is not a straight forward matter but is rather complex. In order to obtain reliable results no pains should be spared to understand the complex problem of broad spectrum Compton scattering inside the objects.
Author
Shadowgraph Photography; X Ray Imagery; X Ray Scattering; Image Processing

20040030567 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Relative Motion of Two Spacecraft Near the Sun-Earth L2 Point
Collange, Guillaume; Leitner, Jesse; December 23, 2003; 1 pp.; In English; AIAA GN and C Conference, 1 Aug. 2004, Providence, RI, USA; No Copyright; Avail: Other Sources; Abstract Only

Over the next two decades international space agencies including the National Aeronautics and Space Administration and the European Space Agency are proposing space missions which employ distributed spacecraft technologies to enable vast improvements in remote sensing performance as compared to fundamental performance limitations associated with fairing sizes of even the largest launch vehicles. These missions will require numerous advanced technologies to enable some extreme scientific goals. However, on the critical path to developing many of those technologies, understanding realistic achievable performance, and formulating such missions involving formation flying spacecraft, is the detailed understanding of the vehicle relative motion in the appropriate dynamic environment. Due to the appealing gravitational and thermal environment, the Sun-Earth L(sub 2) point is a strong candidate for placement of many of these missions. Henceforth, this paper begins to unravel the dynamics of relative motion near L(sub 2), with particular consideration given to the ultimate requirements for flying space- craft in precise formation. This work is meant to be a predecessor to detailed formation flying mission analysis efforts in the areas of formation design, formation control, and relative navigation.
Author
Formation Flying; NASA Programs; Remote Sensing; Spacecraft Motion; Thermal Environments

20040031364 Physics and Electronics Lab. TNO, The Hague, Netherlands
Exploratory Measurements of the Effect of Electro Magnetic Interference on EO/IR Sensors and Several Mitigation Options
Boetz, H. E. R.; Schwerting, P. B. W.; July 2003; 40 pp.; In English
Contract(s)/Grant(s): V049; TNO Proj. 015.29458/01.01
Report No.(s): TD-2003-0018; FEL-03-A025; Copyright; Avail: Other Sources

The objectives of the EO/IR sensor projects in the program Integrated Topside Design (ITD) are to design, test, and evaluate techniques and tools for detection performance. The purpose of the present project was to design tools to estimate EMI influence on the performance of EO and infrared video cameras. For this purpose we performed: 1) A literature survey; 2) EMI interference measurements; 3) Analysis of these EMI measurement data; 4) Design of tools due to EMI to evaluate performance degradation. These points are described in the following sections. Most emphasis was placed on the EMI measurements. It was a priori estimated that electromagnetic interference (EMI) on state of the art infrared and other electro-optical sensors on board of a ship is an uncertain aspect that could influence detection performance in a negative way. It is expected that future equipment, like staring IRSTs, will be configured with more commercial-off-the-shelf (COTS) components than used at present. Furthermore the complexity of these staring sensors, compared to scanning devices, as well as the need for system integration on the ship topside, makes the need for EMI shielding more serious. A summary of the results from this report has been used in the progress report in the programme Integrated Topside Design.
Author
Electromagnetic Interference; Electro-Optics; Infrared Detectors

36
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*.

20040016314 NASA Goddard Space Flight Center, Greenbelt, MD, USA
TerraHertz Free Electron Laser Applications for Satellite Remote Sensing
Heaps, William S.; [2003]; 1 pp.; In English; Workshop on TerraHertz Applications of the Hawaii Free Electron Laser, 16 Jan. 2004, HI, USA; No Copyright; Avail: Other Sources; Abstract Only

The development of a Free Electron Laser (EL) operating in the terahertz frequency regime by the group at the University of Hawaii (Elias et al.) represents a significant new opportunity in the area of atmospheric remote sensing. The FEL has 2 salient features that create a unique opportunity. First of all it represents the only source in this frequency range with sufficient power to enable lidar instrumentation. Secondly its very high electrical efficiency (several times more efficient than any currently employed spaceborne laser) renders it a strong candidate for use in satellite remote sensing. On the negative side the atmosphere is rather strongly absorbing throughout this frequency range due primarily to the water vapor continuum absorption. This means that the instruments using this laser will not be able to access the lower troposphere because of its very high water concentration.. However the instrument will be very capable of measurements in the upper troposphere and stratosphere. A passive instrument, the Microwave Limb Sounder on the UARS satellite operated by Jet Propulsion Laboratory, has already demonstrated that this wavelength region can be used for chemical species with strong emission lines. A lidar would complement the capabilities of this instrument by providing the capability to measure absorbing species in the upper atmosphere. I will discuss the design of such an instrument in greater detail and estimate its performance in measuring a number of chemical species of interest to the Earth Science community.
Author
Free Electron Lasers; Satellite Observation; Remote Sensing; Fabrication; Water Vapor; Laser Applications

20040027733 Nebraska Univ., Lincoln, NE
Transmission Measurements of Femtosecond Laser Pulses Through Aerosols
Alexander, Dennis R.; Li, Jianchao; Zhang, Haifeng; Doerr, David; Dec. 9, 2003; 27 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0928
Report No.(s): AD-A419719; No Copyright; Avail: CASI; A03, Hardcopy

Investigations of ultra short femtosecond pulse propagation of > 9 fs were carried out in aerosol clouds of 10(exp 14) particles per cc and for fused silica, and cells containing water. Results indicated that there is a trend for greater transmission as the pulse length is shortened. The results indicated that the phenomena is just on the turn on of the electron not being able to follow the applied electric fields.
DTIC
Pulsed Lasers; Laser Beams; Aerosols

20040027806 Allwood and Associates, Inc., Mentor, OH, USA
International Workshop on Quantum Cascade Lasers. Meeting Program, Abstract Book & Attendee Roster. January 4-8, 2004, Seville, Spain
Allwood, Shari J.; Jan. 13, 2004; 73 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0435
Report No.(s): AD-A419888; AFRL-SR-AR-TR-04-0061; No Copyright; Avail: CASI; A04, Hardcopy

This document contains abstracts of papers presented at the International Workshop on Quantum Cascade Lasers held 4 Jan 2001 in Seville, Spain.
DTIC
Quantum Theory; Lasers; Quantum Cascade Lasers; Abstracts

20040027837 Air Force Research Lab., Edwards AFB, CA, USA
Benefit of Constant Momentum Propulsion for Large Delta V Missions -Applications to Laser Propulsion
Larson, C. W.; Mead, Franklin B., Jr; Knecht, Sean D.; Jan. 2004; 21 pp.; In English
Contract(s)/Grant(s): Proj-4847
Report No.(s): AD-A419778; AFRL-PR-ED-VG-2003-315; No Copyright; Avail: CASI; A03, Hardcopy
No abstract available
Laser Propulsion; Momentum; Propulsion

20040027841 Army Aviation Systems Command, Fort Eustis, VA, USA
Laser Obstacle Detection System Flight Testing
Davis, Timothy; Centolanze, Louis; Sep. 2003; 137 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419894; USAAMCOM-TR-03-D-49; No Copyright; Avail: CASI; A07, Hardcopy
The USSOCOM Mission Needs Statement (MNS) and Joint Operational Requirements Document (JORDS) on a Cable Warning/Obstacle Avoidance System define the need for an obstacle detection sensor for U.S. Military helicopters. The Helicopter Laser Radar System (HELLAS) was developed in Germany by EADS-Dornier. The Laser Obstacle Detection System (LODS) Foreign Comparative Test (FCT) program began in March 2002 with the objective of evaluating the HELLAS on a U.S. Army helicopter. The managing agency of the LODS-FCT is the U. S. Army Night Vision and Electronic Sensors Directorate (NVESD). The Aviation Applied Technology Directorate (AATD) was contracted to mount the HELLAS sensor on the nose of a UH- 60L Blackhawk helicopter and to conduct flight tests to evaluate the HELLAS obstacle detection sensor. The UH-60L aircraft chosen as the host platform was Tail Number 468. The primary goal of the LODS-FCT flight demonstration was to evaluate, on a helicopter platform, the capability of the UH- 6OL-mounted HELLAS system to detect wires along the flight path and as an aide to avoid the wires. To achieve this objective, sensor installation, aircraft checkout, and flight testing were conducted. Concurrent with this testing, laser raw data (angle-angle-range) including INU/GPS data to support studies was collected to determine the ability of the HELLAS system to detect general obstacles (poles, towers, etc.) and to provide precision landing information to assist rotary wing aircraft and UAV's during the critical landing phases of shipboard operations. Enclosures include a CHPPM Laser Safety Test Report, LODS FCT Flight Test Plan, Daily Flight Reports, Flight Test Cards (Pilot), and Flight Test Cards (System Operator). (18 figures, 2 tables, 5 refs.)
DTIC
Optical Radar; Pulsed Lasers; Helicopters

20040030397
Experimental Operations and Support for LITE
Gallant, David J.; Jul. 2001; 12 pp.; In English
Contract(s)/Grant(s): F29601-00-D-0169; Proj-2301
Report No.(s): AD-A419927; 01RTS068; AFRL-DE-TR-2001-1066; No Copyright; Avail: CASI; A03, Hardcopy
This scope of this task was to provide for the setup, measurement and data analysis of current and future efforts related to high-power solid state lasers. Laboratory operations and fiber laser development support are discussed.
DTIC
Solid State Lasers; Experimentation

20040030413
Low Temperature Alpha Measurement
Gallant, David J.; Jul. 2001; 10 pp.; In English
Contract(s)/Grant(s): F29601-00-D-0169; Proj-3326
Report No.(s): AD-A419916; 01RTS067; AFRL-DE-TR-2001-1065; No Copyright; Avail: CASI; A02, Hardcopy
The objective of this task was to provide for the setup, measurement and data analysis of an experiment to measure the alpha parameter of diode lasers. The alpha parameter oharacterized the degree of coupling between the diode laser carriers and the material index of refraction. This parameter has been measured extensively at room temperature and this task extended the measurement regime to low temperatures.
DTIC
Semiconductor Lasers; Low Temperature

37
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*.

20040016273 Department of the Navy, Washington, DC
Elastomeric Ejection System with Acoustically Improved Check Valve
Barker, William P., Inventor; Sep. 8, 2003; 17 pp.; In English
Patent Info.: Filed 8 Sep. 2003; US-Patent-Appl-SN-10657773
Report No.(s): AD-D020116; No Copyright; Avail: Other Sources

A system for launching bodies from a submarine includes a pump for transferring seawater to an elastomeric ejection tank, and a check valve that permits transfer of the seawater to the tank, and closes upon filling of the tank. The valve includes a head and a seat, a stem having fixed thereon the head and a disk having a circular protrusion extending toward the seat, a cup mounted around the stem and having a circular depression in a surface thereof, and radially extending holes disposed in the cup. During valve closure, the disk protrusion enters the cup depression forcing water in the depression to exit the cup through a primary restrictive path of an annular gap between the protrusion and depression, and a secondary restrictive path of the radially extending holes to slow the valve head in movement during engagement with the valve seat.
DTIC
Ejection; Elastomers; Valves; Submarines; Underwater Acoustics

20040016326 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures
Peairs, Daniel M.; Grisso, Benjamin; Inman, Daniel J.; Page, Kenneth R.; Athman, Robert; Margasahayam, Ravi N.; October 2003; 23 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TM-2003-211193; No Copyright; Avail: CASI; A03, Hardcopy

Many of the structures responsible for the launch, ground systems and support operations of the space shuttle are still being used well past their nominal expected design life. This has led to an increased interest in monitoring these structures in order to decrease the risk of eventual breakdown or structural failure. One monitoring method, which has shown promising results for such applications, is the impedance-based structural health monitoring technique. This paper presents results from proof-of-concept tests on the launch pad's orbiter access arm bolted connection, solid rocket booster hold down post, mobile launch platform heat shield and crawler transporter bearing. Modification for future tests are suggested.
Author
Space Shuttle Boosters; Systems Health Monitoring; Mechanical Impedance; Ground Support Systems; Mechanical Engineering; Smart Materials

20040016436 Research Triangle Inst., USA
Seal Ring Installation
August 21, 2001; 3 pp.; In English; Original contains poor quality, truncated or crooked pages
Report No.(s): SE-2001-08-00047-SSC; No Copyright; Avail: CASI; A01, Hardcopy

The Seal Ring Installation Tool (SRIT) is a type of clamping pliers with arm extensions. The arms are tipped with V-groove jaws that grip the seal ring on the edge and lock it in place. Once the seal ring is in position, the pipes are brought together and the SRIT is withdrawn.
Derived from text
Tools; Clamps

20040027561 Shape Change Technologies, LLC, Thousand Oaks, CA, USA
Preliminary Sizings for an Integrated SME Actuator System for the STAR system
Jardine, A. Peter; [2004]; 13 pp.; In English
Contract(s)/Grant(s): NAG1-03065; No Copyright; Avail: CASI; A03, Hardcopy

The Star configuration consists of three legs of an aperature of total diameter of 2.5 m diameter. For the purposes of this initial study for actuator requirements, several assumptions were made. For support, we assumed that the membrane was Upilex of a thickness of 0.010 in. thick, and with a modulus of approximately YYY. Upilex was chosen as being relatively commercially available and is compatible with either TiNi or AuCd manufacture. We confined the areas in which we could

apply actuators to three strips of length 2.5 meters and width of 0.1 m. This brings the problem to a solution of a strip.
Derived from text
Actuators; Shape Memory Alloys; Size (Dimensions)

20040027572 Toledo Univ., OH, USA
Fault Tolerant Magnetic Bearing Testing and Conical Magnetic Bearing Development for Extreme Temperature Environments
Keith, Theo G., Jr.; Clark, Daniel; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NCC3-1061; No Copyright; Avail: CASI; A01, Hardcopy

During the six month tenure of the grant, activities included continued research of hydrostatic bearings as a viable backup-bearing solution for a magnetically levitated shaft system in extreme temperature environments (1000 F), developmental upgrades of the fault-tolerant magnetic bearing rig at the NASA Glenn Research Center, and assisting in the development of a conical magnetic bearing for extreme temperature environments, particularly turbomachinery. It leveraged work from the ongoing Smart Efficient Components (SEC) and the Turbine-Based Combined Cycle (TBCC) program at NASA Glenn Research Center. The effort was useful in providing technology for more efficient and powerful gas turbine engines.
Derived from text
Fault Tolerance; Gas Turbine Engines; Magnetic Bearings; High Temperature Environments; Hydrostatics; Test Facilities

20040027583 NASA Glenn Research Center, Cleveland, OH, USA
PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems
Jansen, Ralph; Lebron, Ramon; Dever, Timothy P.; Birchenough, Arthur G.; December 2003; 12 pp.; In English; First International Energy Conversion Engineering Conference, 17-21 Aug. 2003, Portsmouth, VA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC3-916; WBS 22-755-60-12
Report No.(s): NASA/TM-2003-212622; E-14180; AIAA Paper 2003-6107; No Copyright; Avail: CASI; A03, Hardcopy

A flywheel magnetic bearing (MB) pulse width modulated power amplifier (PWM) configuration is selected to minimize noise generated by the PWMs in the flywheel position sensor system. Two types of noise are addressed: beat frequency noise caused by variations in PWM switching frequencies, and demodulation noise caused by demodulation of high order harmonics of the switching voltage into the MB control band. Beat frequency noise is eliminated by synchronizing the PWM switch frequencies, and demodulation noise is minimized by selection of a switching frequency which does not have harmonics at the carrier frequency of the sensor. The recommended MB PWM system has five synchronized PWMs switching at a non-integer harmonic of the sensor carrier.
NASA
Magnetic Suspension; Frequencies; Eddy Currents; Power Amplifiers; Pulse Duration

20040028037 NASA Glenn Research Center, Cleveland, OH, USA
Mechanical Components Branch Test Facilities and Capabilities
Oswald, Fred B.; January 2004; 26 pp.; In English
Contract(s)/Grant(s): WBS 22-714-08-11
Report No.(s): NASA/TM-2004-212722; E-14246; No Copyright; Avail: CASI; A03, Hardcopy

The Mechanical Components Branch at NASA Glenn Research Center formulates, conducts, and manages research focused on propulsion systems for both present and advanced aeronautical and space vehicles. The branch is comprised of research teams that perform basic research in three areas: mechanical drives, aerospace seals, and space mechanisms. Each team has unique facilities for testing aerospace hardware and concepts. This report presents an overview of the Mechanical Components Branch test facilities.
Author
Mechanical Drives; Test Facilities; Dynamic Tests; Turbine Engines; Aerospace Engineering

20040028052 NASA Glenn Research Center, Cleveland, OH, USA
Advanced Control Surface Seal Development for Future Space Vehicles
DeMange, J. J.; Dunlap, P. H., Jr.; Steinetz, B. M.; January 2004; 22 pp.; In English; 39th Combustion Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA
Contract(s)/Grant(s): WBS 22-794-40-4V
Report No.(s): NASA/TM-2004-212898; E-14305; No Copyright; Avail: CASI; A03, Hardcopy

NASA s Glenn Research Center (GRC) has been developing advanced high temperature structural seals since the late 1980's and is currently developing seals for future space vehicles as part of the Next Generation Launch Technology (NGLT) program. This includes control surface seals that seal the edges and hinge lines of movable flaps and elevons on future reentry vehicles. In these applications, the seals must operate at temperatures above 2000 F in an oxidizing environment, limit hot gas leakage to protect underlying structures, endure high temperature scrubbing against rough surfaces, and remain flexible and resilient enough to stay in contact with sealing surfaces for multiple heating and loading cycles. For this study, three seal designs were compared against the baseline spring tube seal through a series of compression tests at room temperature and 2000 F and flow tests at room temperature. In addition, canted coil springs were tested as preloaders behind the seals at room temperature to assess their potential for improving resiliency. Addition of these preloader elements resulted in significant increases in resiliency compared to the seals by themselves and surpassed the performance of the baseline seal at room temperature. Flow tests demonstrated that the seal candidates with engineered cores had lower leakage rates than the baseline spring tube design. However, when the seals were placed on the preloader elements, the flow rates were higher as the seals were not compressed as much and therefore were not able to fill the groove as well. High temperature tests were also conducted to asses the compatibility of seal fabrics against ceramic matrix composite (CMC) panels anticipated for use in next generation launch vehicles. These evaluations demonstrated potential bonding issues between the Nextel fabrics and CMC candidates.
Author
Sealing; Aerospace Vehicles; Control Surfaces; Reentry Vehicles; Technology Utilization; Mechanical Engineering

20040028120 Michigan Univ., Ann Arbor, MI
Micromachined Precision Inertial Instruments
Najafi, Khalil; Nov. 2003; 106 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-2-0231; Proj-E117
Report No.(s): AD-A419850; AFRL-IF-RS-TR-2003-276; No Copyright; Avail: CASI; A06, Hardcopy
This program focuses on developing inertial-grade micromachined accelerometers and gyroscopes and their associated electronics and packaging for use in a variety of military and commercial applications. During the project timeline in-plane, out-of-plane and monolithic 3-axis accelerometers have been developed with their interface electronics. Analysis, simulation, fabrication, and testing techniques for these accelerometer systems have been developed.
DTIC
Accelerometers; Military Technology; Gyroscopes; Microelectromechanical Systems

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20040021315 North Carolina State Univ., Raleigh, NC, USA
Health Monitoring of RLV Airframe Structures
Yuan, F. G.; Peters, K.; September 10, 2003; 66 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-01082; No Copyright; Avail: CASI; A04, Hardcopy
This final report is divided into three sections on health monitoring technologies: 1) Analysis of Optical Fiber Bragg Grating Sensor Data from Composite Wing Box Experiment; 2) Current Optical Fiber Bragg Grating Sensor Data Acquisition Design; and 3) Damages Identification of a Composite Plate by Prestack Reverse-Time Migration Technique. The report also includes an appendix, 'Group Velocities of Flexural Waves in a Composite Plate'.
CASI
Systems Health Monitoring; Airframes; Reusable Launch Vehicles

39
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*.

20040016408 Lawrence Livermore National Lab., Livermore, CA
Experimental Assessment of Gradient Plasticity
Barney, M. M.; Campbell, G. H.; Stoelken, J. S.; Schwartz, A. J.; Plitzko, J. M.; Dec. 14, 2000; 14 pp.; In English
Report No.(s): DE2003-15004766; UCRL-JC-139807; No Copyright; Avail: Department of Energy Information Bridge

Classical plasticity theories generally assume that the stress at a point is a function of strain at that point only. However, when gradients in strain become significant, this localization assumption is no longer valid. A common factor in the failure of these conventional models is that, since they do not account for the strain gradients, they do not display a size effect. This effect is seen experimentally when the scale of the phenomenon of interest is on the order of several microns. At this scale, strain gradients are of a significant magnitude as compared to the overall strain and must be considered for models to accurately capture observed phenomena.
NTIS
Plastic Properties; Failure; Position (Location)

20040016409 Lawrence Livermore National Lab., Livermore, CA
ParaDyn A Parallel Nonlinear, Explicit, Three-Dimensional Finite-Element Code for Solid and Structural Mechanics User Manual
Hoover, C. G.; De Groot, A. J.; Sherwood, R. J.; Jun. 01, 2000; 60 pp.; In English
Report No.(s): DE2003-15004769; UCRL-MA-140943; No Copyright; Avail: Department of Energy Information Bridge

ParaDyn is a parallel version of the DYNA3D computer program, a three-dimensional explicit finite-element program for analyzing the dynamic response of solids and structures. The ParaDyn program has been used as a production tool for over three years for analyzing problems which range in size from a few tens of thousands of elements to between one-million and ten-million elements. ParaDyn runs on parallel computers provided by the Department of Energy Accelerated Strategic Computing Initiative (ASCI) and the Department of Defense High Performance Computing and Modernization Program. Preprocessing and post-processing software utilities and tools are designed to facilitate the generation of partitioned domains for processors on a massively parallel computer and the visualization of both resultant data and boundary data generated in a parallel simulation. This manual provides a brief overview of the parallel implementation; describes techniques for running the ParaDyn program, tools and utilities; and provides examples of parallel simulations.
NTIS
Finite Element Method; Nonlinearity; Mechanical Properties; Computer Programs; Dynamic Response

20040020060 Lawrence Livermore National Lab., Livermore, CA
Simulations of Underground Structures Subjected to Dynamic Loading using the Distinct Element Method
Morris, J. P.; Glenn, L. A.; Heuze, F. E.; Bonner, M. P.; Jul. 14, 2003; 12 pp.; In English
Report No.(s): DE2003-15005128; UCRL-JC-146927-R2; No Copyright; Avail: Department of Energy Information Bridge

We present preliminary results from a parameter study investigating the stability of underground structures in response to explosion-induced strong ground motions. In practice, even the most sophisticated site characterization may lack key details regarding precise joint properties and orientations within the rock mass. Thus, in order to place bounds upon the predicted behavior of a given facility, an extensive series of simulations representing different realizations may be required. The influence of both construction parameters (reinforcement, rock bolts, liners) and geological parameters (joint stiffness, joint spacing and orientation, and tunnel diameter to block size ratio) must be considered. We will discuss the distinct element method (DEM) with particular emphasis on techniques for achieving improved computational efficiency, including the handling of contact detection and approaches to parallelization. We also outline the continuum approaches we employ to obtain boundary conditions for the distinct element simulations. Finally, our DEM code is used to simulate dynamic loading of a generic subterranean facility in hardrock, demonstrating the suitability of the DEM for this application.
NTIS
Dynamic Loads; Underground Structures; Computerized Simulation; Underground Explosions

20040021325 NASA Glenn Research Center, Cleveland, OH, USA
Alumina-Reinforced Zirconia Composites
Choi, Sung R.; Bansal, Narottam P.; December 2003; 23 pp.; In English
Contract(s)/Grant(s): WBS 22-708-87-07
Report No.(s): NASA/TM-2003-212701; E-14204; No Copyright; Avail: CASI; A03, Hardcopy

Alumina-reinforced zirconia composites, used as electrolyte materials for solid oxide fuel cells, were fabricated by hot pressing 10 mol percent yttria-stabilized zirconia (10-YSZ) reinforced with two different forms of alumina particulates and platelets each containing 0 to 30 mol percent alumina. Major mechanical and physical properties of both particulate and platelet composites including flexure strength, fracture toughness, slow crack growth, elastic modulus, density, Vickers microhardness, thermal conductivity, and microstructures were determined as a function of alumina content either at 25 C or at both 25 and 1000 C. Flexure strength and fracture toughness at 1000 C were maximized with 30 particulate and 30 mol percent platelet composites, respectively, while resistance to slow crack growth at 1000 C in air was greater for 30 mol percent platelet composite than for 30 mol percent particulate composites.
NASA
Zirconium Oxides; Aluminum Oxides; Yttria-Stabilized Zirconia; Electrolytes; Crack Propagation

20040021345 NASA Dryden Flight Research Center, Edwards, CA, USA
Thermal Buckling Analysis of Rectangular Panels Subjected to Humped Temperature Profile Heating
Ko, William I.; January 2004; 57 pp.; In English
Contract(s)/Grant(s): WU 090-50-00
Report No.(s): NASA/TP-2004-212041; H-2539; No Copyright; Avail: CASI; A04, Hardcopy

This research investigates thermal buckling characteristics of rectangular panels subjected to different types of humped temperature profile heating. Minimum potential energy and finite-element methods are used to calculate the panel buckling temperatures. The two methods give fairly close thermal buckling solutions. 'Buckling temperature magnification factor of the first kind, eta' is established for the fixed panel edges to scale up the buckling solution of uniform temperature loading case to give the buckling solution of the humped temperature profile loading cases. Also, 'buckling temperature magnification factor of the second kind, xi' is established for the free panel edges to scale up the buckling solution of humped temperature profile loading cases with unheated boundary heat sinks to give the buckling solutions when the boundary heat sinks are heated up.
Author
Thermal Buckling; Rectangular Panels

20040027609
Sealed Window Glazing System for Chemical Biological Protected Space Applications
Dover, Dov; Anderson, Mark; Vickers, Richard N.; Oct. 2002; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 8637-98-C-6001; Proj-4915
Report No.(s): AD-A419687; AFRL-ML-TY-TP-2002-4625; No Copyright; Avail: CASI; A03, Hardcopy

Recent world events have drawn attention to threats that extend beyond deployed forces to the civilian population. In the recent Gulf War, several specific threats were highlighted for both U.S. military forces and Israeli civilians. The most obvious threat to civilians in that conflict was explosive. Less obvious, but even more potentially dangerous, was the threat of chemical-biological weapons of mass destruction. The key in 'protective design' is to define the weak points in a structure and reduce the threat at those points. The paper discusses early pioneering work on blast-resistant windows, at the Air Force Research Laboratory (AFRL/MLQD), that dealt with the use of applied polymer membranes to combat the combined threat of blast and chemical- biological attacks. The paper discusses the evolution of 'membrane' windows, right up to the present, where a combination of rigid and flexible components, membranes, anchoring techniques, and pressure relief ports are used to create a window that can withstand the pressure expected from a large blast and afterwards retain membrane integrity sufficient to resist a subsequent chemical-biological attack. Specific improvements that have increased the survivability of the window are discussed, as are improvements currently being tested that should allow these windows to be expanded to 'store-front' size without a degradation in protection. (18 figures)
DTIC
Polymeric Films; Biological Weapons; Warfare

20040028025 NASA Marshall Space Flight Center, Huntsville, AL, USA
Mechanical Properties of Heat-treated Carbon Fibers
Effinger, Michael R.; Patel, Bhavesh; Koenig, John; Cuneo, Jaques; Neveux, Michael G.; Demos, Chrystoph G.; [2004]; 1 pp.;

In English; 28th Annual Conference on Composites, Materials and Structures, 26-30 Jan. 2004, Cocoa Beach, FL, USA; No Copyright; Avail: Other Sources; Abstract Only

Carbon fibers are selected for ceramic matrix composites (CMC) are based on their as-fabricated properties or on 'that is what we have always done' technical culture while citing cost and availability when there are others with similar cost and availability. However, the information is not available for proper selection of carbon fibers since heat-treated properties are not known for the fibers on the market currently. Heat-treating changes the fiber's properties. Therefore, an effort was undertaken to establish fiber properties on 19 different types of fibers from six different manufactures for both PAN and pitch fibers. Heat-treating has been done at three different temperatures.

Author

Carbon Fibers; Mechanical Properties; Heat Treatment; Fabrication

20040028026 NASA Glenn Research Center, Cleveland, OH, USA

Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors

Thesken, John C.; Bowman, Cheryl L.; Arnold, Steven M.; Thompson, Richard C.; January 2004; 24 pp.; In English; 14th Symposium on Composite Materials: Testing and Design, 11-12 Mar. 2002, Pittsburgh, PA, USA

Contract(s)/Grant(s): WBS 22-755-12-11

Report No.(s): NASA/TM-2004-212102; E-13757; No Copyright; Avail: CASI; A03, Hardcopy

Flywheel energy storage offers an attractive alternative to battery systems used in space applications such as the International Space Station. Rotor designs capable of high specific energies benefit from the load carrying capacity of hoop wound carbon fibers but their long-term durability may be limited by time-temperature dependent radial deformations. This was investigated for the carbon/epoxy rotor material, IM7/8552. Coupon specimens were sectioned from filament wound panels. These were tested in compression and tension at room temperature (RT), 95 and 135 C for strain rates from 5x10(exp -6) per second to 5x10(exp -3) per second. Time, temperature and load sign dependent effects were significant transverse to the fiber. At -0.5 percent strain for 72 hr, compressive stresses relaxed 16.4 percent at 135 C and 13 percent at 95 C. Tensile stresses relaxed only 7 percent in 72 hr at 135 C for 0.5 percent strain. Using linear hereditary material response and Boltzmann s principle of superposition to describe this behavior is problematic if not intractable. Micromechanics analysis including the effects of processing residual stresses is needed to resolve the paradoxes. Uniaxial compressive stress relaxation data may be used to bound the loss of radial pre-load stresses in flywheel rotors.

Author

Filament Winding; Flywheels; Mechanical Properties; Rotors; Time Temperature Parameter; Epoxy Matrix Composites; Temperature Dependence; Time Dependence

20040028029 NASA Glenn Research Center, Cleveland, OH, USA

Significance of Strain in Formulation in Theory of Solid Mechanics

Patnaik, Surya N.; Coroneos, Rula M.; Hopkins, Dale A.; December 2003; 28 pp.; In English

Contract(s)/Grant(s): WBS 22-708-24-05

Report No.(s): NASA/TM-2003-212584; E-14131; No Copyright; Avail: CASI; A03, Hardcopy

The basic theory of solid mechanics was deemed complete circa 1860 when St. Venant provided the strain formulation or the field compatibility condition. The strain formulation was incomplete. The missing portion has been formulated and identified as the boundary compatibility condition (BCC). The BCC, derived through a variational formulation, has been verified through integral theorem and solution of problems. The BCC, unlike the field counterpart, do not trivialize when expressed in displacements. Navier s method and the stiffness formulation have to account for the extra conditions especially at the inter-element boundaries in a finite element model. Completion of the strain formulation has led to the revival of the direct force calculation methods: the Integrated Force Method (IFM) and its dual (IFMD) for finite element analysis, and the completed Beltrami-Michell formulation (CBMF) in elasticity. The benefits from the new methods in elasticity, in finite element analysis, and in design optimization are discussed. Existing solutions and computer codes may have to be adjusted for the compliance of the new conditions. Complacency because the discipline is over a century old and computer codes have been developed for half a century can lead to stagnation of the discipline.

Author

Mathematical Models; Solid Mechanics; Mechanical Properties; Structural Strain

20040030463 Institute of Industrial Technology TNO, Eindhoven, Netherlands
Testing of the Joining Rubber Metal of Ultrasound Silencing Devices
Naus, J. H.; March 25, 2003; 9 pp.; In Dutch
Contract(s)/Grant(s): A03/KL/103; TNO Proj. 012.13883
Report No.(s): TD-2003-0172; TNO-007.63136/01.01; Copyright; Avail: Other Sources

13 vibration dampers (producer DAF) for the DAF YAZ/YMZ 2300 out of a stock of 400 pieces were tested on the adhesion of rubber to metal according to ISO 813. The adhesion was judged as fair. A premature failure of the vibration dampers during service can not be excluded.
Author
Vibration Isolators; Adhesion; Rubber; Metals

20040030464 Building and Construction Research TNO, Delft, Netherlands
Risk Analysis LC-Frigate Shock Trials: Some Preliminary Analyses
vandenEikhoff, J.; Trouwborst, W.; April 1, 2003; 126 pp.; In English
Contract(s)/Grant(s): A02/KM/131; TNO Proj. 006.28181
Report No.(s): TD-2003-0003; TNO-2003-CMC-R026; Copyright; Avail: Other Sources

To analyze the risks of the full scale shock trials as planned for the LC-frigate some FEM analyses will be carried out using large models. Within these analyses the UNDEX loading will be described by the Simplified Interaction Tool (SIT). Before performing these analyses, it is necessary to determine some parameters of the SIT and of the FEM-models. The determination of these parameters is described in this report. These parameters are determined using previous SIT-results and by carrying out some SIT and 2DCAV analyses using a relatively small model. The parameters considered are the factor for the incoming pressure wave related with reflections at the wet hull, the mass proportional damping value and the way in which stiffeners should be modelled.
Author
Ship Hulls; Shock Tests; Shock Resistance; Shock Waves

20040030511 NASA Langley Research Center, Hampton, VA, USA
Structural Integrity of a Wind Tunnel Balance
Karkehabadi, R.; Rhew, R. D.; [2004]; 11 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paper 2004-1293; No Copyright; Avail: CASI; A03, Hardcopy

The National Aeronautics and Space Administration (NASA) Langley Research Center (LaRC) has been designing strain-gage balances for utilization in wind tunnels since its inception. The utilization of balances span over a wide variety of aerodynamic tests. A force balance is an inherently critically stressed component due to the requirements of measurement sensitivity. Research and analyses are done in order to investigate the structural integrity of the balances as well as developing an understanding of their performance in order to enhance their capability. Maximum loading occurs when all 6 components of the loads are applied simultaneously with their maximum value allowed (limit load). This circumstance normally does not occur in the wind tunnel. However, if it occurs, is the balance capable of handling the loads with an acceptable factor of safety? LaRC Balance 1621 was modeled and meshed in PATRAN for analysis in NASTRAN. For a complete analysis, it is necessary to consider all the load cases as well as use dense mesh near all the edges. Because of computer limitations, it is not possible to have one model with the dense mesh near all edges. In the present study, a dense mesh is limited to the surface corners where the cage and axial sections meet. Four different load combinations are used for the current analysis. Linear analysis is performed for each load case. In the case where the stress value is above linear elastic region, it is necessary to perform nonlinear analysis. It is also important to investigate the variables limiting the structural integrity of the balances. In order to investigate the possibility of modifying the existing balances to enhance the structural integrity, some modifications are done on this balance. The structural integrity of the balance after modification is investigated.
Derived from text
Wind Tunnel Apparatus; Structural Reliability; Strain Gage Balances; Nastran; Mathematical Models; Computational Grids

20040031531 NASA Dryden Flight Research Center, Edwards, CA, USA
Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts
Fields, Roger A.; Richards, W. Lance; DeAngelis, Michael V.; February 2004; 64 pp.; In English
Contract(s)/Grant(s): 710-55-04-E8-RR
Report No.(s): NASA/TM-2004-212039; H-2488; No Copyright; Avail: CASI; A04, Hardcopy

A structural test requirement of the National Aero-Space Plane (NASP) program has resulted in the design, fabrication, and implementation of a combined loads test fixture. Principal requirements for the fixture are testing a 4- by 4-ft hat-stiffened panel with combined axial (either tension or compression) and shear load at temperatures ranging from room temperature to 915 F, keeping the test panel stresses caused by the mechanical loads uniform, and thermal stresses caused by non-uniform panel temperatures minimized. The panel represents the side fuselage skin of an experimental aerospace vehicle, and was produced for the NASP program. A comprehensive mechanical loads test program using the new test fixture has been conducted on this panel from room temperature to 500 F. Measured data have been compared with finite-element analyses predictions, verifying that uniform load distributions were achieved by the fixture. The overall correlation of test data with analysis is excellent. The panel stress distributions and temperature distributions are very uniform and fulfill program requirements. This report provides details of an analytical and experimental validation of the combined loads test fixture. Because of its simple design, this unique test fixture can accommodate panels from a variety of aerospace vehicle designs. Author

Fabrication; National Aerospace Plane Program; Panels; Structural Engineering; Compression Loads; Reusable Launch Vehicles; Mechanical Properties

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*.

20040016462 State Univ. of New York, Buffalo, NY, USA

Student Research and Accomplishments: 2001-2002, Multidisciplinary Center for Earthquake Engineering Research

Garcia, D. L.; Oct. 2002; In English

Report No.(s): PB2004-102519; MCEER-02-SP09; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: artial): On the Calibration of the Specific Barrier Model to Eastern North America Earthquakes; Assessment of Performance of Bolu Viaduct in the 1999 Duzce Earthquake; Ductile Fiber Reinforced Panels for Seismic Retrofit; MCEER Hospital Demonstration Project; Elements of Community Resilience in the World Trade Center Attack; Analysis of a Damaged Building near Ground Zero; Damping of Frame Structures: An Educational Shake Table Test; Tri-Center Field Mission 2002: Taiwan; Analytical Study on Rehabilitation of Critical Electric Power System Components; and The Impact of the Y2K Threat on Hospital Emergency Preparedness.

NTIS

Research Projects; Earthquakes; Fiber Composites

20040030475 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Orbit Optimization for the Geospace Electrodynamics Connections (GEC) Mission

Mesarch, Michael A.; [2003]; 2 pp.; In English; AIAA/AAS Astrodynamics Specialists Conference, 16-19 Aug. 2004, Providence, RI, USA; No Copyright; Avail: Other Sources; Abstract Only

The Geospace Electrodynamics Connections (GEC) mission plan is to launch multiple spacecraft to perform in-situ atmospheric science in the lower ionosphere. There is limited experience in this low altitude region with the Atmospheric Explorer-C (AE-C) being the last spacecraft to explore this region in 1973. AE-C flew an eccentric orbit using maneuvers to lower its perigee to near 130 km at various times during its mission. GEC will advance the science performed by AE-C by performing multiple low-perigee, atmospheric dipping campaigns for extended durations. AE-C kept its perigee near 130 km for only a total of roughly 1 day. Furthermore, GEC plans to carry a more diverse suite of instruments and will be able to capture different temporal and spatial phenomena through the use of multiple spacecraft flying in a string of pearls formation. The mission analysis for GEC has been broken into two parts: the analysis of the parking orbit with the dipping campaigns and the examination of the multi-satellite dynamics of the GEC constellation. The analysis described in this paper examines the capability to meet the requirements necessary to support the 10 dipping campaigns using a single spacecraft as a representative of all three in the constellation. Further analysis is being performed to analyze the multi-satellite nature of the GEC mission.

NASA

Electrodynamics; Trajectory Optimization; Meteorology; Lower Ionosphere; Atmospheric Physics; Atmospheric Chemistry

20040030573 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska

SauberRosenberg, Jeanne M.; Molnia, Bruce F.; [2003]; 44 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Across southern Alaska the northwest directed subduction of the Pacific plate is accompanied by accretion of the Yakutat terrane to continental Alaska. This has led to high tectonic strain rates and dramatic topographic relief of more than 5000 meters within 15 km of the Gulf of Alaska coast. The glaciers of this area are extensive and include large glaciers undergoing wastage (glacier retreat and thinning) and surges. The large glacier ice mass changes perturb the tectonic rate of deformation at a variety of temporal and spatial scales. We estimated surface displacements and stresses associated with ice mass fluctuations and tectonic loading by examining GPS geodetic observations and numerical model predictions. Although the glacial fluctuations perturb the tectonic stress field, especially at shallow depths, the largest contribution to ongoing crustal deformation is horizontal tectonic strain due to plate convergence. Tectonic forces are thus the primary force responsible for major earthquakes. However, for geodetic sites located < 10-20 km from major ice mass fluctuations, the changes of the solid Earth due to ice loading and unloading are an important aspect of interpreting geodetic results. The ice changes associated with Bering Glacier s most recent surge cycle are large enough to cause discernible surface displacements. Additionally, ice mass fluctuations associated with the surge cycle can modify the short-term seismicity rates in a local region. For the thrust faulting environment of the study region a large decrease in ice load may cause an increase in seismic rate in a region close to failure whereas ice loading may inhibit thrust faulting.

Author

Glaciers; Tectonics; Ice; Subduction (Geology); Strain Rate; Seismology; Deformation

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*.

20040016318 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences

Tracewell, D.; Glickman, J.; Hashmall, J.; Natanson, G.; Sedlak, J.; [2003]; 15 pp.; In English; Flight Dynamics Symposium, 29-30 Oct. 2003, Greenbelt, MD, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NASA Order S-31049-G; No Copyright; Avail: CASI; A03, Hardcopy

The Earth Observing System (EOS) Aqua satellite was successfully launched on May 4,2002. Aqua is the second in the series of EOS satellites. EOS is part of NASA s Earth Science Enterprise Program, whose goals are to advance the scientific understanding of the Earth system. Aqua is a three-axis stabilized, Earth-pointing spacecraft in a nearly circular, sun-synchronous orbit at an altitude of 705 km. The Goddard Space Flight Center (GSFC) Flight Dynamics attitude team supported all phases of the launch and early mission. This paper presents the main results and lessons learned during this period, including: real-time attitude mode transition support, sensor calibration, onboard computer attitude validation, response to spacecraft emergencies, postlaunch attitude analyses, and anomaly resolution. In particular, Flight Dynamics support proved to be invaluable for successful Earth acquisition, fine-point mode transition, and recognition and correction of several anomalies, including support for the resolution of problems observed with the MODIS instrument.

Author

Earth Observing System (Eos); Real Time Operation; Problem Solving; Launching; Imaging Spectrometers; Anomalies

20040016380 NASA Goddard Space Flight Center, Greenbelt, MD, USA

TRMM Fire Algorithm, Product and Applications

Ji, Yi-Min; Stocker, Erich; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Land fires are frequent menaces to human lives and property. They also change the state of the vegetation and contribute to the climate forcing by releasing large amount of aerosols and greenhouse gases into the atmosphere. This paper summarizes methodologies of detecting global land fires from the Tropical Rainfall Measuring Mission (TRMM) Visible Infrared Scanner FIRS) measurements. The TRMM Science Data and Information System (TSDIS) fire products include global images of daily hot spots and monthly fire counts at 0.5 deg. x 0.5 deg. resolution, as well as text fiies that details necessary information of all fire pixels. The information includes date, orbit number, pixel number, local time, solar zenith angle, latitude, longitude, reflectance of visible/near infrared channels, brightness temperatures of infrared channels, as well as background brightness

temperatures of infrared channels. These products have been archived since January 1998. The TSDIS fire products are compared with the coincidental European Commission (EC) Joint Research Center (JRC) 1 km AVHRR fire products. Analyses of the TSDIS monthly fire products during the period from 1998 to 2003 manifested seasonal cycles of biomass fires over Southeast Asia, Africa, North America and South America. The data also showed interannual variations associated with the 98/99 ENS0 cycle in Central America and the Indonesian region. In order to understand the variability of global land fires and their effects on the distribution of atmospheric aerosols, statistical methods were applied to the TSDIS fire products as well as to the Total Ozone Mapping Spectrometer (TOMS) aerosol index products for a period of five years from January 1998 to December 2002. The variability of global atmospheric aerosol is consistent with the fire variations over these regions during this period. The correlation between fire count and TOMS aerosol index is about 0.55 for fire pixels in Southeast Asia, Indonesia, and Africa. Parallel statistical analyses such as Empirical Orthogonal Function (EOF) analysis and Singular Spectrum Analysis (SSA) methods were applied to pentad TRMM fire data and TOMS aerosol data. The EOF analyses showed contrast between North and South hemispheres and also inter- continental transitions in Africa and America. EOF and SSA analyses also identified 25-60 day intra-seasonal oscillations that were superimposed on the annual cycles of both fire and aerosol data. The intra-seasonal variability of fires showed similarity of tropical rainfall oscillation modes. The TRMM fire products were also compared to the coincident TRMh4 rainfall and other rainfall products to investigate the interaction between rainfall and fire. The results indicate that the annual, interannual and intraseasonal variability of fire are dominated by global rainfall variations. However, the feedback of fire to the rainfall occurrence at regional scale for certain regions is also evident.
Author
Algorithms; Fires; Trmm Satellite; Aerosols

20040016432 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
Scientific Data Purchase Project Overview Presentation
Holekamp, Kara; Fletcher, Rose; July 18, 2001; 26 pp.; In English; Applications of Geospatial Technology in Forestry: A Seminar for Members of the Society of American Foresters, 26 Jul. 2001, Bay Saint Louis, MS, USA; Original contains poor quality, truncated or crooked pages
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-2001-07-00039-SSC; No Copyright; Avail: CASI; A03, Hardcopy
The Scientific Data Purchase (SDP) project acquires science data from commercial sources. It is a demonstration project to test a new way of doing business, tap new sources of data, support Earth science research, and support the commercial remote sensing industry. Phase I of the project reviews simulated/prototypical data sets from 10 companies. Phase II of the project is a 3 year purchase/distribution of select data from 5 companies. The status of several SDP projects is reviewed in this viewgraph presentation, as is the SDP process of tasking, verification, validation, and data archiving. The presentation also lists SDP results for turnaround time, metrics, customers, data use, science research, applications research, and user feedback.
CASI
Space Commercialization; Remote Sensing

20040016443 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
NASA IKONOS Characterization Methodologies
Pagnutti, Mary; April 24, 2002; 50 pp.; In English; 2002 ASRPS-ACSM Annual Conference, 22-26 Apr. 2002, Washington, DC, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-2002-04-00036-SSC; No Copyright; Avail: CASI; A03, Hardcopy
The objectives of IKONOS characterization are to: 1) Perform spatial characterization by measuring edge response of IKONOS images to evaluate Modulation Transfer Function (MTF); 2) Perform geolocational accuracy assessment of IKONOS imagery using surveyed geodetic targets; 3) Perform radiometric vicarious calibrations of IKONOS imagery and compare with Space Imaging calibration coefficients. Calibration activities conducted in West Texas, and at Stennis Space Center, Mississippi and Lunar Lake, Nevada are profiled in this viewgraph presentation.
Derived from text
Satellite Imagery; Characterization

20040016453 University of Southern Mississippi, MS, USA
Practical Remote Sensing Application for Agriculture
May 08, 2002; 3 pp.; In English
Contract(s)/Grant(s): NAS13-00004
Report No.(s): NASA/NP-2002-05-00020-SSC; No Copyright; Avail: CASI; A01, Hardcopy

Aerial surveys of plant health in row crops are converted into crucial farm management information plots for each field. These plots are delivered overnight to subscribing farmers. After review, the plots are converted to machinery control discs and installed on farm equipment to manage the appropriate applications of seed, chemicals and water when and where needed. The process is repeated throughout the crop planting, growing and harvesting season. This entire operation has been installed and tested on four Mississippi Delta farms. Its use demonstrated operational cost savings of more than fifty dollars per acre and increased cotton production by ten percent on average.
Author
Remote Sensing; Information Management; Control Equipment; Operating Costs; Mississippi Delta (La); Agriculture

20040016463 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
Satellite Hyperspectral Imaging Simulation
Zanoni, Vicki; Stanley, Tom; Blonski, Slawomir; Cao, Changyong; Gasser, Jerry; Ryan, Robert; October 10, 1999; 11 pp.; In English; International Symposium on Spectral Sensing Research, 1999, Reno, NV, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-1999-09-00022-SSC; No Copyright; Avail: CASI; A03, Hardcopy

Simulation of generic pushbroom satellite hyperspectral sensors have been performed to evaluate the potential performance and validation techniques for satellite systems such as COIS(NEMO), Warfighter-1(OrbView-4) and Hyperion(EO-1). The simulations start with a generation of synthetic scenes from material maps of studied terrain. Scene-reflected radiance is corrected for atmospheric effects and convolved with sensor spectral response using MODTRAN 4 radiance and transmissions calculations. Scene images are further convolved with point spread functions derived from Optical Transfer Functions (OTF's) of the sensor system. Photon noise and etectorr/electronics noise are added to the simulated images, which are also finally quantized to the sensor bit resolution. Studied scenes include bridges and straight roads used for evaluation of sensor spatial resolution, as well as fields of minerals, vegetation and manmade materials used for evaluation of sensor radiometric response and sensitivity. The scenes are simulated with various seasons and weather conditions. Signal-to-noise ratios and expected performance are estimated for typical satellite system specifications and are discussed for all the scenes.
Author
Multispectral Band Scanners; Data Simulation; Satellite Imagery

20040016464 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
NASA Scientific Data Purchase Laboratory Characterization of Positive Systems ADAR 5500 Sensor
Ryan, James, Technical Monitor; Blonski, Slawomir; January 29, 2003; 110 pp.; In English
Contract(s)/Grant(s): NAS13-650
Report No.(s): NASA/SE-2003-01-00006-SSC; No Copyright; Avail: CASI; A06, Hardcopy

This report summarizes the laboratory characterization of the Positive Systems ADAR 5500 SN4 multi-spectral imager measured dirijg the period of April 10-11, 2000 in the NASA CRSP Commercial Instrumentation Validation Laboratory (CIVL). This characterization is one component of the NASA Scientific Data Purchase (SDP) validation and verification process. A complete characterization will require analysis of airborne data. The spectral, radiometric, and spatial characteristics of this system were measured and compared with the product data specifications as defined in the SDP contract. These results are summarized in the specification compliance matrices in this summary. A complete description of the system, the SDP product specification and the sensor laboratory characterization is provided in the body of the main report.
Author
Remote Sensing; Systems Engineering; NASA Programs; Program Verification (Computers)

20040021383 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Wildfires Dynamics in Mid-Siberian Larch Dominated Communities
Kharuk, V. I.; Ranson. K. J.; Dvinskaya, M. L.; [2003]; 1 pp.; In English; Copyright; Avail: CASI; A01, Hardcopy

The longterm wildfire dynamics, including fire return interval (FRI), in Siberian larch communities were examined. A

wildfire chronology encompassing the 15th through the 20th centuries was developed from analyzing tree stem fire scars. Two methods were used to calculate the time interval between fires: 1) direct counting of annual tree growth rings between stem fire scars and 2) the next earlier fire date was estimated from growth ring analysis and added to the first estimate. Average FRI determined from stem fire scar dating was 82 plus or minus 7 using Method I or 95 plus or minus 7 when age of the next earlier fire was inferred from observed larch regeneration structure (Method II). FRI was also found to be dependent on site topography. FRI on north-east facing slopes was 86 plus or minus 11 years (105 plus or minus 12). FRI on south-west facing slopes was significantly less at 61 plus or minus 8 (73 plus ot minus 8) years. Flat terrain showed little difference between methods 68 plus or minus 14 (70 plus or minus 13). This was also the case for bogs, but FRI was much longer; 139 plus or minus 17 (138 plus ot minus 18). The maximum number of annual fires occurred with periods of 36 and 82 years on average. The temporal trend in the FRI decreased from 101 years in the 19 th century to 65 years in the 20th century. The effect of post-fire forest recovery on depth to permafrost was also estimated. After initial melting from increased local temperatures permafrost depth decreased at a rate of 0.3 cm/yr on average as forest canopies developed.
Author
Fires; Communities; Conifers; Siberia

20040026734 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Observing the Global Water Cycle from Space
Hildebrand, Peter H.; Houser, Paul; Schlosser, C. Adam; [2003]; 3 pp.; In English; 31st Conference on Radar Meteorology, 6-12 Aug. 2003, Seattle, WA, USA; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

This paper presents an approach to measuring all major components of the water cycle from space. The goal of the paper is to explore the concept of using a sensor-web of satellites to observe the global water cycle. The details of the required measurements and observation systems are therefore only an initial approach and will undergo future refinement, as their details will be highly important. Key elements include observation and evaluation of all components of the water cycle in terms of the storage of water-in the ocean, air, cloud and precipitation, in soil, ground water, snow and ice, and in lakes and rivers-and in terms of the global fluxes of water between these reservoirs. For each component of the water cycle that must be observed, the appropriate temporal and spatial scales of measurement are estimated, along with the some of the frequencies that have been used for active and passive microwave observations of the quantities. The suggested types of microwave observations are based on the heritage for such measurements, and some aspects of the recent heritage of these measurement algorithms are listed. The observational requirements are based on present observational systems, as modified by expectations for future needs. Approaches to the development of space systems for measuring the global water cycle can be based on these observational requirements.
Derived from text
Hydrological Cycle; Aerospace Systems; Global Warming; Observation

20040027558 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Earth Observing System: Global Observations to Study the Earth's Environment
King, Michael D.; [2003]; 1 pp.; In English; Regional Policy Dialogue on Air Pollution and its likely Transboundary Effects in Southern Africa, 22-24 Sep. 2003, Maputo, Mozambique; No Copyright; Avail: Other Sources; Abstract Only

The Earth Observing System (EOS) is a space-based observing system comprised of a series of satellite sensors by which scientists can monitor the Earth, a Data and Information System (EOSDIS) enabling researchers worldwide to access the satellite data, and an interdisciplinary science research program to interpret the satellite data. During the last couple of years, four EOS science missions were launched, representing observations of (i) total solar irradiance, (ii) Earth radiation budget, (iii) land cover & land use change, (iv) ocean processes (vector wind, sea surface temperature, and ocean color), (v) atmospheric processes (aerosol and cloud properties, water vapor, and temperature and moisture profiles), and (vi) tropospheric chemistry. In succeeding years many more satellites will be launched that will contribute immeasurably to our understanding of the Earth's environment. In this presentation I will describe how scientists are using NASA's Earth science data to examine land use and natural hazards, environmental air quality, including: dust storms over the worlds deserts, cloud and radiation properties, sea surface temperature, and winds over the ocean, with a special emphasis on satellite observations available for studying the southern African environment.
Author
Earth Observing System (Eos); Earth Sciences; Environmental Quality; Information Systems; Data Systems

20040030405 Defence Research and Development Canada, Ottawa, Ontario, Canada
Arctic Shoreline Delineation & Feature Detection Using RADARSAT-1 Interferometry: Case Study Over Alert
Mattar, Karim E.; Gallop, Lloyd; Dec. 2003; 54 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419989; DRDC-TR-2003-225; No Copyright; Avail: CASI; A04, Hardcopy

Extensive ground truth carried out in and around Alert in 2002 permitting testing the geometric calibration of RADARSAT- 1, optimizing the capability of RADARSAT- 1 interferometry to delineate coastlines and riverbeds in an Arctic environment, and investigating the detection of various targets and features of potential interest. Surveyed comer reflectors helped demonstrate that a ground reference point greatly improves the geometric calibration of RADARSAT-1 images. A new coherence filter was developed specifically optimized for coastline and riverbed delineation. GPS surveyed coastlines, mapped into radar perspective and calibrated using the surveyed comer reflectors, deviated from the coastline delineated using the coherence filter by less than 8 meters on average. Furthermore, assuming low decorrelation effects, coastlines and riverbeds are often clearly visible in the coherence image, potentially lending the delineation process much more readily to automation. However, RADARSAT-1's fine resolution mode proved too coarse to reliably detect roads, three crashed airplanes and various monuments in the area.
DTIC
Arctic Regions; Surface Navigation; Pattern Recognition

20040031332 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Remote Sensing System Requirements Development: A Simulation-Based Approach
Zanoni, Vicki; Davis, Bruce; Ryan, Robert; Blonski, Slavomir; Gasser, Gerald; February 1, 2002; 2 pp.; In English; International Society of Photogrammetry and Remote Sensing Commission I Mid-Term Symposium, 8-15 Nov. 2002, Denver, CO, USA
Report No.(s): SE-2002-00010-SSC; No Copyright; Avail: Other Sources; Abstract Only

Earth science research and application requirements for multispectral data have often been driven by currently available remote sensing technology. Few parametric studies exist that specify data required for certain applications. Consequently, data requirements are often defined based on the best data available or on what has worked successfully in the past. Since properites such as spatial resolution, swath width, spectral bands, signal-to-noise ratio (SNR), data quantization, and band-to-band registration drive sensor platform and spaceraft system architecture and cost, analysis of these criteria is important to objectively optimize system design. Remote sensing data requirements are also linked to calibration and characterization methods. Parameters such as spatial resolution, radiometric accuracy, and geopositional accuracy affect the complexity and cost of calibration methods. However, there are few studies that quantify the true accuracies required for specific problems. As calibration methods and standards are proposed, it is important that they be tied to well-known data requirements. The Application Research Toolbox (ART) developed at Stennis Space Center provides a simulation-based method for multispectral data requirements development. The ART produces simulated data sets from hyperspectral data through band synthesis. Parameters such as spectral band shape and width, SNR, data quantization, spatial resolution, and band-to-band registration can be varied to create many different simulated data products. Simulated data utility can then be assessed for different applications so that requirements can be better understood. This paper describes the ART and its applicability for rigorously deriving remote sensing data requirements.
Author
Remote Sensing; Simulation; Requirements; Multispectral Photography

20040031507 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Study on the Effects of J2 Perturbations on a Drag-Free Control System for Spacecraft in Low Earth Orbit
Vess, Melissa Fleck; Starin, Scott R.; [2003]; 11 pp.; In English; Flight Mechanics Symposium, October 2003, Greenbelt, MD, USA; No Copyright; Avail: CASI; A03, Hardcopy

Low Earth Orbit (LEO) missions provide a unique means of gathering information about many of Earth s aspects such as climate, atmosphere, and gravitational field. Among the greatest challenges of LEO missions are designing, predicting, and maintaining the spacecraft orbit. The predominant perturbative forces acting on a spacecraft in LEO are J2 and higher order gravitational components, the effects of which are fairly easy to predict, and atmospheric drag, which causes the greatest uncertainty in predicting spacecraft ephemeris. The continuously varying atmospheric drag requires increased spacecraft tracking in order to accurately predict spacecraft location. In addition, periodic propulsive maneuvers typically must be planned and performed to counteract the effects of drag on the spacecraft orbit. If the effects of drag could be continuously and autonomously counteracted, the uncertainty in ephemeris due to atmospheric drag would essentially be eliminated from the spacecraft dynamics. One method of autonomous drag compensation that has been implemented on some missions is

drag-free control. Drag-free control of a spacecraft was initially proposed in the 1960's and is discussed extensively by Lange. His drag-free control architecture consists of a free-floating proof mass enclosed within a spacecraft, isolating it from external disturbance forces such as atmospheric drag and solar radiation pressure. Under ideal conditions, internal disturbance forces can be ignored or mitigated, and the orbit of the proof mass depends only on gravitational forces. A sensor associated with the proof mass senses the movement of the spacecraft relative to the proof mass. Using the sensor measurements, the spacecraft is forced to follow the orbit of the proof mass by using low thrust propulsion, thus counteracting any non-gravitational disturbance forces. If the non-gravitational disturbance forces are successfully removed, the spacecraft s orbit will be affected only by well-known gravitational forces and will thus be easier to predict.
Derived from text
Perturbation; Drag Reduction; Automatic Control; Low Earth Orbits; Spacecraft Control; Spacecraft Tracking

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*.

20040016368 National Renewable Energy Lab., Golden, CO, Bundesministerium fuer Forschung und Technologie, Bonn, Germany, Swedish National Testing and Research Inst., Boras, Sweden
Durability of Polymeric Glazing Materials for Solar Applications
Jorgensen, G.; Brunold, S.; Carlsson, B.; Moeller, K.; Heck, M.; Sep. 2003; 22 pp.; In English
Report No.(s): DE2003-15004570; NREL/CP-520-34702; No Copyright; Avail: Department of Energy Information Bridge
The economic viability of solar collector systems for domestic hot water (DHW) generation is strongly linked to the cost of such systems. Installation and hardware costs must be reduced by 50% to allow significant market penetration. An attractive approach to cost reduction is to replace glass and metal parts with less expensive, lighter-weight polymeric components. Weight reduction decreases the cost of shipping, handling, and installation. The use of polymeric materials also allows the benefits and cost savings associated with well established manufacturing processes, along with savings associated with improved fastening, reduced part count, and overall assembly refinements. A key challenge is to maintain adequate system performance and assure requisite durability for extended lifetimes.
NTIS
Polymers; Solar Collectors; Manufacturing

20040016418 Lawrence Livermore National Lab., Livermore, CA
Civilian Power from Space in the Early 21st Century
Hyde, R.; Ishikawa, M.; Wood, L.; Jun. 01, 2003; 24 pp.; In English
Report No.(s): DE2003-15004855; UCRL-JC-154032; No Copyright; Avail: Department of Energy Information Bridge
If power beamed from space is to be become widely used on Earth in the first half of the 21st century, several thus-far-persistent impediments must be obviated, including threshold effects and problematic aspects of cost, availability, reliability, hazards and environmental impacts. We sketch a generally-applicable route to doing so, noting key enabling technologies and practical features. Likely-essential features of any successful strategy include vigorous, systematic leveraging of all intrinsic features of space-derived power, e.g., addressing marginal, high-value-added markets for electric power in space- and time-agile manners to conveniently provide power-upon-demand, and incrementally wedging into ever-larger markets with ever more cost-efficient generations and scales of technology.
NTIS
Solar Energy; Market Research; Reliability; Costs

20040027863 NASA Glenn Research Center, Cleveland, OH, USA
Unitized Regenerative Fuel Cell System Development
Burke, Kenneth A.; December 2003; 14 pp.; In English; First International Energy Conversion Engineering Conference, 17-21 Aug. 2003, Portsmouth, VA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 22-755-12-03
Report No.(s): NASA/TM-2003-212739; E-14264; No Copyright; Avail: CASI; A03, Hardcopy
Unitized Regenerative Fuel Cells (URFC) have recently been developed by several fuel cell manufacturers. These

manufacturers have concentrated their efforts on the development of the cell stack technology itself, and have not up to this point devoted much effort to the design and development of the balance of plant. A fuel cell technology program at the Glenn Research Center (GRC) that has as its goal the definition and feasibility testing of the URFC system balance of plant. Besides testing the feasibility, the program also intends to minimize the system weight, volume, and parasitic power as its goal. The design concept currently being developed uses no pumps to circulate coolant or reactants, and minimizes the ancillary components to only the oxygen and hydrogen gas storage tanks, a water storage tank, a loop heat pipe to control the temperature and two pressure control devices to control the cell stack pressures during operation. The information contained in this paper describes the design and operational concepts employed in this concept. The paper also describes the NASA Glenn research program to develop this concept and test its feasibility.
Author
Regenerative Fuel Cells; Systems Engineering; Temperature Control; Control Equipment

20040030569 NASA Glenn Research Center, Cleveland, OH, USA
Historical Precision of an Ozone Correction Procedure for AMO Solar Cell Calibration
Snyder, David B.; Jenkins, Phillip; Scheiman, David; [2003]; 4 pp.; In English; SPRAT XVIII, 16-18 Sep. 2003, Cleveland, OH, USA; Original contains black and white illustrations
Contract(s)/Grant(s): 22-755-60-08; No Copyright; Avail: CASI; A01, Hardcopy

In an effort to improve the accuracy of the high altitude aircraft method for calibration of high band-gap solar cells, the ozone correction procedure has been revisited. The new procedure adjusts the measured short circuit current, Isc, according to satellite based ozone measurements and a model of the atmospheric ozone profile then extrapolates the measurements to air mass zero, AM0. The purpose of this paper is to assess the precision of the revised procedure by applying it to historical data sets. The average Isc of a silicon cell for a flying season increased 0.5% and the standard deviation improved from 0.5% to 0.3% The 12 year average Isc of a GaAs cell increased 1% and the standard deviation improved from 0.8% to 0.5%. The slight increase in measured Isc and improvement in standard deviation suggests that the accuracy of the aircraft method may improve from 1% to nearly 0.5%.
Author
Calibrating; Solar Cells; High Altitude; Atmospheric Correction; Ozone

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20040020058 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Volatile Organic Chemical Emissions from Structural Insulated Panel (SIP) Materials and Implications for Indoor Air Quality
Hodgson, A. T.; Sep. 2003; 34 pp.; In English
Report No.(s): DE2003-816228; LBNL-53768; No Copyright; Avail: Department of Energy Information Bridge

The emissions of volatile organic compounds (VOCs) from structural insulated panel (SIP) materials were investigated. Specimens of newly produced SIPs and associated panel adhesives were obtained from two relatively large manufacturers. Additionally, specimens of the oriented strand board (OSB) used as the inner and outer sheathing and the extruded polystyrene core for the SIP were obtained from one manufacturer. Using small-scale chambers, emissions of formaldehyde, acetaldehyde, acetic acid and other VOCs from SIPs, OSB and polystyrene were measured over a period of four months and from the adhesives over two months. SIP specimens overlaid by gypsum board panels were also tested over four months. The predominant VOCs emitted by the SIPs included acetic acid, pentanal, hexanal and styrene. The emissions of formaldehyde and acetaldehyde were relatively low. Acetic acid and the aldehydes derived from the OSB, while styrene derived from the polystyrene. One of the SIPs emitted toluene and methyl acetate. The adhesives primarily emitted a mixture of hydrocarbons. The emission rates of most VOCs from the SIP/gypsum board assemblies were approximately the same or higher than their respective emission rates from the unfinished SIPs. Modeling using VOC emission factors obtained for the SIP/gypsum board assemblies demonstrated the potential for SIP materials to degrade indoor air quality in houses. A field study to investigate VOC concentrations and emission rates in SIP houses relative to closely matched conventionally constructed houses is necessary to determine the actual impacts of SIPs. If significant impacts are observed, to it may be desirable to develop control

measures to reduce the emissions of VOCs from SIPs, such as the substitution of lower emitting materials or the use of vapor diffusion barriers.
NTIS
Air Quality; Volatile Organic Compounds; Emittance; Indoor Air Pollution

20040020073 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Predicted Concentrations in New Relocatable Classrooms of Volatile Organic Compounds Emitted from Standard and Alternate Interior Finish Materials
Hodgson, A. T.; Fisk, W. J.; Shendell, D. G.; Apte, M. G.; Jul. 18, 2001; 42 pp.; In English
Report No.(s): DE2003-817239; LBNL-48490; No Copyright; Avail: Department of Energy Information Bridge

Relocatable classrooms (RCs) are widely employed by California school districts to satisfy rapidly expanding space requirements due to population growth and class size reduction policies. There is public concern regarding indoor environmental quality (IEQ) in schools, particularly in RCs, but very little data to support or dispel these concerns. Several studies are investigating various aspects of IEQ in California schools. This laboratory-based study focused on evaluating the emissions of toxic and/or odorous volatile organic compounds (VOCs), including formaldehyde and acetaldehyde, from materials used to finish the interiors of new RCs. Furthermore, the study implemented a procedure for VOC source reduction by testing and selecting lower-emitting materials as substitutes for standard materials. In total, 17 standard and alternate floor coverings, wall panels and ceiling panels were quantitatively tested for emissions of VOCs using small-scale environmental chambers.
NTIS
Organic Compounds; Environmental Quality; Emission Spectra

20040020077 CH2M HILL Hanford Group, Inc., Richland, WA, USA, Department of Energy, Richland, WA, USA
Safety Evaluation of the Single-Shell Tanks Modified Sluicing Waste Retrieval System
Smith, R. D.; Sep. 2003; 84 pp.; In English
Report No.(s): DE2003-817855; RPP-17965-REV-1; No Copyright; Avail: Department of Energy Information Bridge

The purpose of this safety evaluation is to determine if the potential risk associated with using the single-shell tank modified sluicing system for retrieval of the 100-series SSTs in the tank farms is adequately addressed and hounded by the current tank farms safety basis documented safety analysis and to determine if additional controls may be required.
NTIS
Risk; Radioactive Wastes

20040020079 Westinghouse Savannah River Co., Aiken, SC, USA
Savannah River Site Approved Site Treatment Plan, 2003 Annual Update. Volumes I and II
Nov. 2003; 230 pp.; In English
Report No.(s): DE2003-817861; No Copyright; Avail: Department of Energy Information Bridge

Contents include the following: Compliance Plan Volume . Purpose and Scope of the Compliance Plan Volume; Key Order Provisions; Mixed Low-Level Waste Treatment (Mixed Low-Level Waste Streams with Treatment Capacity, Mixed Low-Level Waste Streams Requiring Mixed Low-Level Waste Streams for which further characterization is required, Mixed Low-Level Waste Streams Requiring Radionuclide, Mixed Low-Level Waste Streams - Other Commitments); Mixed TRU (MTRU) Waste Streams; High-Level Waste (HLW); List of Tables (User's Guide to Chapters 3, 4, and 5); List of Waste Streams.
NTIS
Radioactive Wastes; Waste Treatment; Radioactive Isotopes

20040020081 Fluor Daniel Hanford, Inc., Richland, WA, USA, Department of Energy, Richland, WA, USA
Compact Liquid Waste Evaporator for Cleanup on Hanford's Hot Cells
Hobart, R. L.; Nov. 2003; 16 pp.; In English
Report No.(s): DE2003-819808; HNF-18782-FP-REV-0; No Copyright; Avail: Department of Energy Information Bridge

Removal of radionuclide and hazardous contaminants from hot cells in Hanford's 324 Building will produce an aqueous waste stream requiring volume reduction and packaging. This paper describes a compact and remotely-operated evaporator system that was designed for use in the 324 Building's B-Cell (a shielded hot cell) to volume-reduce the waste waters that are generated from pressure washing of hot cell ceiling, wall, and floor surfaces. The evaporator incorporates an electric-heated

reboiler to provide evaporation and drying to allow disposal of waste material. Design features of the evaporator system were strongly influenced by the need for remote handling and remote maintenance. Purified water vapor from the evaporation process will be released directly to the hot cell ventilation air.
NTIS
Radioactive Isotopes; Cells (Biology); Evaporators

20040020093 Colorado Univ., Boulder, CO, USA, Cincinnati Univ., OH, USA
Review of Sampling and Analysis Methods for Assessing Airborne Microbiological Contamination on Commerical Aircraft. A Literature Survey and Review
Hernandez, M.; 2003; 96 pp.; In English
Report No.(s): PB2004-102749; No Copyright; Avail: CASI; A05, Hardcopy

Exposure to airborne particles of microbiological origin is increasingly being recognized as responsible for infectious, hypersensitivity, and inflammatory lung diseases. Such particles are referred to as biological aerosols, or 'bioaerosols,' and include but are not limited to bacteria, fungi, their spores and fragments thereof (associated toxins), and viruses. Modern aircraft use pressurized cabins to transport millions of passengers each year. With the occupant levels experienced by the air transport industry, concerns regarding human exposure to bioaerosols have been raised among the traveling public, flight crews, scientific communities, and regulatory agencies. Based on extensive monitoring, professional societies have published guidelines suggesting acceptable ranges for bioaerosol exposures in indoor environments, yet it is not established if such exposure thresholds should apply to commercial aircraft, nor is it established what bioaerosol exposures are experienced by the average passenger during routine air travel. This survey has focused on a comprehensive characterization of bioaerosols in aircraft using the best available technology.
NTIS
Aerosols; Air Transportation; Air Pollution; Microbiology; Bacteria; Viruses

20040020094 National Inst. for Occupational Safety and Health, Cincinnati, OH, USA
Survey Report: Evaluation of an Air Shower for Reducing Exposure to Carbon Monoxide at USA Port of Entry, Calexico, California
Dunn, K.; Shulman, S. A.; Hammond, D. R.; Blade, L. M.; Jan. 2004; 52 pp.
Report No.(s): PB2004-102750; EPHB-171-33A; No Copyright; Avail: CASI; A04, Hardcopy

From July through December 2002, an engineering control evaluation was conducted to assess the effectiveness of a redesigned external air supply installed in two lanes at the Calexico West Port of Entry. Air diffusers, known as air showers, delivered roof top air to primary inspection lanes 5 and 7 at a height of 10 feet above ground. This improved delivery system was expected to provide cleaner, roof top air closer to the inspectors breathing zone resulting in reduced exposure to carbon monoxide. In the initial in-depth survey, carbon monoxide (CO) concentrations measured on the inspectors and in the lane area for those lanes outfitted with the air shower (primary lanes 5 and 7) were compared to those with existing ventilation (primary inspection lanes 4, 6, and 8). Following the initial survey, fixed area CO monitors were installed in primary inspection lanes 4 through 8 to provide long term measurement of area CO concentrations. The long term data was collected over several months to assess seasonal environmental variations and the effect of variable traffic flow among the primary inspection lanes. The results of the in-depth and long-term surveys showed that the air showers, as installed, did not result in lower personal or area CO concentrations.
NTIS
Air Pollution; Carbon Monoxide; Annual Variations; Cosmic Ray Showers

20040020095 Texas Univ., Austin, TX, USA
User's Guide to GIS-Based Application for Traffic Inputs to MOBILE6 Emissions Factor Model
Bhat, C. R.; Nerella, S.; Aug. 31, 2003; 46 pp.; In English
Report No.(s): PB2004-102752; RR-4377-4; No Copyright; Avail: CASI; A03, Hardcopy

This guide familiarizes users with the GIS-based platform for vehicle age distribution and VMT distribution, including installation instructions, system and program requirements, and important guidelines for use of the software package.
NTIS
User Manuals (Computer Programs); Applications Programs (Computers); Installing

20040020097 Texas Univ., Austin, TX, USA
GIS-Integrated Traffic Input Models for Mobile-Source Emissions Analysis
Bhat, C. R.; Conoor, S. S.; Nerella, S.; Aug. 31, 2003; 90 pp.; In English
Report No.(s): PB2004-102754; RR-4377-3; No Copyright; Avail: CASI; A05, Hardcopy

The EPA recently released the latest version MOBILE6, its first major update to the MOBILE series since 1996. This model will soon become the required standard for air quality conformity analysis transportation conformity measure (TCM) effectiveness analysis. A brief review of the input requirements of the MOBILE6 emissions factor model is presented which is followed by a more detailed discussion of the traffic-related input needs of the model. In particular, the various issues involved in the modeling of vehicle registration distribution and the VMT distribution, the methodology adopted, data acquisition and analysis, and the modeling results are discussed. The report also briefly describes the GIS-based software application developed to facilitate TCM analysis. Some simple TCM scenarios that were analyzed as part of the study are also presented to better explain the application of the software to perform TCM analyses.
NTIS
Air Pollution; Emission; Air Quality

20040020098 Environmental Evaluation Group, Albuquerque, NM, USA
Application of Beryllium-7 and Lead-210 Concentration Measurements to Monitoring the Validity of Effluent Air Sampling at the Waste Isolation Pilot Plant
Gray, D. H.; Dec. 2003; 34 pp.; In English
Report No.(s): PB2004-102967; EEG-88; No Copyright; Avail: CASI; A03, Hardcopy

The Waste Isolation Pilot Plant (WIPP) is an underground repository in southeast New Mexico owned and operated by the U.S. Department of Energy (DOE) for the purpose of safely disposing of transuranic (TRU) waste materials generated by the national defense programs. During normal operations, the underground rooms and drifts at WIPP are ventilated by three large induced draft exhaust fans. These fans pull approximately 425,000 cu ft/min down an intake shaft, through the repository, up a 4.3-meter-diameter exhaust shaft and out one or more exhaust vents to the atmosphere. A sampling station, called Station A, has been established near the top of the exhaust shaft so that a sample of the effluent air may be extracted immediately before the effluent air is discharged to the environment.
NTIS
Beryllium 7; Effluents; Lead Isotopes; Air Sampling; Pilot Plants

20040020099 Environmental Evaluation Group, Albuquerque, NM, USA
Rationale for Maintaining the Double Containment Requirement for Plutonium Shipments
Channell, J. K.; Anastas, G.; Dec. 2003; 78 pp.; In English
Report No.(s): PB2004-102968; EEG-89; No Copyright; Avail: CASI; A05, Hardcopy

Contents include the following: Foreword; EEG Staff; Acknowledgments; List of Tables; List of Figures; Acronyms and Symbols; Executive Summary; Introduction; Effect of Double Containment on Accident Free Doses; Weight Penalty From Double Containment; Effect of Double Containment in Severe Accidents; The A(1)/A(2) Value Inconsistency; Conclusions and Recommendations, and References.
NTIS
Plutonium; Containment

20040027685 Army Test and Evaluation Command, Aberdeen Proving Ground, MD
Toxic Hazards Tests for Vehicles and Other Equipment
Oct. 31, 2003; 53 pp.; In English
Report No.(s): AD-A418728; TOP-2-2-614; No Copyright; Avail: CASI; A04, Hardcopy

This TOP details specific tests designed to both measure and analyze the concentrations of toxic gases and aerosols produced during equipment and systems operations such as would occur during firing of weapon systems, operation of engines during automotive operations, operation of fuel fired personnel heaters, operation of any fuel burning systems, e.g., generators and compressors, and live fire vulnerability testing.
DTIC
Aerosols; Combustion; Concentration (Composition); Toxic Hazards

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*.

20040016377 ManTech International Corp., Greenbelt, MD, USA
Near-Field Magnetic Dipole Moment Analysis
Harris, Patrick K.; [2003]; 8 pp.; In English; IEST, ESTECH 2004, 25-28 Apr. 2004, Las Vegas, NV, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAS5-02034; No Copyright; Avail: CASI; A02, Hardcopy

This paper describes the data analysis technique used for magnetic testing at the NASA Goddard Space Flight Center (GSFC). Excellent results have been obtained using this technique to convert a spacecraft s measured magnetic field data into its respective magnetic dipole moment model. The model is most accurate with the earth s geomagnetic field cancelled in a spherical region bounded by the measurement magnetometers with a minimum radius large enough to enclose the magnetic source. Considerably enhanced spacecraft magnetic testing is offered by using this technique in conjunction with a computer-controlled magnetic field measurement system. Such a system, with real-time magnetic field display capabilities, has been incorporated into other existing magnetic measurement facilities and is also used at remote locations where transport to a magnetics test facility is impractical.
Author
Near Fields; Magnetic Dipoles; Method of Moments; Numerical Control; Dipole Moments; Magnetic Fields

20040021339 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Geomagnetic Field During a Reversal
Heirtzler, James R.; November 2003; 14 pp.; In English; AGU Chapman Conference on Timescales of the Geomagnetic Field, 9-11 Mar. 2003, Gainesville, FL, USA
Report No.(s): NASA/TM-2003-212250; Rept-2004-00416-0; No Copyright; Avail: CASI; A03, Hardcopy

By modifying the IGRF it is possible to learn what may happen to the geomagnetic field during a geomagnetic reversal. If the entire IGRF reverses then the declination and inclination only reverse when the field strength is zero. If only the dipole component of the IGRF reverses a large geomagnetic field remains when the dipole component is zero and he direction of the field at the end of the reversal is not exactly reversed from the directions at the beginning of the reversal.
Author
Geomagnetism; Reversing

20040027559 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations
Chin, Mian; Dubovik, Oleg; Holben, Brent; Anderson, Tad; Quinn, Patricia; Duncan, Bryan; Ginoux, Paul; [2003]; 1 pp.; In English; Atmospheric Chemistry Gordon Research Conference, 7-12 Sep. 2003, Big Sky, MT, USA; No Copyright; Avail: Other Sources; Abstract Only

Aerosol absorption in the atmosphere poses a major uncertainty in assessing the aerosol climate effects. This uncertainty arises from the poorly quantified aerosol sources, especially black carbon emissions, and our limited knowledge of aerosol mixing state and optical properties. Here we use a global model GOCART to simulate atmospheric aerosols, including sulfate, black carbon, organic carbon, dust, and sea salt. We compare the model calculated total aerosol optical thickness, extinction, and absorption with those quantities from the ground-based sun photometer measurements from AERONET at several different wavelengths and the field observations from ACE-Asia. We will examine what are the most sensitive factors in determining the aerosol absorption, and the consequences of assessing the aerosol radiative forcing and atmospheric heating associated with those factors.
NASA
Aerosols; Atmospheric Heating; Optical Properties; Photometers

20040027680 Boston Coll., Chestnut Hill, MA
Validation of Ionospheric Models
Doherty, Patricia; Mar. 31, 2003; 68 pp.; In English
Contract(s)/Grant(s): F19628-96-C-0039; Proj-1010
Report No.(s): AD-A419702; TR-7; AFRL-VS-TR-2003-1594; No Copyright; Avail: CASI; A04, Hardcopy

During the period of April 2002 through March 2003, we have continued to pursue the validation of ionospheric models. This work included significant efforts to access, process and analyze Total Electron Content (TEC) data from a variety of sources. These databases were useful in a series of validation studies that focused on PRISM's ability to predict the sub-peak ionospheric profile and geomagnetic storm effects. They were also useful in determining the overall quality of data from several sources. In this year, we also finalized two major projects. These projects included the validation of the GPS Single-Frequency Position Maps and the development of a pre-processor for PRISM that will enable the assimilation of a new source of ionospheric data from the UltraViolet (UV) imagers of the impending DMSP Block SD-3 satellites. The work summarized above resulted in four presentations at various ionospheric conferences, three papers published in meeting proceedings and two AFRL technical Reports.
DTIC
Atmospheric Models; Electron Density (Concentration); Ionospheric Propagation

20040027686 Massachusetts Univ., Lowell, MA
Measuring Electrodynamics of the Ionosphere by Digital Ionosondes and Other HF Techniques
Reinisch, Bodo; Sales, Gary; Jan. 20, 2003; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-96-C-0159; Proj-1010
Report No.(s): AD-A419700; AFRL-VS-TR-2003-1541; No Copyright; Avail: CASI; A03, Hardcopy

We conducted a general investigation into radiowave propagation modeling and ionospheric structure in the equatorial region. Techniques were developed to track ionospheric bubbles that form after sunset at or near the magnetic equator. These bubbles were identified as a source of satellite scintillation at 250 MHz. Drift speeds averaging around 100 m/s were observed during the test period in South America. HF propagation on a global scale was modeled using the USAF PRISM model of the ionosphere and rapid ray tracing techniques. These were combined with absorption and noise models to generate operational HF performance maps. Data bases combining global jonosonde measurements were established for the calibration and validation of satellite borne ionospheric measurements. As part of this program, special ionogram scaling and processing techniques were developed for auroral-E traces often observed at high latitudes.
DTIC
Ionosondes; Electrodynamics; High Frequencies

20040027722 NorthWest Research Associates, Inc., Bellevue, WA
Investigations of the Nature and Behavior of Plasma Density Disturbances That May Impact GPS and Other Transionospheric Systems
Fremouw, Edward J.; Mazzella, Andrew J., Jr.; Rao, Guan-Shu; Nov. 26, 2001; 30 pp.; In English
Contract(s)/Grant(s): F19628-97-C-0078
Report No.(s): AD-A419703; NWRA-CR-01-R240; AFRL-VS-TR-2002-1672; No Copyright; Avail: CASI; A03, Hardcopy

This report summarizes research during the fourth year of a contract for investigating (a) natural variations in ionospheric total electron content (TEC) and (b) plasma and electromagnetic effects produced by transmitting high-powered HF waves into the ionosphere. Ongoing efforts to maintain and utilize data from the Air Force Ionospheric Measuring Systems are being conducted. Initial efforts in upgrading these systems for enhanced data collection and reporting capabilities also are being conducted. Preliminary scintillation capabilities at the GPS L1 and L2 frequencies were established, with additional arrangements for incorporating UHF scintillation measurements also being accomplished. An array of diagnostic instruments is being maintained and enhanced in association with the High-frequency Active Auroral Research Program (HAARP). In addition to a classic riometer and a GPS Total Electron Content (TEC) sensor previously operating at the HAARP site, NWRA also operates a set of Transit receivers for measurements of TEC and scintillation at VHF and UHF, supplementing the receiver at HAARP with a receiver north of the site and an additional receiver installed south of the HAARP site.
DTIC
Electromagnetic Properties; Global Positioning System; Ionospheric Electron Density; Ionospheric Propagation

20040027734 Oslo Univ., Norway
Polar Cap Dynamics and Formation of High-Latitude Ionospheric Irregularities
Moen, Jeran; Nov. 28, 2003; 11 pp.; In English
Contract(s)/Grant(s): F61775-O2-WEO54
Report No.(s): AD-A419734; No Copyright; Avail: CASI; A03, Hardcopy

This report results from a contract tasking University of Oslo as follows: The contractor will Investigate the probability

of scintillation (rapid variations in ionosphere electrical properties) deep within the polar cap as a function of Universal Time. The objective of this research is to determine if a relationship exists and if so can the probability be predicted days or weeks in advance.
DTIC
Earth Ionosphere; Scintillation

20040027820 Oslo Univ., Norway
Combined Svalbard Optical and Radar Observations for Polar Cusp/Cap Research
Moen, Joran; May 28, 2003; 10 pp.; In English
Contract(s)/Grant(s): F61775-02-WE053
Report No.(s): AD-A419776; SPC-02-4053; No Copyright; Avail: CASI; A02, Hardcopy

This report results from a contract tasking University of Oslo as follows: The contractor will investigate the ionosphere using meridian scanning photometers, all-sky imagers and the incoherent scatter radar on Svalbard. The main aim of this research proposal is to obtain a reliable understanding of disturbances in the polar ionosphere. which is important to current space research and its application in space weather activities. In particular, the contractor will focus on locating the boundary between open and closed magnetic field lines and then determine which processes occur on open and which one on closed field lines.
DTIC
Ionospheres; Polar Caps; Space Weather; Optical Radar

20040028111 Naval Research Lab., Washington, DC
An Analysis of Airship Acceleration Dynamics for Airborne Gravimetry
Peters, Mary E.; Brozena, John M.; Liang, Robert T.; Jan. 12, 2004; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N0001404WX30001
Report No.(s): AD-A420006; No Copyright; Avail: CASI; A03, Hardcopy

A Honeywell three-axis inertial accelerometer was placed on board a Skyship 600B and acceleration data were recorded during the flight. Weather conditions during the flight were windy and turbulent, considered to be near the upper limits of this airship's operational envelope. Power spectra were computed from the acceleration data and showed favorable fall-off at high frequencies, but high power at low frequencies, as compared to a large, multi-engine aircraft used for gravity surveying. The vertical component of the airship accelerations was used as the driving input to model the response of a mechanical, 'zero-length spring' style gravimeter. The model shows that the meter would exceed its dynamic limits if it experienced the accelerations recorded on the airship. However, one commercially available gravimeter, the Bell BGM-5, has sufficient dynamic range to operate under these conditions.
DTIC
Gravimetry; Airships; Accelerometers; Dynamic Range; Airborne Equipment

20040030399 Boston Coll., Chestnut Hill, MA
Validation of Ionospheric Models
Doherty, Patricia; Mar. 31, 1999; 27 pp.; In English
Contract(s)/Grant(s): F19628-96-C-0039; Proj-1010
Report No.(s): AD-A419929; AFRL-VS-TR-2003-1590; No Copyright; Avail: CASI; A03, Hardcopy

During the period of April 1998 through March 1999, research efforts continued to support the validation of ionospheric models. These efforts included the acquisition and analysis of ionospheric measurements, software and algorithm development and comprehensive analysis of ionospheric model results. Research results provided unique The, scintillation and electron density data sets for model validations. Efforts also provided initial validations of a new sensor's ability to measure the electron density profile, novel applications of kinetic equations for ionospheric modeling, and the first comprehensive validation and comparison of various climatological and assimilative ionospheric models. The work resulted in five presentations at ionospheric conferences and one published journal article.
DTIC
Scintillation; Proving; Ionospheric Propagation

20040030417 Boston Coll., Chestnut Hill, MA
Validation of Ionospheric Models
Doherty, Patricia; Mar. 31, 2002; 45 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-96-C-0039; Proj-1010
Report No.(s): AD-A419921; AFRL-VS-TR-2003-1593; No Copyright; Avail: CASI; A03, Hardcopy

During the period of April 2001 through March 2002, we have continued to pursue the validation of ionospheric models. These efforts included the development of software to enable assimilation of new data types into the Parametrized Real-Time Ionospheric Specification Model (PRISM). This work required validation of the output from the enhanced PRISM input. Other validation efforts included analysis of the Total Electron Content (TEC) generated by the PRISM model and determination of the accuracy of the GPS positioning Error Maps that are part of the Operational Space Environment Network Display (OP-SEND). The Coupled Ionospheric Thermosphere Electrodynamic Forecast Model was enhanced by adding the Thermosphere Forecast Model. Ionospheric response% geomagnetic storms was also a focus of our work in the current year together with the development of automated software to perform quality control of ionograms data. The work summarized above resulted in seven presentations at various ionospheric conferences and one published journal article. The journal article is appended to this report.
DTIC
Specifications; Global Positioning System; Ionospherics

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20040016316 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate
Amitai, E.; Nystuen, J. A.; Liao, L.; Meneghini, R.; Morin, E.; [2003]; 1 pp.; In English; Copyright; Avail: CASI; A01, Hardcopy

Global precipitation is monitored from a variety of platforms including space-borne, ground- and ocean-based platforms. Intercomparisons of these observations are crucial to validating the measurements and providing confidence for each measurement technique. Probability distribution functions of rain rates are used to compare satellite and ground-based radar observations. A preferred adjustment technique for improving rain rate distribution estimates is identified using measurements from ground-based radar and radar and rain gauges within the coverage area of the radar. The underwater measurement of rainfall shows similarities to radar measurements, but with intermediate spatial resolution and high temporal resolution. Reconciling these different measurement techniques provides understanding and confidence for all of the methods.
Author
Meteorological Radar; Precipitation (Meteorology); Rain; Radar Tracking; Radar Measurement

20040016322 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds
Campbell, James R.; O'C. Starr, David; Welton, Ellsworth J.; Spinhirne, James D.; Ferrare, Richard A.; [2003]; 23 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

On 31 December 2001, ice-crystal fallstreaks (e.g., cirrus uncinus, or colloquially 'Mare's Tails') from supercooled liquid water parent clouds were observed by ground-based lidars pointed vertically from the Atmospheric Radiation Measurement Southern Great Plains (SGP) facility near Lamont, Oklahoma. The incidence of liquid phase cloud with apparent ice-phase precipitation is investigated. Scenarios for mixed-phase particle nucleation, and fallstreak formation and sustenance are discussed. The observations are unique in the context of the historical reverence given to the commonly observed c h s uncinus fallstreak (wholly ice) versus this seemingly contradictory coincidence of liquid water begetting ice-crystal streaks.
Author
Crystals; Ice; Supercooling; Water; Clouds (Meteorology); Liquid Phases

20040016323 NASA Goddard Space Flight Center, Greenbelt, MD, USA, NASA Langley Research Center, Hampton, VA, USA

Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking

Yang, Fanglin; Schlesinger, Michael E.; Andranova, Natasha; Zubov, Vladimir A.; Rozanov, Eugene V.; Callis, Lin B.; [2003]; 43 pp.; In English

Contract(s)/Grant(s): NAG5-10942; Copyright; Avail: CASI; A03, Hardcopy

The sensitivity of the middle atmospheric temperature and circulation to the treatment of mean- flow forcing due to breaking gravity waves was investigated using the University of Illinois at Urbana-Champaign 40-layer Mesosphere-Stratosphere-Troposphere General Circulation Model (MST-GCM). Three GCM experiments were performed. The gravity-wave forcing was represented first by Rayleigh friction, and then by the Alexander and Dunkerton (AD) parameterization with weak and strong breaking effects of gravity waves. In all experiments, the Palmer et al. parameterization was included to treat the breaking of topographic gravity waves in the troposphere and lower stratosphere. Overall, the experiment with the strong breaking effect simulates best the middle atmospheric temperature and circulation. With Rayleigh friction and the weak breaking effect, a large warm bias of up to 60 C was found in the summer upper mesosphere and lower thermosphere. This warm bias was linked to the inability of the GCM to simulate the reversal of the zonal winds from easterly to westerly crossing the mesopause in the summer hemisphere. With the strong breaking effect, the GCM was able to simulate this reversal, and essentially eliminated the warm bias. This improvement was the result of a much stronger meridional transport circulation that possesses a strong vertical ascending branch in the summer upper mesosphere, and hence large adiabatic cooling. Budget analysis indicates that 'in the middle atmosphere the forces that act to maintain a steady zonal-mean zonal wind are primarily those associated with the meridional transport circulation and breaking gravity waves. Contributions from the interaction of the model-resolved eddies with the mean flow are small. To obtain a transport circulation in the mesosphere of the UIUC MST-GCM that is strong enough to produce the observed cold summer mesopause, gravity-wave forcing larger than 100 m/s/day in magnitude is required near the summer mesopause. In the tropics, only with the AD parameterization can the model produce realistic semiannual oscillations.

Author

Atmospheric General Circulation Models; Troposphere; Mesosphere; Stratosphere; Gravitational Effects; Thermosphere

20040016352 NASA Marshall Space Flight Center, Huntsville, AL, USA

The Tropical Convective Spectrum, 1, Archetypal Vertical Structures

Boccippio, Dennis J.; Petersen, Walter A.; Cecil, Daniel J.; January 1, 2004; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

A taxonomy of tropical convective vertical structures is constructed through cluster analysis of three years of Tropical Rainfall Measuring Mission [TRMM] Precipitation Radar [PR] vertical profiles, their surface rainfall and associated radar-based classifiers (convective/stratiform and bright band existence). archetypal profile types are identified. These include nine convective types, divided into warm, 'just cold', midlevel, deep and deep/wet-growth categories, seven stratiform types, divided into warm, 'just cold', midlevel and deep categories, three 'mixed' types (deep profiles with low reflectivity aloft), and six fragment types (non-precipitating anvils and sheared deep convective profiles). The taxonomy allows for description of any storm or local Convective spectrum by the nine primary convective and stratiform types, a significant reduction over full three-dimensional radar data which nonetheless retains vertical structure information. The analysis provides a quasi-independent corroboration of the TRMM 2A23 convective/stratiform classification. The global frequency of occurrence and contribution to rainfall for the profile types is presented, demonstrating primary rainfall contribution by midlevel glaciated convection and similar depth decaying/stratiform stages. Close correspondence is found between deep convective profile frequency and annualized lightning production. Passive microwave and lightning properties associated with the profiles are reported, and cases presented illustrating known nonuniqueness problems with 85 and 37 GHz brightness temperature pairs (the same pairs corresponding to both convective and stratiform profiles), and how supplementary lightning information might be used to mitigate these problems.

Author

Tropical Regions; Convection; Spectra; Vertical Distribution; Taxonomy

20040016379 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA)

Tsay, Si-Chee; Hsu, Christina N.; King, Michael D.; Sun, Wen-Yih; [2003]; 1 pp.; In English; Asian-Pacific Radiation Symposium, 25-27 Aug. 2003, Xian, China; Copyright; Avail: Other Sources; Abstract Only

Biomass burning has been a regular practice for land clearing and land conversion in many countries, especially those in Africa, South America, and Southeast Asia. However, the unique climatology of Southeast Asia is very different than that of Africa and South America, such that large-scale biomass burning causes smoke to interact extensively with clouds during the peak-burning season of March to April. Significant global sources of greenhouse gases (e.g., CO2, CH4), chemically active gases (e.g., NO, CO, HC, CH3Br), and atmospheric aerosols are produced by biomass burning processes. These gases influence the Earth-atmosphere system, impacting both global climate and tropospheric chemistry. Some aerosols can serve as cloud condensation nuclei, which play an important role in determining cloud lifetime and precipitation, hence, altering the earth's radiation and water budget. Biomass burning also affects the biogeochemical cycling of nitrogen and carbon compounds from the soil to the atmosphere; the hydrological cycle (i.e., run off and evaporation); land surface reflectivity and emissivity; as well as ecosystem biodiversity and stability. Analyses from satellite measurements reveal that smoke is frequently present solar (emitted thermal) radiation from clouds due to smoke aerosols can be reduced (enhanced) by as much as 100 (20) W/sq m over the month of March 2000. In addition, the reduction in cloud spectral reflectance at 670 run is large enough to lead to significant errors in retrieving cloud properties (e.g., optical thickness and effective radius) from satellite measurements. The fresh water distribution in this region is highly dependent on monsoon rainfall; in fact, the predictability of the tropical climate system is much reduced during the boreal spring. Estimating the burning fuel (e.g., bark, branches, and wood), an important part of studying regional carbon cycle, may rely on utilizing a wide range of distinctive spectral features in the shortwave and longwave regions. Therefore, to accurately assess the impact of smoke aerosols in this region requires continuous observations from satellites, aircraft, networks of ground-based instruments and dedicated field experiments. A new initiative will be proposed and discussed.
Author
Biomass Burning; Aerosols; Air Land Interactions; Greenhouse Effect; Atmospheric Chemistry; Nitrogen Compounds

20040016382 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sensitivity Studies for Space-based Measurements of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight
Mao, Jianping; Kawa, S. Randolph; [2003]; 1 pp.; In English; SPIE International Symposium on Remote Sensing, 8-12 Sep. 2003, Barcelona, Spain; Copyright; Avail: Other Sources; Abstract Only

A series of sensitivity studies is carried out to explore the feasibility of space-based global carbon dioxide (CO2) measurements for global and regional carbon cycle studies. The detection method uses absorption of reflected sunlight in the CO2 vibration-rotation band at 1.58 micron. The sensitivities of the detected radiances are calculated using the line-by-line model (LBLRTM), implemented with the DISORT (Discrete Ordinates Radiative Transfer) model to include atmospheric scattering in this band. The results indicate that (a) the small (approx.1%) changes in CO2 near the Earth's surface are detectable in this CO2 band provided adequate sensor signal-to-noise ratio and spectral resolution are achievable; (b) the effects of other interfering constituents, such as water vapor, aerosols and cirrus clouds, on the radiance are significant but the overall effects of the modification of light path length on total back-to-space radiance sensitivity to CO2 change are minor for general cases, which means that generally the total column CO2 can be derived in high precision from the ratio of the on-line center to off-line radiances; (c) together with CO2 gas absorption aerosol/cirrus cloud layer has differential scattering which may result in the modification of on-line to off-line radiance ratio which could lead a large bias in the total column CO2 retrieval. Approaches to correct such bias need further investigation. (d) CO2 retrieval requires good knowledge of the atmospheric temperature profile, e.g. approximately 1K RMS error in layer temperature, which is achievable from new atmospheric sounders in the near future; (e) the atmospheric path length, over which the CO2 absorption occurs, should be known in order to correctly interpret horizontal gradients of CO2 from the total column CO2 measurement; thus an additional sensor for surface pressure measurement needs to be attached for a complete measurement package.
Author
Absorption Spectra; Atmospheric Sounding; Carbon Dioxide Concentration; Sunlight; Carbon Dioxide; Mathematical Models

20040016383 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002
Demoz, B.; Miller, D.; Evans, K.; Whiteman, D.; DiGirolamo, P.; Schwemmer, G.; Gentry, B.; Starr, D.; Wang, Z.; [2003]; 3 pp.; In English; 6th International Symposium on Tropospheric Profiling, 14-20 Sep. 2003, Leipzig, Germany; Copyright; Avail: CASI; A01, Hardcopy

As part of the International H2O Project (MOP-2002), three NASNGSFC lidars acquired high-resolution clear air data of wind, CBL evolution, and water vapor mixing ratio profiles during a dryline event that occurred on 22 May 2002. Together

with the anciliary suite of instruments deployed in MOP-2002, these lidar data sets offer a unique look into the mesoscale evolution and convective scale dynamics in and around a dryline.
Author
Boundary Layers; Atmospheric Moisture; Holography; Mixing Ratios

20040016413 Lawrence Livermore National Lab., Livermore, CA
Evaluating the Carbon Cycle of a Coupled Atmosphere-Biosphere Model
Delire, C.; Foley, J. A.; Thompson, S.; Aug. 21, 2002; 54 pp.; In English
Report No.(s): DE2003-15004812; UCRL-JC-149715; No Copyright; Avail: Department of Energy Information Bridge

We investigate how well a coupled biosphere-atmosphere model, CCM3-IBIS, can simulate the functioning of the terrestrial biosphere and the carbon cycling through it. The simulated climate is compared to observations, while the vegetation cover and the carbon cycle are compared to an offline version of the biosphere model IBIS forced with observed climatic variables. The simulated climate presents some local biases that strongly affect the vegetation (e.g., a misrepresentation of the African monsoon). Compared to the offline model, the coupled model simulates well the globally averaged carbon fluxes and vegetation pools. The zonal mean carbon fluxes and the zonal mean seasonal cycle are also well represented except between 0(sup o) and 20(sup o)N due to the misrepresentation of the African monsoon. These results suggest that, despite regional biases in climate and ecosystem simulations, this coupled atmosphere-biosphere model can be used to explore geographic and temporal variations in the global carbon cycle.
NTIS
Atmospheric Models; Carbon Cycle; Biosphere

20040016441 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.)
Carter, Gregory A.; Bahadur, Raj; Norby, Richard J.; January 14, 1999; 23 pp.; In English
Contract(s)/Grant(s): DE-AC05-96OR-22464
Report No.(s): SE-1999-01-00009-SSC; Copyright; Avail: CASI; A03, Hardcopy

Elevated atmospheric CO2 pressure and numerous causes of plant stress often result in decreased leaf chlorophyll contents and thus would be expected to alter leaf optical properties. Hypotheses that elevated carbon dioxide pressure and air temperature would alter leaf optical properties were tested for sugar maple (Acer saccharum Marsh.) in the middle of its fourth growing season under treatment. The saplings had been growing since 1994 in open-top chambers at Oak Ridge, Tennessee under the following treatments: 1) Ambient CO2 pressure and air temperature (control); 2) CO2 pressure approximately 30 Pa above ambient; 3) Air temperatures 3 C above ambient; 4) Elevated CO2 and air temperature. Spectral reflectance, transmittance, and absorptance in the visible spectrum (400-720 nm) did not change significantly (rho = 0.05) in response to any treatment compared with control values. Although reflectance, transmittance, and absorptance at 700 nm correlated strongly with leaf chlorophyll content, chlorophyll content was not altered significantly by the treatments. The lack of treatment effects on pigmentation explained the non-significant change in optical properties in the visible spectrum. Optical properties in the near-infrared (721-850 nm) were similarly unresponsive to treatment with the exception of an increased absorptance in leaves that developed under elevated air temperature alone. This response could not be explained by the data, but might have resulted from effects of air temperature on leaf internal structure. Results indicated no significant potential for detecting leaf optical responses to elevated CO2 or temperature by the remote sensing of reflected radiation in the 400-850 nm spectrum.
Author
Carbon Dioxide Concentration; Atmospheric Composition; Optical Properties; Leaves; Deciduous Trees; Atmospheric Temperature; Atmospheric Pressure; Chlorophylls

20040020080 National Defence Research Establishment, Linkoeping, Sweden
Wind Sounding with Laser Radar: A Pre-Study
Letalick, D.; Sep. 2002; 64 pp.; In Swedish
Report No.(s): PB2004-101761; FOI-R-0588-SE; No Copyright; Avail: CASI; A04, Hardcopy

Platform based wind sensors measure the wind close to the platform where the wind field often is disturbed by the platform and surroundings. There is often a need of remote sensing of the wind, away from the wind sensor and in an undisturbed wind field. Modern platforms should also have a low signature, which demands that the wind sensor does not

significantly add to the platform signature. With a laser radar for wind sounding these requirements can be fulfilled. With dynamic analysis of the atmosphere in real time, the ability to act with precision weapons is increased, as detailed and updated data about the weather situation, especially the wind, is made available. The aim of the present study is to collect information about the possibilities and limitations of this technology, the costs, the risks and feasibility in possible applications.
NTIS
Meteorological Radar; Remote Sensing; Velocity Distribution

20040020110 Colorado Univ., Boulder, CO, USA
Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions
Frei, Allan; Nolin, Anne W.; Serreze, Mark C.; Armstrong, Richard L.; McGinnis, David L.; Robinson, David A.; January 2004; 18 pp.; In English
Contract(s)/Grant(s): NAG5-7543
Report No.(s): Rept-97-MTPE-12; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this three-year study is to develop and evaluate techniques to estimate the range of potential hydrological impacts of climate change in mountainous areas. Three main objectives are set out in the proposal. (1) To develop and evaluate transfer functions to link tropospheric circulation to regional snowfall. (2) To evaluate a suite of General Circulation Models (GCMs) for use in estimating synoptic scale circulation and the resultant regional snowfall. And (3) to estimate the range of potential hydrological impacts of changing climate in the two case study areas: the Upper Colorado River basin, and the Catskill Mountains of southeastern New York State. Both regions provide water to large populations.
Author
Climate Change; Mountains; Snow; Climate Models

20040021369 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2)
Chou, Shu-Hsien; Nelkin, Eric; Ardizzone, Joe; Atlas, Robert M.; Shie, Chung-Lin; [2002]; 1 pp.; In English; 12th Conference on Interaction of the Sea and Atmosphere, 9-13 Feb. 2003, Long Beach, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The global air-sea fluxes of momentum, latent and sensible heat, radiation, and freshwater (precipitation-evaporation) are required for driving Ocean models and validating coupled ocean- atmosphere global models. Wind stress is the major forcing for driving the oceanic circulation, while evaporation is a key component of hydrological cycle and surface heat budget. We have produced a 13.5-year (July 1987-December 2000) dataset containing daily, monthly, and climatological surface fluxes of momentum, latent and sensible heat over the global Oceans from the Special Sensor Microwave/Imager (SSM/I) radiance easurements. This dataset is called version 2 Goddard Satellite-based Surface Turbulent Fluxes (GSSTF-2). The GSSW-2 has a spatial resolution of 1.0deg x 1.0deg lat-long. In addition, evaporation has been combined with the satellite-retrieved precipitation to produce monthly freshwater fluxes over the global Ocean for the same period. Daily turbulent fluxes are derived from the S S M surface winds and surface air humidity, and 2-m air and sea surface temperatures (SST) of the NCEP/NCAR reanalysis, using an improved stability-dependent bulk flux algorithm based on the surface layer similarity theory. Hourly fluxes computed from the GSSTF-2 bulk flux algorithm using the observed hourly input variables validate well against those of ten experiments observed by the research ships over the tropical and midlatitude oceans. In addition, daily wind stresses, latent heat fluxes, wind speeds, surface air humidity and SSTs of the GSSTF-2 compare reasonably well with those of the collocated in situ measurements of the ten experiments. The global distributions of 1988-2000 annual- and seasonal-mean turbulent fluxes show reasonable patterns related to the atmospheric general circulation and its seasonal variations. The comparison of zonally-averaged wind stress and latent heat fluxes of the GSSTF-2 with those of other satellite products as well as the NCEPNCAR and ECMWF reanalyses for the annual mean and seasonal variations during 1992-93 will be discussed. .
Author
Wind Shear; Shear Stress; Air Water Interactions; Atmospheric Circulation; Atmospheric Models; Hydrological Cycle

20040021399 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Okhotsk Sea Kashevarov Bank Polynya: Its Dependence on Diurnal and Fortnightly Tides and its Initial Formation
Martin, Seelye; Polyakov, Igor; Markus, Thorsten; Drucker, Robert; [2003]; 33 pp.; In English
Contract(s)/Grant(s): NAG5-11057; NSF OCE-98-11097; Copyright; Avail: CASI; A03, Hardcopy

Open water areas within the sea ice (polynyas) are sources of intense heat exchange between the ocean and the atmosphere. In this paper, we used microwave and visible/infrared satellite data together with a sea ice model to investigate the polynya opening mechanisms. The satellite data and the model show significant agreement and prove that tides play an active role in the polynya dynamics.
Author
Air Water Interactions; Diurnal Variations; Heat Transfer; Sea of Okhotsk

20040026654 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time
Huffman, George J.; Adler, Robert F.; Stocker, Erich; Bolvin, David T.; Nelkin, Eric J.; [2002]; 7 pp.; In English; 12th Conference on Satellite Meteorology and Oceanography, 9-13 Feb. 2003, Long Beach, CA, USA; No Copyright; Avail: CASI; A02, Hardcopy

Satellite data form the core of the information available for estimating precipitation on a global basis. While it is possible to create such estimates solely from one sensor, researchers have increasingly moved to using combinations of sensors in an attempt to improve accuracy, coverage, and resolution. This poster updates a long-term project in which the authors are working to provide routine combined-sensor estimates of precipitation over the entire globe at relatively fine time and space intervals. The goal is to produce these globally complete precipitation estimates on a 25-km grid every 3 hours. Since late January 2002 we have been estimating precipitation for the latitude band 50 degrees N-S within about 6 hours of observation time. This work is 1 of only 2 or 3 such efforts in the world. Now we are preparing to provide similar estimates for the last 5 years. All of this work is being carried out as part of the Tropical Rainfall Measuring Mission (TRMM). Initially, TRMM was focused on providing excellent long-term averages of precipitation in tropical regions, but since its launch in November 1997 continued research has allowed the same satellite and data system to be used for addressing weather-scale problems as well.
Derived from text
Real Time Operation; Trmm Satellite; Precipitation (Meteorology); Weather; Algorithms; Data Processing

20040027493 Science Systems and Applications, Inc., Greenbelt, MD, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA
Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM)
Radakovich, Jon D.; Wang, Guiling; Chern, Jiundar; Bosilovich, Michael G.; Lin, Shian-Jiann; Nebuda, Sharon; Shen, Bo-Wen; [2002]; 2 pp.; In English; AMS 83rd Annual Meeting, 9-13 Feb. 2003, Long Beach, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

In this study, the NCAR CLM version 2.0 land-surface model was integrated into the NASA/NCAR fvGCM. The CLM was developed collaboratively by an open interagency/university group of scientists and based on well-proven physical parameterizations and numerical schemes that combine the best features of BATS, NCAR-LSM, and IAP94. The CLM design is a one-dimensional point model with 1 vegetation layer, along with sub-grid scale tiles. The features of the CLM include 10-uneven soil layers with water, ice, and temperature states in each soil layer, and five snow layers, with water flow, refreezing, compaction, and aging allowed. In addition, the CLM utilizes two-stream canopy radiative transfer, the Bonan lake model and topographic enhanced streamflow based on TOPMODEL. The DAO fvGCM uses a genuinely conservative Flux-Form Semi-Lagrangian transport algorithm along with terrain- following Lagrangian control-volume vertical coordinates. The physical parameterizations are based on the NCAR Community Atmosphere Model (CAM-2). For our purposes, the fvGCM was run at 2 deg x 2.5 deg horizontal resolution with 55 vertical levels. The 10-year climate from the fvGCM with CLM2 was intercompared with the climate from fvGCM with LSM, ECMWF and NCEP. We concluded that the incorporation of CLM2 did not significantly impact the fvGCM climate from that of LSM. The most striking difference was the warm bias in the CLM2 surface skin temperature over desert regions. We determined that the warm bias can be partially attributed to the value of the drag coefficient for the soil under the canopy, which was too small resulting in a decoupling between the ground surface and the canopy. We also discovered that the canopy interception was high compared to observations in the Amazon region. A number of experiments were then performed focused on implementing model improvements. In order to correct the warm bias, the drag coefficient for the soil under the canopy was considered a function of LAI (Leaf Area Index). Analysis of the results revealed that there was a substantial impact, and the warm and dry bias in the CLM2 was significantly reduced. For the interception scheme, the canopy throughfall was increased to allow for more

infiltration of precipitation into the soil, resulting in increased low-level moisture and a decrease in the interception loss ratio (canopy evaporation to precipitation).
Author
Climate Models; Mathematical Models; Finite Volume Method; Parameterization; Climatology

20040027503 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Heating Structures Derived from Satellite
Tao, W.-K.; Adler, R.; Haddad, Z.; Hou, A.; Kakar, R.; Krishnamurti, T. N.; Kummerow, C.; Lang, S.; Meneghini, R.; Olson, W., et al.; [2004]; 50 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Rainfall is a key link in the hydrologic cycle and is a primary heat source for the atmosphere. The vertical distribution of latent-heat release, which is accompanied by rainfall, modulates the large-scale circulations of the tropics and in turn can impact midlatitude weather. This latent heat release is a consequence of phase changes between vapor, liquid, and solid water. The Tropical Rainfall Measuring Mission (TRMM), a joint U.S./Japan space project, was launched in November 1997. It provides an accurate measurement of rainfall over the global tropics which can be used to estimate the four-dimensional structure of latent heating over the global tropics. The distributions of rainfall and inferred heating can be used to advance our understanding of the global energy and water cycle. This paper describes several different algorithms for estimating latent heating using TRMM observations. The strengths and weaknesses of each algorithm as well as the heating products are also discussed. The validation of heating products will be exhibited. Finally, the application of this heating information to global circulation and climate models is presented.
Author
Atmospheric Circulation; Heat Sources; Heat Transfer; Hydrological Cycle; Climate Models; Atmospheric Models; Rain

20040027505 NASA Marshall Space Flight Center, Huntsville, AL, USA
Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models
Robertson, Franklin R.; Roads, John; Oglesby, Robert; Marshall, Susan; [2004]; 1 pp.; In English; 84th AMS Annual Meeting, 11-15 Jan. 2004, Seattle, WA, USA; No Copyright; Avail: Other Sources; Abstract Only

One of the most fundamental properties of the global heat balance is the net heat input into the tropical atmosphere that helps drive the planetary atmospheric circulation. Although broadly understood in terms of its gross structure and balance of source / sink terms, incorporation of the relevant processes in predictive models is still rather poor. The work reported here examines the tropical radiative and water cycle behavior as produced by four contemporary climate models. Among these are the NSIPP-2 (NASA Seasonal to Interannual Prediction Project) which uses the RAS convective parameterization; the FVCCM, a code using finite volume numerics and the CCM3.6 physics; FVCCM-MCRAS again having the finite volume numerics, but MCRAS convective parameterization and a different radiation treatment; and, finally, the NCEP GSM which uses the RAS. Using multi-decadal integrations with specified SSTs we examine the statistics of radiative / convective processes and associated energy transports, and then estimate model energy flux sensitivities to SST changes. In particular the behavior of the convective parameterizations is investigated. Additional model integrations are performed specifically to assess the importance representing convective inhibition in regulating convective cloud-top structure and moisture detrainment as well as controlling surface energy fluxes. To evaluate the results of these experiments, a number of satellite retrievals are used: TRMM retrievals of vertical reflectivity structure, rainfall rate, and inferred diabatic heating are analyzed to show both seasonal and interannual variations in vertical structure of latent heat release. Top-of-atmosphere radiative fluxes from ERBS and CERES are used to examine shortwave and longwave cloud forcing and to deduce required seasonal energy transports. Retrievals of cloud properties from ISCCP and water vapor variations from SSM/T-2 are also used to understand behavior of the humidity fields. These observations are supplemented with output form the DOE Reanalysis-2.
Author
Atmospheric Heating; Tropical Regions; Atmospheric Circulation; Convection; Climate Models

20040027554 NASA Goddard Space Flight Center, Greenbelt, MD, USA, Georgia Inst. of Tech., Atlanta, GA, USA
Characteristics and Global Impact of Aerosols from Southern Africa and Eastern Asia
Chin, Mian; [2004]; 3 pp.; In English
Contract(s)/Grant(s): NAG5-12256; No Copyright; Avail: CASI; A01, Hardcopy

Supported mainly by the NASA GACP and ACMAP, we have made significant progress in the global modeling of tropospheric aerosols and their precursors in the past few years, especially in the development of the GOCART model,

simulation of anthropogenic and natural aerosols, data analysis of field observations and satellite retrievals, assessment of global and regional budgets, estimate of aerosol direct radiative forcing, and aerosol forecasting and data analysis for the ACE-Asia field experiment. Our results and findings are summarized in Chin et al. Model calculated multiple-year optical thickness for individual and total aerosols are at internet. These results have been frequently used by other groups, for example, to impose initial conditions for regional models, provide dust source functions for other global models, supply aerosol fields for chemistry and climate models, help data group interpret their measurements, select monitoring sites for ground observation network, and assist satellite retrievals.
Author
Aerosols; Troposphere; Atmospheric Models; Forecasting; Dust; Climate Models

20040027569 Ohio State Univ., Columbus, OH, USA
Modeling and Observational Study of the Global Atmospheric Impacts of Antarctic Sea Ice Anomalies
Bromwich, David H.; Hines, Keith M.; [2004]; 9 pp.; In English
Contract(s)/Grant(s): NAG5-7750
Report No.(s): OSURF-736746; No Copyright; Avail: CASI; A02, Hardcopy

A combined observational and modeling study considers the linkage between Antarctic sea ice and the climate of non-local latitudes. The observational component is based upon analyses of monthly station observations and the National Centers for Environmental Prediction (NCEP)/National Center for Atmospheric Research (NCAR) Reanalysis (NNR). The modeling component consists of simulations of the NCAR Community Climate Model versions 2 (CCM2) and 3 (CCM3) and the recent Community Atmosphere Model (CAM2). A convenient mechanism for communication between the Antarctic region (particularly the Ross Sea area) and the tropics and Northern Hemisphere is examined. The first evidence of this teleconnection came from CCM2 simulations performed during an earlier NASA supported project. Annual-cycle simulations with and without Antarctic sea ice show statistically- significant responses in monsoon precipitation over central and northern China during the month of September. The changes in monsoon precipitation are physically consistent with an intensified southwest Pacific (Northern Hemisphere) subtropical high in response to all Antarctic sea ice being removed and replaced with open water at -1.9'C. The intensified high is the northernmost component of three primary anomalies. The southernmost anomaly includes the Ross Sea area, where sea ice has been removed. An earlier study by Peng and Domros had also found a link between Antarctic sea ice and the East Asian monsoon circulation. The current project has helped to understand the teleconnection.
Author
Antarctic Regions; Sea Ice; Observation; Atmospheric Models; Atmospheric Effects; Climate Models

20040027705 NASA Goddard Space Flight Center, Greenbelt, MD, USA
On the Cause of the 1930s Dust Bowl
Schubert, Siegfried D.; Suarez, Max J.; Pegion, Philip J.; Koster, Randal D.; Bacmeister, Julio T.; [2004]; 23 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The 1930s was characterized by a decade of rainfall deficits and high temperatures that desiccated much of the USA Great Plains. Numerous dust storms created one of the most severe environmental catastrophes in U.S. history and led to the popular characterization of much of the southern Great Plains as the Dust Bowl . In this study, we show that the origin of the drought was in the anomalous tropical sea surface temperatures that occurred during that decade. We further show that interactions between the atmosphere and the land surface were essential to the development of the severe drought conditions. The results are based on simulations with the NASA Seasonal-to-Interannual Prediction Project general circulation model forced with observed and idealized sea surface temperatures. We contrast the 1930s drought with other major droughts of the 20th century, and speculate on the possibility of another Dust Bowl developing in the foreseeable future.
NASA
Dust Storms; Atmospheric General Circulation Models; Earth Surface; Great Plains Corridor (North America); Mathematical Models; Sea Surface Temperature

20040027706 NASA Goddard Inst. for Space Studies, New York, NY, USA
Climate Impacts on Tropospheric Ozone and Hydroxyl
Shindell, Drew T.; Bell, N.; Faluvegi, G.; [2003]; 1 pp.; In English; ACU/EGS Conference, 6-11 Apr. 2003, Nice, France; No Copyright; Avail: Other Sources; Abstract Only

Climate change may influence tropospheric ozone and OH via several main pathways: (1) altering chemistry via

temperature and humidity changes, (2) changing ozone and precursor sources via surface emissions, stratosphere-troposphere exchange, and light- ning, and (3) affecting trace gas sinks via the hydrological cycle and dry deposition. We report results from a set of coupled chemistry-climate model simulations designed to systematically study these effects. We compare the various effects with one another and with past and projected future changes in anthropogenic and natural emissions of ozone precursors. We find that white the overall impact of climate on ozone is probably small compared to emission changes, some significant seasonal and regional effects are apparent. The global effect on hydroxyl is quite large, however, similar in size to the effect of emission changes. Additionally, we show that many of the chemistry-climate links that are not yet adequately modeled are potentially important.
Author
Climate Change; Troposphere; Ozone; Atmospheric Temperature; Climate Models; Hydrological Cycle

20040027721 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Momentum Transport: 2D and 3D Cloud Resolving Model Simulations
Tao, Wei-Kuo; [2001]; 1 pp.; In English; IAMAS Conference, 10-18 Jul. 2001, Innsbruck, Austria; No Copyright; Avail: Other Sources; Abstract Only

The major objective of this study is to investigate the momentum budgets associated with several convective systems that developed during the TOGA COARE IOP (west Pacific warm pool region) and GATE (east Atlantic region). The tool for this study is the improved Goddard Cumulas Ensemble (GCE) model which includes a 3-class ice-phase microphysical scheme, explicit cloud radiative interactive processes and air-sea interactive surface processes. The model domain contains 256 x 256 grid points (with 2 km resolution) in the horizontal and 38 grid points (to a depth of 22 km) in the vertical. The 2D domain has 1024 grid points. The simulations were performed over a 7-day time period (December 19-26, 1992, for TOGA COARE and September 1-7, 1994 for GATE). Cyclic literal boundary conditions are required for this type of long-term integration. Two well organized squall systems (TOGA, COARE February 22, 1993, and GATE September 12, 1994) were also simulated using the 3D GCE model. Only 9 h simulations were required to cover the life time of the squall systems. the lateral boundary conditions were open for these two squall systems simulations. the following will be examined: (1) the momentum budgets in the convective and stratiform regions, (2) the relationship between momentum transport and cloud organization (i.e., well organized squall lines versus less organized convective), (3) the differences and similarities in momentum transport between 2D and 3D simulated convective systems, and (4) the differences and similarities in momentum budgets between cloud systems simulated with open and cyclic lateral boundary conditions. Preliminary results indicate that there are only small differences between 2D and 3D simulated momentum budgets. Major differences occur, however, between momentum budgets associated with squall systems simulated using different lateral boundary conditions.
Author
Precipitation (Meteorology); Atmospheric Models; Boundary Conditions; Cloud Physics; Ice

20040027753 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Discoveries about Tropical Ozone from Satellite and SHADOZ (Southern Hemisphere ADditional Ozonesondes)
Thompson, Anne M.; January 2004; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We have been producing near-real tropical tropospheric ozone ('TTO') data from TOMS since 1997 with Prof. Hudson and students at the University of Maryland. Maps for 1996-2000 for the operational Earth-Probe instrument reside at: <http://www.atmos.umd.edu/~trope>. The tropics is a region strongly influenced by natural variability and anthropogenic activity and the satellite data have been used to track biomass burning pollution and to detect interannual variability and climate signals in ozone. The satellite view of chemical-dynamical interactions in tropospheric ozone is not adequate to capture vertical variability. Thus, in 1998, NASA's Goddard Space Flight Center, NOAA's Climate Monitoring and Diagnostics Laboratory (CMDL) and a team of international sponsors established the SHADOZ (Southern Hemisphere ADditional OZonesondes) project to address the gap in tropical ozone soundings. SHADOZ provides a public archive of ozonesonde data from twelve tropical and subtropical stations at http://croc.gsfc.nasa.gov/shadoz. Highlights from the first 4-5 years of SHADOZ data (presently > 2000 sondes) will be shown.
Author
Total Ozone Mapping Spectrometer; Troposphere; Meteorological Parameters; Biomass Burning; Climate; Man Environment Interactions

20040027824 Army Research Lab., Adelphi, MD

A High Resolution, Three-Dimensional, Computationally Efficient, Diagnostic Wind Model: Initial Development Report

Wang, Yansen; Mercurio, Jon J.; Williamson, Chatt C.; Garvey, Dennis M.; Chang, Sam; Oct. 2003; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419809; ARL-TR-3094; No Copyright; Avail: CASI; A03, Hardcopy

This document describes a three-dimensional, high resolution, computationally efficient, diagnostic model for flow over complex terrain using a mass consistent approach. The differences between the current model and similar approaches are (a) the lower boundary conditions and (b) an efficient numerical method. The model includes the effects of topography and small surface features such as forest areas and building on the overall flow. The numerical implementation takes advantage of a multigrid method that greatly improves the computation speed. The framework of the model and associated implementations are described here. Several preliminary test cases for the model are also given in this documentation.

DTIC

High Resolution; Boundary Conditions; Topography

20040027867 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Advanced Global Atmospheric Gases Experiment (AGAGE): MIT Contribution

Kurylo, Michael; [2003]; 11 pp.; In English

Contract(s)/Grant(s): NAG5-3974; No Copyright; Avail: CASI; A03, Hardcopy

We describe in detail the instrumentation and calibrations used in the ALE, GAGE and AGAGE experiments and present a history of the majority of the anthropogenic ozone- depleting and climate-forcing gases in air based on these experiments. Beginning in 1978, these three successive automated high frequency in-situ experiments have documented the long-term behavior of the measured concentrations of these gases over the past twenty years, and show both the evolution of latitudinal gradients and the high frequency variability due to sources and circulation. We provide estimates of the long-term trends in total chlorine contained in long- lived halocarbons involved in ozone depletion. We summarize interpretations of these measurements using inverse methods to determine trace gas lifetimes and emissions. Finally, we provide a combined observational and modeled reconstruction of the evolution of chlorocarbons by latitude in the atmosphere over the past sixty years which can be used as boundary conditions for interpreting trapped air in glaciers and oceanic measurements of chlorocarbon tracers of the deep oceanic circulation. Some specific conclusions are: (a) International compliance with the Montreal Protocol is so far resulting in chlorofluorocarbon and chlorocarbon mole fractions comparable to target levels, (b) Mole fractions of total chlorine contained in long-lived halocarbons (CCl2F2, CCl3F, CH3CCl3, CCl4, CHClF2, CCl2FCClF2, CH3Cl, CH2Cl2, CHCl3, CCl2=CCl2) in the lower troposphere reached maximum values of about 3.6 ppb in 1993 and are beginning to slowly decrease in the global lower atmosphere, (c) The chlorofluorocarbons have atmospheric lifetimes consistent with destruction in the stratosphere being their principal removal mechanism, (d) Multi-annual variations in chlorofluorocarbon and chlorocarbon emissions deduced from ALUGAGWAGAGE data are consistent approximately with variations estimated independently from industrial production and sales data where available (CCl2F2 (CFC-12) and CCl2FCClF2 (CFC-113) show the greatest discrepancies), (e) The mole fractions of the hydrochlorofluorocarbons and hydrofluorocarbons, which are replacing the regulated halocarbons, are rising very rapidly in the atmosphere but, with the exception of the much longer manufactured CHClF2 (HCFC-22), they are not yet at levels sufficient to contribute significantly to atmospheric chlorine loading. These replacement species could in the future provide independent estimates of the global weighted-average OH concentration provided their industrial emissions are accurately documented, (f) In the future, analysis of pollution events measured using high frequency in-situ measurements of chlorofluorocarbons and their replacements may enable emission estimates at the regional level which, together with industrial end-use data, are of sufficient accuracy to be capable of identifying regional non-compliance with the Montreal Protocol.

Author

Atmospheric Composition; Combustion; Carbon Tetrachloride; Chlorofluorocarbons; Climate; Exhaust Gases; Ozone Depletion

20040027868 Pennsylvania State Univ., University Park, PA, USA

TRACE-P OH and HO2 Measurements with the Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) on the DC-8

Brune, William H.; Martinez-Harder, Monica; Harder, Hartwig; [2004]; 12 pp.; In English

Contract(s)/Grant(s): NCC1-414; No Copyright; Avail: CASI; A03, Hardcopy

The Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) measures OH and HO2 from the NASA DC-8. This

instrument detects OH by laser induced fluorescence (LIF) in detection chambers at low pressure and detects HO2 by chemical conversion with NO followed by LIF detection. The demonstrated detection limit (S/N=2, 5 min.) for OH is about 0.005 pptv (1x10(exp 6)/cu cm at 2 km altitude) and for HO2 is 0.05 pptv (1x10(exp 6)/cu cm at 2 km altitude). We will use ATHOS to measure OH, HO2, and HO2/OH during TRACE- P, analyze these results by comparing them against fundamental relationships and computer models, and publish the analyses. TRACE-P HO(x), measurements will help develop a clearer picture of the atmospheric oxidation and 0 3 production that occur as Asian pollution spreads across the Pacific Ocean.
Author
Computerized Simulation; Gas Detectors; Hydrogen Compounds; Laser Induced Fluorescence

20040028003 NASA Ames Research Center, Moffett Field, CA, USA, Stanford Univ., Stanford, CA, USA, Stanford Univ., Stanford, CA, USA
Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer
Kirkpatrick, M. P.; Mansour, N. N.; Ackerman, A. S.; Stevens, D. E.; 2003; 15 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

The use of large eddy simulation, or LES, to study the atmospheric boundary layer dates back to the early 1970s when Deardor (1972) used a three-dimensional simulation to determine velocity and temperature scales in the convective boundary layer. In 1974 he applied LES to the problem of mixing layer entrainment (Deardor 1974) and in 1980 to the cloud-topped boundary layer (Deardor 1980b). Since that time the LES approach has been applied to atmospheric boundary layer problems by numerous authors. While LES has been shown to be relatively robust for simple cases such as a clear, convective boundary layer (Mason 1989), simulation of the cloud-topped boundary layer has proved more of a challenge. The combination of small length scales and anisotropic turbulence coupled with cloud microphysics and radiation effects places a heavy burden on the turbulence model, especially in the cloud-top region. Consequently, over the past few decades considerable effort has been devoted to developing turbulence models that are better able to parameterize these processes. Much of this work has involved taking parameterizations developed for neutral boundary layers and deriving corrections to account for buoyancy effects associated with the background stratification and local buoyancy sources due to radiative and latent heat transfer within the cloud (see Lilly 1962; Deardor 1980a; Mason 1989; MacVean & Mason 1990, for example). In this paper we hope to contribute to this effort by presenting a number of turbulence models in which the model coefficients are calculated dynamically during the simulation rather than being prescribed a priori.
Derived from text
Atmospheric Boundary Layer; Cloud Physics; Large Eddy Simulation; Turbulence Models; Dynamic Models

20040028009 NASA Marshall Space Flight Center, Huntsville, AL, USA
The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations
Goodman, S. J.; Lapenta, W.; Jedlovec, G.; Dodge, J.; Bradshaw, T.; [2003]; 1 pp.; In English; 20th Conference on Weather Analysis and Forecasting, 15 Jan. 2004, Seattle, WA, USA; No Copyright; Avail: Other Sources; Abstract Only

The NASA Short-term Prediction Research and Transition (SPoRT) Center in Huntsville, Alabama was created to accelerate the infusion of NASA earth science observations, data assimilation and modeling research into NWS forecast operations and decision-making. The principal focus of experimental products is on the regional scale with an emphasis on forecast improvements on a time scale of 0-24 hours. The SPoRT Center research is aligned with the regional prediction objectives of the US Weather Research Program dealing with 0-1 day forecast issues ranging from convective initiation to 24-hr quantitative precipitation forecasting. The SPoRT Center, together with its other interagency partners, universities, and the NASA/NOAA Joint Center for Satellite Data Assimilation, provides a means and a process to effectively transition NASA Earth Science Enterprise observations and technology to National Weather Service operations and decision makers at both the global/national and regional scales. This paper describes the process for the transition of experimental products into forecast operations, current products undergoing assessment by forecasters, and plans for the future.
Author
Earth Sciences; NASA Programs; Research and Development; Weather Forecasting; Atmospheric Models

20040028011 NASA Goddard Space Flight Center, Greenbelt, MD, USA
African Easterly Waves and Their Association with Precipitation
Gu, Guo-Jun; Adler, Robert F.; Huffman, George J.; Curtis, Scott; [2003]; 40 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Summer tropical synoptic-scale waves over West Africa are quantified by the 850 mb meridional wind component from the NCEP/NCAR reanalysis project. Their relationships with surface precipitation patterns are further explored by applying the data from the Tropical Rainfall Measuring Mission (TRMM) satellite in combination with other satellite observations during 1998-2002. Evident wavelet spectral power peaks are seen within a period of 2.5 - 6 days in both meridional wind and precipitation. The most intense wave signals in meridional wind are concentrated along 15 deg N- 25 deg N. Wave signals in precipitation and corresponding wavelet cross-spectral signals between these two variables, however, are primarily located at 5 deg N- 15 deg N, the latitudes of major summer rain events. There is a tendency for the perturbations in meridional wind component to lag (lead) precipitation signals south (north) of 15 deg N. In some cases, either an in-phase or out-of-phase relationship can even be found between these two variables, suggesting a latitude-dependent horizontal structure for these waves and probably implying two distinct wave-convective coupling mechanisms. Moreover, the lagging relationship (and/or the out-of-phase tendency) is only observed south of 15 deg N during July-September, indicating a strong seasonal preference. This phase relationship is generally consistent with the horizontal wave structures from a composite analysis.
Author
Africa; Precipitation (Meteorology); Wavelet Analysis; Wind (Meteorology)

20040028102 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals
Joiner, J.; Vasilkov, A. P.; Bhartia, P. K.; Yang, K.; [2003]; 1 pp.; In English; International Quadrennial Ozone Symposium, 1-8 Jun. 2004, Kos, Greece; No Copyright; Avail: Other Sources; Abstract Only

The OMI cloud pressure product is necessary for accounting for cloud effects on the mission- critical total ozone product. One of the OM1 cloud pressure algorithms uses UV measurements to derive cloud pressures from the high frequency structure of top- of-atmosphere reflectance caused by rotational Raman scattering (RRS) in the atmosphere. RRS results in filling-in of Fraunhofer lines in the backscatter UV spectra (also known as the Ring effect). The magnitude of filling-in of the Fraunhofer lines is roughly proportional to the average number of solar photon scatterings in the atmosphere above the clouds. This property of RRS is used to deduce an effective cloud pressure. The cloud pressure algorithm retrieves the cloud pressure and cloud fraction using a concept of the Mixed Lambert Equivalent Reflectivity (MLER) also used for the TOMS-V8 OM1 total column ozone algorithm. Currently, this OMI total column ozone algorithm utilizes information about cloud top pressures from a climatology based on IR measurements. The IR-derived cloud top pressure is known to be lower than UV-derived cloud top pressure because UV radiation penetrates clouds deeper than IR radiation. That is why the UV-derived cloud pressure may be more consistent withthe total ozone algorithm. We estimate total column ozone differences caused by replacing the cloud pressure climatology with cloud pressures retrieved from GOME data same as used for retrieval of ozone.
Author
Ozone; Raman Spectra; Ultraviolet Radiation; Clouds (Meteorology); Climatology

20040030483 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region
Quinn, P. K.; Coffman, D. J.; Bates, T. S.; Welton, E. J.; Covert, D. S.; Miller, T. L.; Johnson, J. E.; Maria, S.; Russell, L.; Arimoto, R., et al.; [2004]; 46 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

During the ACE Asia intensive field campaign conducted in the spring of 2001 aerosol properties were measured onboard the R/V Ronald H. Brown to study the effects of the Asian aerosol on atmospheric chemistry and climate in downwind regions. Aerosol properties measured in the marine boundary layer included chemical composition; number size distribution; and light scattering, hemispheric backscattering, and absorption coefficients. In addition, optical depth and vertical profiles of aerosol 180 deg backscatter were measured. Aerosol within the ACE Asia study region was found to be a complex mixture resulting from marine, pollution, volcanic, and dust sources. Presented here as a function of air mass source region are the mass fractions of the dominant aerosol chemical components, the fraction of the scattering measured at the surface due to each component, mass scattering efficiencies of the individual components, aerosol scattering and absorption coefficients, single scattering albedo, Angstrom exponents, optical depth, and vertical profiles of aerosol extinction. All results except aerosol optical depth and the vertical profiles of aerosol extinction are reported at a relative humidity of 55 +/- 5%. An over-determined data set was collected so that measured and calculated aerosol properties could be compared, internal consistency in the data set could be assessed, and sources of uncertainty could be identified. By taking into account non-sphericity of the dust aerosol, calculated and measured aerosol mass and scattering coefficients agreed within overall experimental uncertainties. Differences between measured and calculated aerosol absorption coefficients were not within reasonable uncertainty limits, however, and may indicate the inability of Mie theory and the assumption of internally mixed homogeneous spheres to predict absorption

by the ACE Asia aerosol. Mass scattering efficiencies of non-sea salt sulfate aerosol, sea salt, submicron particulate organic matter, and dust found for the ACE Asia aerosol are comparable to values estimated for ACE 1, Aerosols99, and INDOEX. Unique to the ACE Asia aerosol was the large mass fractions of dust, the dominance of dust in controlling the aerosol optical properties, and the interaction of dust with soot aerosol.
Author
Aerosols; Optical Properties; Measurement; Chemical Composition; Atmospheric Composition

20040030488 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data
Stajner, Ivanka; Winslow, Nathan; Rood, Richard B.; Pawson, Steven; [2003]; 23 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The stratospheric ozone layer protects life on Earth from the harmful effects of solar ultravioiet radiation. The ozone layer is currently in a fragile state because of depletion caused by man-made chemicals, especially chlorofluorocarbons. The state of the ozone layer is being monitored and evaluated by scientific experts around the world, in order to help policy makers assess the impacts of international protocols that control the production and release of ozone depleting chemicals. Scientists use a variety ozone measurements and models in order to form a comprehensive picture about the current state of the ozone layer, and to predict the future behavior (expected to be a recovery, as the abundance of the depleting chemicals decreases). Among the data sets used, those from satellite-borne instruments have the advantage of providing a wealth of information about the ozone distribution over most of the globe. Several instruments onboard American and international satellites make measurements of the properties of the atmosphere, from which atmospheric ozone amounts are estimated; long-term measurement programs enable monitoring of trends in ozone. However, the characteristics of satellite instruments change in time. For example, the instrument lenses through which measurements are made may deteriorate over time, or the satellite orbit may drift so that measurements over each location are made later and later in the day. These changes may increase the errors in the retrieved ozone amounts, and degrade the quality of estimated ozone amounts and of their variability. Our work focuses on combining the satellite ozone data with global models that capture atmospheric motion and ozone chemistry, using advanced statistical techniques: this is known as data assimilation. Our method provides a three-dimensional global ozone distribution that is consistent with both the satellite measurements and with our understanding of processes (described in the models) that control ozone distribution. Through the monitoring of statistical properties of the agreement between the data and the model, this approach also enables us to detect changes in the quality of ozone data retrieved from satellite-borne instrument measurements. This paper demonstrates that calculations of the changes in satellite data quality, and the impact these changes on the estimates of the global ozone distribution, can assist in maintaining the uniform quality of the satellite ozone data throughout the lifetime of these instruments, thus contributing to our understanding of long-term ozone change.
Derived from text
Monitors; Errors; Ozone; Data Acquisition; Stratosphere; Radiation Effects; Ozonosphere; Atmospheric Composition

20040031361 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present, Volume 5
Welker, Jean E.; Au, Andrew Y.; December 2003; 16 pp.; In English
Report No.(s): NASA/TM-2003-212252/VOL5; Rept-2004-00660-0/VOL5; No Copyright; Avail: CASI; A03, Hardcopy

As part of a larger analysis of country systems described elsewhere, named a Crop Country Inventory, CCI, large variations in annual crop yield for selected climate sensitive agricultural regions or sub-regions within a country have been studied over extended periods in decades. These climate sensitive regions, principally responsible for large annual variations in an entire country s crop production, generally are characterized by distinctive patterns of atmospheric circulation and synoptic processes that result in large seasonal fluctuations in temperature, precipitation and soil moisture as well as other climate properties. The immediate region of interest is drought prone Kazakhstan in Central Asia, part of the Former Soviet Union, FSU. As a partial validation test in a dry southern region of Kazakhstan, the Almati Oblast was chosen. The Almati Oblast, a sub-region of Kazakhstan located in its southeast corner, is one of 14 oblasts within the Republic of Kazahstan. The climate data set used to characterize this region was taken from the results of the current maturely developed Global Climate Model, GCM. In this paper, the GCM results have been compared to the meteorological station data at the station locations, over various periods. If the empirical correlation of the data sets from both the GCM and station data is sufficiently significant, this would validate the use of the superior GCM profile mapping and integration for the climatic characterization of a sub-region. Precipitation values interpolated from NCEP Reanalysis II data, a global climate database spanning over 5 decades

since 1949, have been statistically correlated with monthly-averaged station data from 1949 through 1993, and with daily station data from April through August, 1990 for the Almati Oblast in Kazakhstan. The resultant correlation is significant, which implies that the methodology may be extended to different regions globally for Crop Country Inventory studies.
Author
Climate Models; Climatology; Kazakhstan; Weather Stations; Atmospheric General Circulation Models; Annual Variations; Earth Environment; Data Acquisition; Crop Inventories

20040031486 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Physical Validation Program for the GPM Mission
Smith, Eric A.; [2003]; 1 pp.; In English; IUGG 2003, 30 Jun. - 11 Jul. 2003, Sapporo, Japan; No Copyright; Avail: Other Sources; Abstract Only

The GPM mission is currently planned for start in the late 2007 - early 2008 time frame. Its main scientific goal is to help answer pressing scientific problems arising within the context of global and regional water cycling. These problems cut across a hierarchy of scales and include climate-water cycle interactions, techniques for improving weather and climate predictions, and better methods for combining observed precipitation with hydrometeorological prediction models for applications to hazardous flood-producing storms, seasonal flood draught conditions, and fresh water resource assessments. The GPM mission will expand the scope of precipitation measurement through the use of a constellation of some 9 satellites, one of which will be an advanced TRMM-like core satellite carrying a dual-frequency Ku-Ka band precipitation radar and an advanced, multifrequency passive microwave radiometer with vertical-horizontal polarization discrimination. The other constellation members will include new dedicated satellites and co-existing operational/research satellites carrying similar (but not identical) passive microwave radiometers. The goal of the constellation is to achieve approximately 3-hour sampling at any spot on the globe -- continuously. The constellation's orbit architecture will consist of a mix of sun-synchronous and non-sun-synchronous satellites with the core satellite providing measurements of cloud-precipitation microphysical processes plus calibration-quality rainrate retrievals to be used with the other retrieval information to ensure bias-free constellation coverage. A major requirement before the retrieved rainfall information generated by the GPM mission can be used effectively by prognostic models to improve weather forecasts, hydrometeorological forecasts, and climate model reanalysis simulations is a capability to quantify the error characteristics of the retrievals. A solution for this problem has been upheld in past precipitation missions because of the lack of suitable error modeling systems incorporated into the validation programs and data distribution systems. An overview of how NASA intends to overcome this problem for the GPM mission using a physically-based error modeling approach within a multi-faceted validation program is described. The solution is to first identify specific user requirements and then determine the most stringent of these requirements that embodies all essential error characterization information needed by the entire user community. In the context of NASA s scientific agenda for the GPM mission, the most stringent user requirement is found within the data assimilation community. The fundamental theory of data assimilation vis-a-vis ingesting satellite precipitation information into the pre-forecast initializations is based on quantifying the conditional bias and precision errors of individual rain retrievals, and the space-time structure of the precision error (i.e., the spatial-temporal error covariance). By generating the hardware and software capability to produce this information in a near real-time fashion, and to couple the derived quantitative error properties to the actual retrieved rainrates, all key validation users can be satisfied. The talk will describe the essential components of the hardware and software systems needed to generate such near real-time error properties, as well as the various paradigm shifts needed within the validation community to produce a validation program relevant to the precipitation user community.
Author
Precipitation Measurement; Hydrometeorology; Climate Models; Weather Forecasting; Cloud Physics

20040031523 Stanford Univ., Stanford, CA, USA
Large-eddy Simulation of Stratocumulus-topped Atmospheric Boundary Layers with Dynamic Subgrid-scale Models
Senocak, Inane; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 69-80; In English
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

The objective of the present study is to evaluate the dynamic procedure in LES of stratocumulus topped atmospheric boundary layer and assess the relative importance of subgrid-scale modeling, cloud microphysics and radiation modeling on the predictions. The simulations will also be used to gain insight into the processes leading to cloud top entrainment instability and cloud breakup. In this report we document the governing equations, numerical schemes and physical models that are employed in the Goddard Cumulus Ensemble model (GCEM3D). We also present the subgrid-scale dynamic procedures that

have been implemented in the GCEM3D code for the purpose of the present study.
Author
Atmospheric Boundary Layer; Radiative Heat Transfer

20040031528 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Accessing and Understanding MODIS Data
Leptoukh, Gregory; Jenkerson, Calli B.; Jodha, Siri; [2003]; 1 pp.; In English; IGARSS 2003, 20 Jul. 2003, Toulouse, France, USA; No Copyright; Avail: Other Sources; Abstract Only

The National Aeronautics and Space Administration (NASA) launched the Terra satellite in December 1999, as part of the Earth Science Enterprise promotion of interdisciplinary studies of the integrated Earth system. Aqua, the second satellite from the series of EOS constellation, was launched in May 2002. Both satellites carry the MODerate resolution Imaging Spectroradiometer (MODIS) instrument. MODIS data are processed at the Goddard Space Flight Center, Greenbelt, MD, and then archived and distributed by the Distributed Active Archive Centers (DAACs). Data products from the MODIS sensors present new challenges to remote sensing scientists due to specialized production level, data format, and map projection. MODIS data are distributed as calibrated radiances and as higher level products such as: surface reflectance, water-leaving radiances, ocean color and sea surface temperature, land surface kinetic temperature, vegetation indices, leaf area index, land cover, snow cover, sea ice extent, cloud mask, atmospheric profiles, aerosol properties, and many other geophysical parameters. MODIS data are stored in HDF- EOS format in both swath format and in several different map projections. This tutorial guides users through data set characteristics as well as search and order interfaces, data unpacking, data subsetting, and potential applications of the data. A CD-ROM with sample data sets, and software tools for working with the data will be provided to the course participants.
Derived from text
Satellite Constellations; Calibrating; Imaging Spectrometers; Meteorological Parameters; Sea Surface Temperature; Spectral Reflectance

20040031577 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Current results from AIRS/AMSU/HSB
Susskind, Joel; Atlas, Robert; Barnet, Christopher; Blaisdell, Jon; Iredell, Lena; Bri, Genia; Jusem, Juan Carlos; Keita, Fricky; Kouvaris, Louis; Molnar, Gyula; [2004]; 10 pp.; In English; 13th International TOVS Study Conference Proceedings, 10 Sep. 2003, Canada; No Copyright; Avail: CASI; A02, Hardcopy

AIRS was launched on EOS Aqua on May 4,2002, together with AMSU A and HSB, to form a next generation polar orbiting infrared and microwave atmospheric sounding system. The primary products of AIRS/AMSU/HSB are twice daily global fields of atmospheric temperature-humidity profiles, ozone profiles, sea/land surface skin temperature, and cloud related parameters including OLR. The sounding goals of AIRS are to produce 1 km tropospheric layer mean temperatures with an rms error of 1K, and layer precipitable water with an rms error of 20%, in cases with up to 80% effective cloud cover. Pre-launch simulation studies indicated that these results should be achievable. Minor modifications have been made to the pre-launch retrieval algorithm as alluded to in this paper. Sample fields of parameters retrieved from AIRS/AMSU/HSB data are presented and temperature profiles are validated as a function of retrieved fractional cloud cover. As in simulation, the degradation of retrieval accuracy with increasing cloud cover is small. Select fields are also compared to those contained in the ECMWF analysis, done without the benefit of AIRS data, to demonstrate information that AIRS can add to that already contained in the ECMWF analysis. Assimilation of AIRS temperature soundings in up to 80% cloud cover for the month of January 2003 into the GSFC FVSSI data assimilation system resulted in improved 5 day forecasts globally, both with regard to anomaly correction coefficients and the prediction of location and intensity of cyclones.
Author
Atmospheric Sounding; Atmospheric Temperature; Humidity; Infrared Radiation; Microwave Sounding

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*.

20040016375 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Tides and Decadal Variability
Ray, Richard D.; [2003]; 1 pp.; In English; Tides and Decadal Variability Workshop, 23-27 Feb. 2004, Waikoloa, HI, USA; No Copyright; Avail: CASI; A01, Hardcopy

This paper reviews the mechanisms by which oceanic tides and decadal variability in the oceans are connected. We distinguish between variability caused by tides and variability observed in the tides themselves. Both effects have been detected at some level. The most obvious connection with decadal timescales is through the 18.6-year precession of the moon's orbit plane. This precession gives rise to a small tide of the same period and to 18.6-year modulations in the phase and amplitudes of short-period tides. The 18.6-year 'node tide' is very small, no more than 2 cm anywhere, and in sea level data it is dominated by the ocean's natural Variability. Some authors have naively attributed climate variations with periods near 19 years directly to the node tide, but the amplitude of the tide is too small for this mechanism to be operative. The more likely explanation (Loder and Garrett, JGR, 83, 1967-70, 1978) is that the 18.6-y modulations in short-period tides, especially h e principal tide M2, cause variations in ocean mixing, which is then observed in temperature and other climatic indicators. Tidally forced variability has also been proposed by some authors, either in response to occasional (and highly predictable) tidal extremes or as a nonlinear low-frequency oscillation caused by interactions between short-period tides. The former mechanism can produce only short-duration events hardly more significant than normal tidal ranges, but the latter mechanism can in principle induce low-frequency oscillations. The most recent proposal of this type is by Keeling and Whorf, who highlight the 1800-year spectral peak discovered by Bond et al. (1997). But the proposal appears contrived and should be considered, in the words of Munk et al. (2002), 'as the most likely among unlikely candidates.'
Author
Tides; Variability; Low Frequencies; Climatology; Oscillations

20040021365 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity
Hildebrand, Peter H.; Hilliard, Laurence; Rincon, Rafael; LeVine, David; Mead, James; [2003]; 2 pp.; In English; 31st Conference on Radar Meteorology, 6-12 Aug. 2003, Seattle, WA, USA; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The RadSTAR instrument combines an L-band, digital beam-forming radar with an L-band synthetic aperture, thinned array (STAR) radiometer. The RadSTAR development will support NASA Earth science goals by developing a novel, L-band scatterometer/ radiometer that measures Earth surface bulk material properties (surface emissions and backscatter) as well as surface characteristics (backscatter). Present, real aperture airborne L-Band active/passive measurement systems such as the JPUPALS (Wilson, et al, 2000) provide excellent sampling characteristics, but have no scanning capabilities, and are extremely large; the huge JPUPALS horn requires a the C-130 airborne platform, operated with the aft loading door open during flight operation. The approach used for the upcoming Aquarius ocean salinity mission or the proposed Hydros soil mission use real apertures with multiple fixed beams or scanning beams. For real aperture instruments, there is no upgrade path to scanning over a broad swath, except rotation of the whole aperture, which is an approach with obvious difficulties as aperture size increases. RadSTAR will provide polarimetric scatterometer and radiometer measurements over a wide swath, in a highly space-efficient configuration. The electronic scanning approaches provided through STAR technology and digital beam forming will enable the large L-band aperture to scan efficiently over a very wide swath. RadSTAR technology development, which merges an interferometric radiometer with a digital beam forming scatterometer, is an important step in the path to space for an L-band scatterometer/radiometer. RadSTAR couples a patch array antenna with a 1.26 GHz digital beam forming radar scatterometer and a 1.4 GHz STAR radiometer to provide Earth surface backscatter and emission measurements in a compact, cross-track scanning instrument with no moving parts. This technology will provide the first L-band, emission and backscatter measurements in a compact aircraft instrument and will be ideally suited to large apertures, possibly at GEO, and could possibly be implemented on a swarm of micro-satellites. This instrument will have wide application for validation studies, and will have application for other microwave frequencies.
Derived from text
Beamforming; Oceans; Radiometers; Salinity; Soil Moisture; Ultrahigh Frequencies; Scatterometers; Soil Mapping

20040027738 Naval Research Lab., Bay Saint Louis, MS
Assessment and Testing of the GODAE Products
Le Provost, Christian; Bell, Mike; Chassignet, Eric; Cummings, Jim; Fukumori, Ichiro; Jun. 2002; 9 pp.; In English
Report No.(s): AD-A419770; NRL/PP/7304/02/0002; No Copyright; Avail: CASI; A02, Hardcopy

The aim of this paper is to review how the Global Ocean Data Assimilation Experiment (GODAE) centers will proceed to ensure the value and quality of their ocean products and to evaluate the performance of their systems. The strategy is to define a set of standard internal verification tests and metrics. The scientific credibility will rely on careful checks of the consistency of the system outputs with state-of-the-art knowledge of the ocean state and its variability. The quality assurance of the products will rely on systematic verification of key parameters and computation of statistical indexes by reference to

both climatologies and real-time data, and, in a delayed mode, to quality controlled observations. The performance of the systems will rely on diagnostics based on key indicators such as estimates of forecasting skill, ability to constrain a sparsely observed field or non-assimilated field, and evaluation of real-time versus re-analysis products. The internal metrics discussed in this paper rely on the following diagnostics: consistency analysis, including time-mean climatologies, space and time variability, and physical balance; quality assurance, including time series stations, satellite remote sensing, and VOS and floats; and performance analysis, including error estimates and model-data differences. The sharing of experience between the GODAE centers is critical. Intercomparison exercises between the different Centers is one way to respond to this need. A few examples of metrics for intercomparison are given from operational systems that are specific to the Atlantic and the Pacific basins, where knowledge of ocean characteristics is the most advanced and where comparison exercises are underway as part of the GODAE common. (8 refs.)
DTIC
Thermodynamics; Forecasting; Standardization; Quality Control; Marine Meteorology; Ocean Models; Hydrodynamics

20040028022
Influence of Surface and Bottom Stress in the Coupled Ocean Circulation and Wind-Wave Models
Zhang, Hong; Sannasiraj, S. A.; Tark, N. G. Keong; Oct. 2002; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419844; No Copyright; Avail: CASI; A03, Hardcopy

Viewgraphs on presentation of the influence of surface and bottom stress in the coupled ocean circulation and wind-wave models.
DTIC
Wave Propagation; Ocean Currents

20040030448 Physics and Electronics Lab. TNO, The Hague, Netherlands
Technical Report on Inversion of the First RUMBLE Sea Trial Data
Ainslie, M. A.; Boek, W.; Simons, D. G.; Lentze-Muller, S. H. E.; May 2003; 107 pp.; In English
Report No.(s): FEL-03-A042; TD03-0028; Copyright; Avail: Other Sources

The performance of sonar in shallow water is very sensitive to sea bed properties. This is true for any system requiring multiple bottom interactions such as low frequency active sonar (LFAS). For this reason large uncertainties can arise in shallow water sonar performance caused by imperfect knowledge of sea bed parameters. Current methods for estimating bottom properties involve in situ measurements (cores or grabs) or high frequency sonar (eg echosounder). In situ methods are very time consuming and usually only undertaken to provide support for scientific sea trials. Echosounders are more practical but still provide data that may be unrepresentative for a long range low frequency system because they measure only the local properties at normal incidence, and usually at a higher frequency than that of interest. Of interest to LFAS is the grazing incidence behaviour of the sea bed at low frequency and at a location several km from the sonar itself. How better to measure this than with the sonar itself? Both discrete echoes (whether from a true or false target) and diffuse reverberation are likely to have come into contact with the sea bed, and therefore must contain some information about the nature of the bottom interaction. The objective of the RUMBLE project is to exploit the reverberation field by inverting for the sea bed properties. Such a measurement provides the potential for long range coverage from a single platform, precisely at the frequency or frequencies of interest to the sonar. This report is deliverable DE12 of the RUMBLE project, i.e. the technical report on inversion of first sea trial data. The report is structured as follows: in section 2 we present some background information, including a description of available knowledge prior to the trial, and a brief overview of the trial itself, and this is followed by a description of the reverberation measurements (section 3) and other measurements (section 4). Inversions are described in sections 5 and 6 , first using synthetic data and then for the measured data. Conclusions are given in section 7.
Author
Grazing Incidence; Sonar; Oceanography

20040031457 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean
Borovikov, Anna; Rienecker, Michele M.; Keppenne, Christian; Johnson, Gregory C.; February 26, 2004; 45 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

One of the most difficult aspects of ocean state estimation is the prescription of the model forecast error covariances. The paucity of ocean observations limits our ability to estimate the covariance structures from model-observation differences. In most practical applications, simple covariances are usually prescribed. Rarely are cross-covariances between different model

variables used. Here a comparison is made between a univariate Optimal Interpolation (UOI) scheme and a multivariate OI algorithm (MvOI) in the assimilation of ocean temperature. In the UOI case only temperature is updated using a Gaussian covariance function and in the MvOI salinity, zonal and meridional velocities as well as temperature, are updated using an empirically estimated multivariate covariance matrix. Earlier studies have shown that a univariate OI has a detrimental effect on the salinity and velocity fields of the model. Apparently, in a sequential framework it is important to analyze temperature and salinity together. For the MvOI an estimation of the model error statistics is made by Monte-Carlo techniques from an ensemble of model integrations. An important advantage of using an ensemble of ocean states is that it provides a natural way to estimate cross-covariances between the fields of different physical variables constituting the model state vector, at the same time incorporating the model's dynamical and thermodynamical constraints as well as the effects of physical boundaries. Only temperature observations from the Tropical Atmosphere-Ocean array have been assimilated in this study. In order to investigate the efficacy of the multivariate scheme two data assimilation experiments are validated with a large independent set of recently published subsurface observations of salinity, zonal velocity and temperature. For reference, a third control run with no data assimilation is used to check how the data assimilation affects systematic model errors. While the performance of the UOI and MvOI is similar with respect to the temperature field, the salinity and velocity fields are greatly improved when multivariate correction is used, as evident from the analyses of the rms differences of these fields and independent observations. The MvOI assimilation is found to improve upon the control run in generating the water masses with properties close to the observed, while the UOI failed to maintain the temperature and salinity structure.
Author
Covariance; Error Analysis; Monte Carlo Method; Multivariate Statistical Analysis; Pacific Ocean; Interpolation; Mathematical Models

20040031476 Stanford Univ., Stanford, CA, USA
Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation
Dietrich, David E.; Mehra, Avichal; Haney, Robert L.; Bowman, Malcolm J.; Tseng, Yu-Heng; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 101-114; In English
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

Gulf Stream (GS) separation near its observed Cape Hatteras (CH) separation location, and its ensuing path and dynamics, is a challenging ocean modeling problem. If a model GS separates much farther north than CH, then northward GS meanders, which pinch off warm core eddies (rings), are not possible or are strongly constrained by the Grand Banks shelfbreak. Cold core rings pinch off the southward GS meanders. The rings are often re-absorbed by the GS. The important warm core rings enhance heat exchange and, especially, affect the northern GS branch after GS bifurcation near the New England Seamount Chain. This northern branch gains heat by contact with the southern branch water upstream of bifurcation, and warms the Arctic Ocean and northern seas, thus playing a major role in ice dynamics, thermohaline circulation and possible global climate warming. These rings transport heat northward between the separated GS and shelf slope/Deep Western Boundary Current system (DWBC). This region has nearly level time mean isopycnals. The eddy heat transport convergence/divergence enhances the shelfbreak and GS front intensities and thus also increases watermass transformation. The fronts are maintained by warm advection by the Florida Current and cool advection by the DWBC. Thus, the GS interaction with the DWBC through the intermediate eddy field is climatologically important.
Derived from text
Gulf Stream; Upstream; Heat Transfer; Boundaries

20040031526 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models
Stoessel, Achim; Markus, Thorsten; [2003]; ISSN 0148-0227; 12 pp.; In English
Contract(s)/Grant(s): NAG5-10641; Copyright; Avail: Other Sources

The focus of this paper is on the representation of Antarctic coastal polynyas in global ice-ocean general circulation models (OGCMs), in particular their local, regional, and high-frequency behavior. This is verified with the aid of daily ice concentration derived from satellite passive microwave data using the NASATeam 2 (NT2) and the bootstrap (BS) algorithms. Large systematic regional and temporal discrepancies arise, some of which are related to the type of convection parameterization used in the model. An attempt is made to improve the fresh-water flux associated with melting and freezing in Antarctic coastal polynyas by ingesting (assimilating) satellite ice concentration where it comes to determining the thermodynamics of the open-water fraction of a model grid cell. Since the NT2 coastal open-water fraction (polynyas) tends to be less extensive than the simulated one in the decisive season and region, assimilating NT2 coastal ice concentration yields

overall reduced net freezing rates, smaller formation rates of Antarctic Bottom Water, and a stronger southward flow of North Atlantic Deep Water across 30 S. Enhanced net freezing rates occur regionally when NT2 coastal ice concentration is assimilated, concomitant with a more realistic ice thickness distribution and accumulation of High-Salinity Shelf Water. Assimilating BS rather than NT2 coastal ice concentration, the differences to the non-assimilated simulation are generally smaller and of opposite sign. This suggests that the model reproduces coastal ice concentration in closer agreement with the BS data than with the NT2 data, while more realistic features emerge when NT2 data are assimilated.
Author
Atmospheric General Circulation Models; Climate Models; Ice; Polynyas; Satellite Observation; Oceanography; Algorithms

51
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*.

20040016363 NASA Marshall Space Flight Center, Huntsville, AL, USA
Setting up a Grid: A Guide for Beginners by a Beginner
Welch, Clara; [2003]; 1 pp.; In English; Globus World 2004, 20-23 Jan. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

A simple compute grid can be constructed for under $ 1,000 with 5 computers on a LAN for the purpose of video compression from captured digital video to MPEG file format. The process for setting up this grid will be covered in detail, including the required operating systems and hardware, the required globus software, and the required video capture and compression software. Pitfalls encountered will be discussed, and the approximate timeline for a motivated but uninformed beginner. The installation, configuration, and operation of additional software that is needed test, measure and otherwise verify that the grid components are functioning as 'advertised', will also be presented. This is a true life account for setting up a grid based on instructions in Chapters 9 and 10 of Introduction to Grid Computing with Globus.
Author
Computers; Grid Computing (Computer Networks); Video Compression

20040020044 Oak Ridge National Lab., TN, USA
Need for Research Programs to Provide Data Applicable to the Estimate of Maximum Permissible Exposure Values for Internally Deposited Radionuclides
Morgan, K. Z.; Mar. 1965; 28 pp.; In English
Report No.(s): DE2003-4006521; ORNL-P-350; No Copyright; Avail: Department of Energy Information Bridge

The nuclear age, which has been with us slightly more than 20 years, has brought with it an unusual awareness of a relatively new toxic agent--ionizing radiation. In fact, a new science, health physics, was created to give special attention to this problem. As a consequence and in spite of the unparalleled hazards associated with ionizing radiation, this new nuclear industry is growing rapidly into a benevolent giant bringing a better way of life while at the Same time maintaining radiation damage at an insignificant level. Although in the past few decades we have learned much more about the hazards associated with ionizing radiation than those associated with some of the common industrial hazards and although maximum permissible exposure levels for the radionuclides have been established with greater reliability and confidence than have the levels for many chemical agents with which man has been familiar for many centuries, there still remains a considerable uncertainty in many of the basic assumptions and in the parameters used in the calculation of maximum permissible body burden and maximum permissible concentration of the various radionuclides in food, water and air. There is need to determine the uptake, distribution and elimination of a variety of chemical compounds of the approximately 300 common radionuclides. These data are needed for the several modes of intake by the various age groups, and differences due to race, sex, weight, eating habits, etc., should be investigated. There is need especially to obtain data from studies of human exposure and to examine the influence of the quantity and chemical form of the radionuclide and of other associated chemical elements taken into the body, both from single exposure and from continuous exposure.
NTIS
Human Resources; Radiation Dosage; Research Projects; Health Physics

20040021396 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Isolation of Purines and Pyrimidines from the Murchison Meteorite
Glavin, D. P.; Bada, J. K.; [2003]; 3 pp.; In English; 35th Lunar and Planetary Science Conference, 15-19 Mar. 2004, Houston, TX, USA; Copyright; Avail: CASI; A01, Hardcopy

The origin of life on Earth, and possibly on other planets such as Mars, would have required the presence of liquid water and a continuous supply of prebiotic organic compounds. The delivery of organic matter by asteroids, comets, and carbonaceous meteorites could have contributed to the early Earth's prebiotic inventory by seeding the planet with biologically important organic compounds. A wide variety of prebiotic organic compounds have previously been detected in the Murchison CM type carbonaceous chondrite including amino acids, purines and pyrimidines'. These compounds play a major role in terrestrial biochemistry and are integral components of proteins, DNA and RNA. In this study we developed a new extraction technique using sublimation in order to isolate purines and pyrimidines from Murchison2, which is cleaner and more time efficient that traditional methods3. Several purines including adenine, guanine, hypoxanthine and xanthine were positively identified by high performance liquid chromatography and ultraviolet absorption detection in our Murchison extracts. The purines detected in Murchison do not correlate with the distribution of nucleobases found in geological environments on Earth4. Moreover, the abundance of extraterrestrial amino acids and the low level of terrestrial amino acid contaminants found in Murchison', support the idea that the purines in t h s meteorite are extraterrestrial in origin.
Author
Purines; Pyrimidines; Carbonaceous Chondrites; Carbonaceous Meteorites

20040027589 Naval Health Research Center, San Diego, CA
Health Surveillance in the U.S. Navy: Asthma
Gunderson, E. K.; Garland, Cedric F.; May 2002; 13 pp.; In English
Report No.(s): AD-A419662; NAVHLTHRSCHC-02-09; No Copyright; Avail: CASI; A03, Hardcopy

Incidence rates of asthma in young adults appear to have been rising in the general population. Time trends and demographic risk factors are reported here for asthma in a well defined population at risk of U.S. Navy young to middle- aged adults. To measure time trends and demographic risk factors for asthma.
DTIC
Asthma; Health

20040027597 University Health Network, Toronto, Ontario, Canada
A Study of Transrectal Tumor Oxygen Measurements in Patients With Clinically Localized Prostate Cancer
Milosevic, Michael F.; Aug. 2003; 41 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0111
Report No.(s): AD-A419673; No Copyright; Avail: CASI; A03, Hardcopy

The primary aim of this clinical study is to determine the relationship between pre- treatment prostate cancer oxygen levels and long-term disease control following treatment with radiotherapy, and the independent prognostic effect of oxygen measurements relative to established prognostic factors. In addition, the study will determine the relationship between pre-treatment tumor oxygen levels and mutations of the p53 tumor suppressor gene, and the impact of this interaction on patient outcome. The accrual rate increased in year 2 and is now close to the value anticipated when the study was designed. Nevertheless, because of slower than expected accrual I year 1 and disruption in clinical and research activity in year 2 by Severe Acute Respiratory Syndrome (SARS), it is anticipated that accrual will need to be extended into year 4 to meet the target of the 195 patients. The oxygen measurement technique was revised based on the results of our pilot study to assure that the highest quality data are being collected. The microregional distribution of oxygen in prostate cancer biopsies will be studied using intrinsic markers of oxygenation. The molecular studies of p53 are proceeding as outlined in the proposal. It is anticipated that all aspects of the proposed work will be completed.
DTIC
Cancer; Clinical Medicine; Oxygen

20040027598 Colorado Univ., Aurora, CO, USA
International Hypoxia Symposium (13th) for the Publishing of the Conference Proceedings for 2003 Conference
Roach, Robert; Hackett, Peter; Wagner, Peter; Jan. 2004; 369 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-P-0228
Report No.(s): AD-A419675; No Copyright; Avail: CASI; A16, Hardcopy

The publication Hypoxia: Through the Lifecycle, published in December, 2003 by Plenum Kluwer Academic Publishers, NY, NY is the result of U.S. Army Medical Research and Materiel Command support of the 13th International Hypoxia Symposium.
DTIC
Hypoxia; Medical Science

20040027600 Creighton Univ., Omaha, NE
Efficacy of Calcium and Vitamin D Supplementation for the Prevention of Stress Fractures in Female Naval Recruits
Lappe, Joan M.; Oct. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0807
Report No.(s): AD-A419678; No Copyright; Avail: CASI; A01, Hardcopy

The goal of this project is to determine if calcium and vitamin D intervention can reduce the incidence of stress fracture by at least 50% in female Naval recruits during basic training. We will recruit 5200 recruits who will be randomly assigned to an intervention group given calcium 2000 mg and vitamin D 800 I.U. per day or a control placebo group. The recruit intervention and stress fracture monitoring will continue through 8 weeks of basic training. Positive findings form this study would provide support for the Navy to adopt an easy, low cost method of further decreasing incidence of stress fractures.
DTIC
Bones; Calciferol; Low Cost

20040027608 State Univ. of New York, Stony Brook, NY, USA
Stress Fracture Etiology as Dependent on Mechanically Induced Fluid Flow
Qin, Yi-Xian; Mar. 2003; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0218
Report No.(s): AD-A419689; No Copyright; Avail: CASI; A03, Hardcopy

Bone fluid flow is hypothesized to initiate aberrant remodeling which can ultimately compromise bone quantity and quality. Thus, pathologic response of load- induced fluid flow can potentially damage tissue viability, and initiate bone's remodeling process, ultimately leading to the stress fracture syndrome. The research goal is evaluated through two primary specific aims: (1) repetitive fluid flow, as dependent on magnitude and duration, will stimulate pathological remodeling; and (2) cyclic intramedullary pressure (ImP) will induce nutrient vessel remodeling and constriction, and thus partially reduce nutritional flow to the cortex. Results have shown that within the physiological range, bone formation is proportional to applied fluid flow stimulation. While the pressure exceeds the physiological intensity of falls within the pathologic range, i.e., addition to normal physical loading, it triggers extensive remodeling and thus even weaken the quality of bone, i.e., increase intracortical porosity and induce lesions. Repetitive cyclic fluid flow in bone has shown an effect on the nutrient vessel remodeling inducing vessel wall thickening, which may potentially contribute to pathological remodeling in bone. These results may provide insight of fluid flow in physiological and pathological remodeling and its role in stress fracture.
DTIC
Bones; Physiological Responses; Actuators

20040027611 Texas Univ. Health Science Center, San Antonio, TX, USA
Training Program in the Molecular Basis of Breast Cancer Research
Lee, Wen-Hwa; Aug. 2002; 178 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9402
Report No.(s): AD-A419693; No Copyright; Avail: CASI; A09, Hardcopy

The objective of the program is to train highly qualified doctoral students in the genetic, cellular, and molecular basis of Breast Cancer. The training program, conducted within the Molecular Medicine Ph.D. Program, was administered by a select group of faculty whose research projects were intimately involved in breast cancer. An additional goal of the program was to promote synergistic interactions between the various laboratories engaged in breast cancer research. Breast cancer meetings, Molecular Medicine Distinguished Seminar Series were integral parts of the training program for students supported by the Breast Cancer Training Program. The major strengths of the program were the high quality of the Program faculty, and the interactive nature of the Breast Cancer research community in San Antonio. The program faculty encompassed scientists and physicians studying different aspects of breast cancer and cancer therapy, as well as fundamental mechanisms of DNA repair, cell growth and cell differentiation. Key research accomplishments during the 2001-2002 reporting period were: 1) publication of 14 peer-reviewed articles by students in the program; 2) DOD BCRP pre-doctoral grants awarded to four students in the

program, and a postdoctoral training grant to a fellow in a faculty member's laboratory; 3) the addition of one new highly qualified faculty; and 4) six faculty awarded DOD BCRP Idea and/or Career Development grants; 5) five Ph.D. students supported by the program graduated.
DTIC
Cancer; Cell Division; Mammary Glands

20040027613 California Univ., Davis, CA
Improving Blood Monitoring of Enzymes as Biomarkers of Risk Form Anticholinergic Pesticides and Chemical Warfare Agents
Wilson, Barry W.; Oct. 2003; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0772
Report No.(s): AD-A419695; No Copyright; Avail: CASI; A03, Hardcopy

Blood cholinesterase (ChE) biomarkers are an important way to monitor exposure to anticholinergic pesticides and chemical warfare (CW) agents and to establish whether some are at greater risk tan others form exposure to them. Many clinical and research laboratories use the colorimetric El lam assay based on the hydrolysis of acetylthiocholine. CHPPM (US Army Center For Health Promotion and Preventive Medicine) uses the Michel delta pH method to monitor more than 25,000 DoD personnel each year.
DTIC
Anticholinergics; Chemical Warfare; Continuous Radiation; Colorimetry; Hydrolysis

20040027670 South Carolina Univ., Columbia, SC
Do the Effects of Exercise on Breast Cancer Prevention Vary With Environment
Teas, Jane; Oct. 2003; 12 pp.; In English
Contract(s)/Grant(s): Proj-DAMD17-00-1-0659
Report No.(s): AD-A419699; No Copyright; Avail: CASI; A03, Hardcopy

Does walking outdoors have the same breast cancer protective effect as walking on a treadmill indoors, away form natural light, in a typical gym atmosphere? Is the ambient exposure to sunlight important in stress and breast cancer risk reduction? Our basic premise is that the breast cancer protective mechanisms of exercise depend on context of exercise, not just on the number of repetitive muscular contractions completed over a specific period of time, and that a more pleasant and peaceful environment will decrease perceived stress and enhance immunity, theoretically leading to more positive mood and more effective cancer surveillance. A more relaxed walking atmosphere may decrease physiological consequences of stress, such as high cortisol and depressed natural killer cell function.
DTIC
Cancer; Cytology; Mammary Glands

20040027673 Baltimore Univ., MD, USA
Sulfur Mustard Damage to Cornea With Emphasis on Skin: Preventative Studies
Varma, Shambhu D.; Petrali, John; Henein, Medhat; Hedge, Kavita; May 2003; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-98-1-8361
Report No.(s): AD-A419697; No Copyright; Avail: CASI; A03, Hardcopy

A mixture of physiologically compatible compounds with the properties of inhibiting alkylation reactions, providing metabolic support to the tissue and capable of preventing oxidative damage is being developed and tested for its effectiveness against mustard induced toxicity. A partial preventive effect of such a formulation using mouse skin as an animal model has been demonstrated for the first time.
DTIC
Sulfur; Toxicity; Alkylation

20040027674 Wayne State Univ., Detroit, MI
Bioactive Lipids: Role in Prostate Cancer Angiogenesis
Honn, Kenneth V.; Apr. 2003; 90 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-98-1-8502
Report No.(s): AD-A419706; No Copyright; Avail: CASI; A05, Hardcopy

Angiogenesis is an integral part of human prostate cancer progression. In the Phase I of this grant, we have identified arachidonate 12-lipoxygenase as a promoter of angiogenesis in human prostate carcinoma by stimulating VECF expression and via the pro-angiogenic activity of 12(S)-HETE. The first objective of phase II of this grant is to delineate the regulation of VEGF gene expression by 12-LOX in PCa cells, specifically the involvement of Spl and possibly AP2. The second objective of this proposal is to describe the signal transduction pathway by which 12-LOX stimulates VEGF expression. These two objectives are based upon our observations in the Phase I of this grant that 12-LOX, when overexpressed in human PCa cells, stimulates tumor angiogenesis and growth. The third objective to evaluate the therapeutic potential of 12-LOX inhibitors for PCa treatment.
DTIC
Cancer; Genetics; Inhibitors

20040027681 Health Research, Inc., Rensselaer, NY, USA
Determinants of Stress Fracture and Bone Mass in Elite Military Cadets
Cosman, Felicia; Nieves, Jeri; Ruffing, Jamie; Aug. 2002; 34 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8539
Report No.(s): AD-A419705; No Copyright; Avail: CASI; A03, Hardcopy

The aim of this 4-year prospective cohort study of 891 cadets at the USA Military Academy at West Point was to examine the determinants of stress fractures and the acquisition of peak bone mass in elite military cadets. Cadets BMD, on average, was above the population mean (1 SD) at the calcaneus, hip and lumbar spine. Determinants of bone mass we identified included: menstrual function in females and prior exercise and milk drinking in men. Bone density was also related to standardized run score, PT score and body mass index. The accrual of bone mass in-women was related to current menstrual function, other factors related to peak bone mass in males and females are currently being investigated. There were 131 stress fractures during the 3.5 years of follow- up, with the majority occurring within the first 3 months. The incidence of stress fractures was higher in females versus males. In a nested case control design, PTH, BSAP, IGF-1 and NTX were unrelated to stress fracture. Collagen 1 A1 was not related to bone density or stress fracture. Fitness upon entry assessed by run score was significantly associated with stress fractures in both genders. In women with fractures, BMD at the heel, spine and hip were all lower than in women without fractures.
DTIC
Bones; Fracturing; Collagens

20040027690 Georgetown Univ., Washington, DC, USA
Role of a Novel Splice Variant of the Steroid Receptor Coactivator AIB1 in Breast Cancer
Riegel, Anna T.; Aug. 2003; 44 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0254
Report No.(s): AD-A419708; No Copyright; Avail: CASI; A03, Hardcopy

In this proposal we have investigated the hypothesis that overexpression of a novel truncated version of AIB1 (Delta-3AIB1) that we have found to be overexpressed in breast cancer is import for tumor development by impacting upon nuclear hormone receptor function. We have examined the hypothesis that the novel AIB1 variant has an altered function that changes its interaction with nuclear receptors such as the estrogen or progesterone receptor. We propose that changes in the level of expression of the novel AIBi variant will support tumor progression and may well have prognostic significance for breast cancer. We have now determined that A3AIB1 is overexpressed relative to the full-length protein in breast cancer tumor samples and cell lines. We have determined that A3AIB1 is a significantly more active coactivator than full-length AIB1 on the estrogen and progesterone receptor (J. Biol. Chem. 276, 39736-3974l, 2001). We have shown that A3AIB1 overexpression increases estrogenic activity in agonists and SERMs such as tamoxifen (On co gene, in press 2003). In addition, a surprising finding is that overexpression of A3AIB1 can also potentiate BCE signaling. This implies that A3AIB1 can also drive non-hormone mediated proliferation in breast cancer.
DTIC
Cells (Biology); Estrogens; Mammary Glands; Cancer

20040027712 California Univ., Los Angeles, CA
Interrogating Androgen Receptor Mediated Gene Expression and Tumor Progression by Molecular Imaging
Carey, Michael F.; Oct. 2003; 40 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0719
Report No.(s): AD-A419790; No Copyright; Avail: CASI; A03, Hardcopy

The main goal of the project is to develop a transcription-based optical imaging system for studying androgen receptor (AR) function during prostate cancer progression in animal models. We have now developed a system termed two-step transcriptional activation (TSTA) and used it to show that AR is functional in the androgen independent (AI) phase of the cancer. Mechanistic analyses showed that AR was localized to the nucleus, bound its enhancers and assembled transcription complexes in AI cancers. We have also modified the TSTA system to detect elevated levels of mitogen activated protein kinase (MAPK) in cell culture and in AI animal models of prostate cancer. We are employing the MAPK optical imaging system to study the transition of prostate cancer from androgen dependence to AI. preliminary data suggest that AI cancer contains markedly elevated levels of MAPK compared with AD cancer.
DTIC
Gene Expression; Imaging Techniques; Tumors; Receptors (Physiology); Prostate Gland

20040027720 University of Southern California, Los Angeles, CA
Genetic Variation in the HSD3B2 Gene and Prostate Cancer
Reichardt, Juergen; Jul. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0099
Report No.(s): AD-A419804; No Copyright; Avail: CASI; A02, Hardcopy

Prostate cancer is the most common cancer in American men. It is also characterized by a substantial racial/ethnic variation in risk: highest in African-American men, lowest in Asian men and intermediate in Caucasian and Latino men. We propose to investigate genetic variants of genes involved in the regulation of prostatic growth and particularly in androgen metabolism, particularly the HSD3B2 gene which encodes the type II beta-hydoxysternid dehydrogenase. Our current progress is highlighted by the following three findings. First, our data indicate that the locus under investigation is highly polymorphic in constitutional DNA. Furthermore, our population-based investigations are proceeding according to plan with MAPA technology. Finally, our initial biochemical results suggest that this aim will also be completed soon.
DTIC
Cancer; Genetics; Prostate Gland; Races (Anthropology)

20040027728 Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD
Guidance for Ability Group Run Speeds and Distances in Basic Combat Training
Knapik, Joseph J.; Scott, Shawn J.; Sharp, Marilyn A.; Hauret, Keith G.; Darakjy, Salima; Dec. 2003; 29 pp.; In English
Report No.(s): AD-A419750; USACHPPM-12-HF-5772A-03; No Copyright; Avail: CASI; A03, Hardcopy

During the first few days of Basic Combat Training (BCT), new recruits take an initial assessment run and they Me ranked from fast to slow. Four roughly equally sized 'ability groups' Me established from these rankings and recruits run together in these groups for their aerobic training. There is no formal guidance on how fast or how far these ability groups should run. This paper provides this guidance and a rationale for systematically progressing ability group runs. The major considerations in the development of the guidance were 1) minimizing injuries, 2) the initial fitness level (maximum oxygen uptake or VO2max) of recruits, 3) improvements in run times during BCT, 4) running speeds of the slower individuals in each ability group 5) running speeds that must be achieved to 'pass' the 2-mile run in BCT, 6) the gender composition of the ability groups, and 7) recommendations from the trainers.
DTIC
Physical Exercise; Personnel; Exercise Physiology

20040027732 Massachusetts Univ. Medical Center, Worcester, MA
Prostate Cancer Cell Growth: Role of Neurotensin in Mediating Effect of Dietary Fat and Mechanism of Action
Carraway, Robert E.; Oct. 2003; 23 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0528
Report No.(s): AD-A419819; No Copyright; Avail: CASI; A03, Hardcopy

The aims are (a) to determine the mechanism by which neurotensin (NT) enhances prostate cancer growth and (b) to test if NT released by eating contributes to cancer- promoting effects of high fat diets. Experiments show that NT transactivated the EGF receptor by liberating HB-ECF form the cell-surface by a metallo-protease-dependent and PKC-dependent mechanism. Activation of EGFR was followed by activation of MAp-kinase, P13-kinase, AKT and p70-S6-kinase, and in 24 hrs by a stimulation of DNA synthesis. We found that NT and EGF stimulated 3H-AA release form PC3 cells and that lipoxygenase (LOX) inhibitors blocked basal and NT-induced DNA synthesis. This suggests that EGF and NT act by way of PLA2 f-Lox and 12- LOX. Cell growth responses depend on the hormonal milieu. In the presence of a Gs stimulus, NT

enhances cAMP production and his results in an inhibition of DNA synthesis. Thus, NT effects involve actions on protein kinase, LOX, EGFR, and cross-talk with adenylyl cyclases. Drug effects on NT-receptor function include calcium channel blockers, such as dihydropyridines, which indirectly block the first step in the signaling pathway, the formation of inositol phosphates. The mechanism is under study.
DTIC
Cancer; Cell Division; Diets; Neurotransmitters; Prostate Gland; Fats

20040027741 Texas Univ., Houston, TX, USA
Cyclin E, a Powerful Predictor of Survival in Breast Cancer - A Prospective Study
Keyomarsi, Khandan; Jun. 2003; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0452
Report No.(s): AD-A419793; No Copyright; Avail: CASI; A03, Hardcopy

Aberrations in expression of cyclin E, a positive cell cycle regulator at the Ol to S transition, may affect the biological behavior of breast cancer. In a retrospective analysis of tumor specimens from 395 breast cancer patients, we found that overexpression of the full-length cyclin E protein and its LMW isoforms was a very strong predictor of breast cancer death regardless of whether patients had lymph node-negative disease or lymph node-positive disease (p less than 0.0001). Our hypothesis is that dysregulation of cyclin E is a powerful prognostic indicator of outcome in early stage breast cancer. Specifically we will: 1: use cyclin E antibody as a prognostic marker for stage I and II breast cancer in a PROSPECTIVE study, 2: examine the cyclin E associated activity and its immune-complex formation with key cell cycle regulators in freshly resected tumor samples, and 3: develop an immunohistochemical (IHC) assay for specifically detecting the LMW forms of cyclin E in Breast Cancer. We will correlate the cyclin E alterations in samples with the expression of key cell cycle regulators and clinical biomarkers. If we prospectively confirm cyclin E overexpression correlates with poor outcome, clinicians can more appropriately tailor aggressive systemic treatment to those at greatest risk for systemic metastases.
DTIC
Cancer; Mammary Glands; Gene Expression; Clinical Medicine; Cells (Biology)

20040027768 Health Research, Inc., Buffalo, NY, USA
Delivering DNA Vaccine by Transdermal Electroporation
Hui, Sek-Wen; Aug. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0530
Report No.(s): AD-A419796; No Copyright; Avail: CASI; A02, Hardcopy

Successful delivery of the HER-2/neu derived p369 peptide vaccine, KIFGSLAFL, to a large population of skin Langerhans cells (LC) by transdermal electroporationis expected to enhance the CTL response to breast cancer cells. Strategies have been developed to improve the electroporation protocol to enable the delivery of peptides. By using anionic lipids and detergents, the upper molecular weight limit of transdermal delivery by electroporation has been extended to beyond 10,000. This enables the delivery of antigenic peptides but not minigenes. With the new design of skin electrode, the transdermal flux of antigenic peptides was measured to be in the order of 10 mug/sq cm/min. Electric pulses also stimulates the migration of skin Langerhans cells. Antigen-specific CTL response in immunized mice was measured by ELISPOT of gamma- interferon production. Earlier attempts to generate CTL response to KIFGSLAFL by electroporation delivery were negative, due to weak immune response. CTL response to electroporation delivery of the peptide vaccine SIINFEKL was positive, although it was not as effective as intradermal injection. We attribute the weaker response to the necessity to inject adjuvant separately. Effort to simultaneously deliver lower molecular weight CpG-containing oligonucleotide adjuvant by electroporation is underway. Delivery of p369 HER- 2/ neu derived peptide vaccines will be re-examined.
DTIC
Peptides; Vaccines; Cancer; Mammary Glands

20040027784 Sir Mortimer B. Davis Jewish General Hospital, Montreal, Quebec, Canada
Is Breast Tissue from Women Who Carry Germ-Line BRCA1 or BRCA2 Mutations 'Normal'? - An Immuno-Histopathological Study
Foulkes, William D.; Alpert, Lesley; Quenneville, Louise; Tremblay, Gilles; Aug. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0627
Report No.(s): AD-A419802; No Copyright; Avail: CASI; A01, Hardcopy

After review of 140 files, a total of 90 prevalent cases of breast cancer were recruited from both clinical genetic services

at the Montreal Hospital sites. A total of 36 cases were examined by three separate blinded pathologists for certain morphological and histological features to be compared among carriers and non-carriers of the BRCAl/2 genes. The pre-cancerous features that we focused on included apocrine hyperplasia, sclerosing adenosis, columnar alteration with prominent apical snouts and secretions(CAPSS) and usual ductal hyperplasia. We are now in the process of having the remaining 24 cases examined and reviewing the raw data to establish some results and conclusions. We hope to complete the examination of the remaining cases and the analysis of the raw data very shortly. Immunohistochemical analysis will follow.
DTIC
Cancer; Mammary Glands; Mutations

20040027818 Bolt, Beranek, and Newman, Inc., Cambridge, MA, USA
An Evaluation of Stereoscopic Digital Mammography for Earlier Detection of Breast Cancer and Reduced Rate of Recall
Getty, David J.; Aug. 2003; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0295
Report No.(s): AD-A419794; No Copyright; Avail: CASI; A04, Hardcopy

The goal of this project is to evaluate stereoscopic digital mammography, compared to standard, non- stereo digital mammography, for the earlier detection of breast cancer and reduced rate of patient recall for further workup. During the project, approximately 2000 women at elevated risk for development of breast cancer will receive stereo mammograms at the Emory Breast Clinic. In the first year of the project, we built a high-resolution (2304 x 1800 pixels) stereo display workstation that will be used during the project, and we wrote a software application that will be used by the participating mammographers to control various aspects of the displayed stereo mammograms as they interpret mammographic cases. We also wrote software to calibrate the grayscale on the high-resolution grayscale monitor to comply with the DICOM standard. The stereo workstation was shipped to Emory University near the end of the first project year. Working with project staff at Emory University, we developed the set of data forms that will be used to collect study data on patients enrolled into the project.
DTIC
Cancer; Mammary Glands

20040027834 Alabama Univ., Birmingham, AL
Derivation of Double-Targeted Adenovirus Vectors for Gene Therapy of Prostate Cancer
Krasnykh, Victor; Jan. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0002
Report No.(s): AD-A419820; No Copyright; Avail: CASI; A02, Hardcopy

The subject of the present studies is the development of adenovirus (Ad)-based vector capable of selectively infecting and killing prostate cancer cells. The intended use of such a vector is for gene therapy of prostate cancer patients, whereby the virus administered to patients would find, infect and destroy tumor cells. Development of this vector is to employ the concepts of conditionally replicative Ad (CRAd) and genetic targeting of Ad to tumor- specific cell surface molecules (transductional targeting). Conditional control over the replication of the vector is to be achieved by using the previously established osteocalcin (OC) promoter. Targeting of the virus to prostate tumor cells will be accomplished via genetic incorporation into its capsid of peptide ligands, which selectively bind to a major marker of prostate tumors, prostate-specific membrane antigen (PSMA). Identification of these targeting peptides by phage library biopanning is the central task of the project. The efficiency of the resultant Ad therapeutic is to be tested by using the virus for the treatment of prostate tumor xenografts established in immunodeficient mice.
DTIC
Adenoviruses; Cancer; Prostate Gland

20040027964 Air Force Inst. of Tech., Wright-Patterson AFB, OH
The Effects of Gender on Receovery Times Following General Anesthesia with Propofol and Sevoflurane
Strait, Sean A.; Dominguez, Dino R.; Gunning, Donna T.; Dec. 2003; 83 pp.; In English
Report No.(s): AD-A419843; No Copyright; Avail: CASI; A05, Hardcopy

Research has shown that men and women metabolize drugs differently, but little is known about how gender affects recovery from general anesthesia. The purpose of this study was to determine if there were differences in recovery times between men and women following general anesthesia with sevoflurane and propofol. A review of the literature showed two studies where women awoke from general anesthesia significantly faster than men. Following institutional review board

approval, 24 men and 24 women were enrolled in this descriptive, non-randomized, quasi-experimental study. After informed consent was obtained, general anesthesia was induced with a standardized weight-based protocol. Anesthesia was then maintained with a propofol infusion and sevoflurane was adjusted to maintain appropriate anesthetic depth. Following discontinuation of anesthetic agents, recovery end points (eye opening and hand grip) were elicited by investigators at one-minute intervals. For the purposes of the study the subject was considered recovered when both end points were met. There was no statistically significant difference in demographics, or type of surgery. No statistically significant difference was found in recovery times between the two groups. This study did not control for local anesthetic injections made by the surgeon that might influence recovery times. Because women continue to experience recall at higher rates than men more studies are needed in this area.
DTIC
Recovery; Metabolism; Anesthesia; Anesthetics

20040028043 Brookhaven National Lab., Upton, NY
Differential Expression of DNA Double-Strand Break Repair Proteins in Breast Cells
Anderson, Carl W.; Jul. 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0168
Report No.(s): AD-A419972; No Copyright; Avail: CASI; A03, Hardcopy

Two mechanisms that repair DNA double-strand breaks in mammalian cells are homologous recombination and non-homologous DNA end-joining (NHEJ). Previous studies showed that a critical component of the NHEJ pathway, the DNA-activated protein kinase (DNA-PK), was poorly expressed in non- lactating (resting) breast tissue. Therefore, we proposed to identify the mechanisms responsible for regulating levels of non-homologous end-joining DNA repair components in human breast tissue and to measure the DNA double-strand break repair capacity of breast epithelial cells. We reexamined the expression of DNA-PK in human breast tissues by immuno- histochemistry and extended these studies to two other components of the NHEJ repair pathway, XRCC4 and DNA ligase IV, as well as other DNA repair components including NBSl and MRE11. In contrast to the original report, 90% of the epithelial cells in normal resting breast tissues from 10 different patients expressed both components of DNA-PK, DNAPKcs and Ku. In contrast, stromal cells failed to express NHEJ proteins, but a cell line derived from breast stromal tissue did. No polymorphisms were detected in the Ku7O gene of 14 breast cancer patients, but a high frequency fragment length polymorhism was identified in the promoter region of the Ku8O gene from breast cancer patients. We also showed that 11.3% of breast cancer patients amplified the gene for the Wip1 phosphatase that regulates p53 activity. Furthermore, mouse cells lacking the Wip1 gene were resistant to cell transformation, and mice lacking the Wip1 gene were resistant to tumor formation, suggesting that Wip1 is a potential target for anti-cancer drugs.
DTIC
Cancer; Mammary Glands; Polymorphism; Histochemical Analysis; Deoxyribonucleic Acid

20040028139 Army Research Inst. of Environmental Medicine, Natick, MA
Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications
Yokota, Miyo; Matthew, William T.; Berglund, Larry G.; Buller, Mark J.; Hoyt, Reed W.; Dec. 2003; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419922; USARIEM-T-04-03; No Copyright; Avail: CASI; A03, Hardcopy

SCENARIO-J is a Java (R)-based thermoregulatory prediction model developed by Kraning and Gonzalez of USARIEM. The model was previously evaluated under thermally stressful laboratory environments and the model performance in long-term field conditions was still unclear. This study evaluates the reliabilities of SCENARIO-J in long term military field training and showed the comparisons in these results with previous laboratory controlled validation studies.
DTIC
Thermoregulation; Military Technology; Mathematical Models; Clinical Medicine

20040030412 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD, USA
Relationship of Ambient Atmosphere and Biological Aerosol Responses from a Fielded Pyrolysis-Gas Chromatography- Ion Mobility Spectrometry Bioanalytical Detector
Snyder, A. P.; Maswadeh, Waleed M.; Tripathi, Ashish; Dec. 2003; 35 pp.; In English
Report No.(s): AD-A419910; ECBC-TR-328; No Copyright; Avail: CASI; A03, Hardcopy

Interrogation of the ambient atmosphere for identification of bioaerosol material has predominately been accomplished

by aerosol particulate collection, concentration, and growth on agar plates coupled with biochemical tests. A challenge facing the aerobiological community is characterizing the ambient atmospheric aerosol burden with respect to a relatively rapid monitoring for distinct biological species. A pyrolysis-gas chromatography-ion mobility spectrometry stand-alone bioaerosol system was interfaced to an aerosol concentrator to collect ambient background aerosols and produce bioanalytical baseline/background signal levels over 28-hr. Random, discrete, deliberate bursts of biological aerosol near the aerosol concentrator inlet were performed during the continuous bioanalytical interrogation of an outdoor urban atmospheric environment. In the presence of outdoor aerosol background, detection, classification, and characterization of the bioaerosol were accomplished from relatively low to high concentration aerosol bursts of Bacillus subtilis spores and ovalbumin protein. This work provides initial attempts to shepherd continuous bioanalytical instrumentation monitoring of the ambient atmospheric aerosol for detection and classification of specific bioaerosols.
DTIC
Bacteria; Gas Chromatography; Aerobiology; Aerosols; Bacillus

20040030471 Kentucky Univ., Lexington, KY
Factors Related to Nonadherence of a Low Sodium Diet in Heart Failure Patients
Bentley, Brooke; De Jong, Marla J.; Moser, Debra K.; Peden, Ann R.; Jan. 2004; 19 pp.; In English
Report No.(s): AD-A419967; AFIT-CI04-55; No Copyright; Avail: CASI; A03, Hardcopy

A low sodium diet is a cornerstone of non-pharmacologic therapy for heart failure patients. Although nonadherence is common, little is known about why heart failure patients fail to adhere to this diet. The purpose of this study was to explore the experience of heart failure patients in following a low sodium diet. We conducted a qualitative descriptive study with a convenience sample of 20 participants. Interviews were conducted and analyzed for themes. The data reflected three primary themes about nonadherence to the low sodium diet: lack of knowledge, interference with socialization, and lack of food selections. Participants expressed a need for details about dietary information, low sodium food selection, food preparation, and rationale for the diet. Lack of knowledge also was manifested as diet confusion for participants who required additional dietary restrictions related to other disease processes. Interference with socialization was manifested by patients' experiences with family conflict when family members chose and ate high-sodium foods at home or family gatherings, and difficulty eating out. The theme of lack of low sodium food selections was reflected by comments about limited food choices, and lack of palatability. Researchers and clinicians need to consider patients' perceptions as they generate and evaluate interventions to increase adherence to a low sodium diet.
DTIC
Sodium; Heart; Failure; Diets

20040030514 Georgia Tech Research Inst., Atlanta, GA, USA
Molecular Basis of Mechano-Signal Transduction in Vascular Endothelial Cells
Jo, Hanjoong; February 13, 2004; 4 pp.; In English
Contract(s)/Grant(s): NAG2-1348; No Copyright; Avail: CASI; A01, Hardcopy

Simulated microgravity studies using a random positioning machine (RPM). One RPM machine has been built for us by Fokker Science in Netherland. Using the device, we have developed an in vitro system to examine the effect of simulated microgravity on osteoblastic bone cells. Using this system, we have carried out gene chip studies to determine the gene expression profiles of osteoblasts cultured under simulated microgravity conditions in comparison to static controls. From this study, we have identified numerous genes, some of which are expected ones inducing bone loss, but many of which are unexpected and unknown. These findings are being prepared for publications.
Derived from text
Bone Demineralization; Cardiovascular System; Genetics; Gravitational Effects

20040031325 Naval Medical Research Inst., Wright-Patterson AFB, OH, USA
The Acute Respiratory Distress Syndrome (ARDS) and Military Relevant Inhalation Injury: A Brief Review
Kimmel, E. C.; Still, K. R.; Dec. 1997; 98 pp.; In English
Report No.(s): AD-A419968; NMRI-97-42; No Copyright; Avail: CASI; A05, Hardcopy

A brief overview of fundamental aspects of the continuum of diseases from Acute Lung Injury (ALI) to the more severe form Acute Respiratory Distress Syndrome (ARDS) is given. The review is not technologically comprehensive and is intended as an introductory primer for Naval operational personnel interested in health risks associated primarily with inhalation of smoke. Although there are numerous and varied causes of ARDS from inhalation of combustion products or inhalation injury.

In particular, the risk of ALI/ARDS from inhalation of combustion products and smokes. The pulmonary toxicity of some we'll known smoke constituents is discussed. Inhalation of vesicant chemical warfare agents is addressed as- militarily relevant risk factor for ALI/ARDS. A brief synopsis of animal research models of ALI/ARDS is given.
DTIC
Respiratory Diseases; Injuries; Armed Forces; Clinical Medicine

20040031362 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Diagnosis of Exposure to Chemical Warfare Agents
Noort, D.; August 2003; 36 pp.; In English
Contract(s)/Grant(s): A03/CO/4CA; TNO Proj. 014.15094
Report No.(s): TD-2003-0257; PML-2003-A63; Copyright; Avail: Other Sources

In this report an overview is presented of the methods currently available for detection of exposure to a number of chemical warfare agents (CWA), i.e., sulfur mustard, lewisite and nerve agents. Such methods can be applied for various purposes, e.g., diagnosis and dosimetry of exposure of casualties, confirmation of nonexposure, verification of non-adherence to the Chemical Weapons Convention, health surveillance, and forensic purposes. The methods are either based on mass spectrometric or immunochemical analysis of CWA adducts with DNA or proteins, or on mass spectrometric analysis of urine or plasma metabolites that result from hydrolysis and/or glutathione conjugation. Several of the methods have been successfully applied to actual cases.
Author
Chemical Warfare; Diagnosis; Exposure; Mass Spectroscopy; Adducts; Metabolites

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*.

20040027595 Naval Health Research Center, San Diego, CA
Running Performance as an Indicator of VO(2max): A Replication of Distance Effects
Vickers, Ross R., Jr; Jul. 23, 2001; 27 pp.; In English
Report No.(s): AD-A419674; NAVHLTHRSCHC-01-24; No Copyright; Avail: CASI; A03, Hardcopy

An earlier review showed that run test validity as an indicator of aerobic capacity increased with test distance up to 2 km and with test duration up to 12 min, then remained constant. This representation of the relationship between distance/time and test validity was labeled the piecewise (PW) model of run test validity. The range of constant validity in the PW model was surprising in light of physiological and mathematical models of running performance. Therefore, this review analyzed 74 correlations from 39 additional studies to replicate the prior findings if possible. Cross-validation of the models showed that only the PW model had positive predictive value in the new data. An earlier finding that fixed-time run tests (e.g., a 12-min run) provided better estimates of aerobic capacity than fixed-distance run tests (e. g., 5 km) also replicated (r = .807 vs. r = .706). Based on this evidence, a I 2-min run test maximizes validity while minimizing demands on the runners.
DTIC
Mathematical Models; Aerobes; Correlation

20040027736 Army Research Inst. of Environmental Medicine, Natick, MA, USA
Cold Air Data Acquisition System Documentation
Robinson, Scott B.; Blanchard, Laurie A.; Sep. 2003; 34 pp.; In English
Report No.(s): AD-A419763; USARIEM/TMMD-TN-04-04; No Copyright; Avail: CASI; A03, Hardcopy

This report describes a data acquisition system developed to obtain body temperature measurements for human volunteers during cold air exposure. Since acceptable commercial systems are not available, we had to custom-build this system to acquire data using National Instruments hardware components and LabVIEW 6.0 Developmental Software. This report provides detailed documentation for the construction and operation of the cold air data acquisition system. This report lends

to the reader insight to duplicate or modify this system, given general background knowledge in National Instrument's LabVIEW graphical programming language.
DTIC
Software Engineering; Cold Tolerance; Temperature Measurement

20040031333 National Space Biomedical Research Inst., Houston, TX, USA
National Space Biomedical Research Institute
September 30, 2003; 879 pp.; In English
Contract(s)/Grant(s): NCC9-58; No Copyright; Avail: CASI; A99, Hardcopy

In June 1996, NASA released a Cooperative Agreement Notice (CAN) inviting proposals to establish a National Space Biomedical Research Institute (9-CAN-96-01). This CAN stated that: The Mission of the Institute will be to lead a National effort for accomplishing the integrated, critical path, biomedical research necessary to support the long term human presence, development, and exploration of space and to enhance life on Earth by applying the resultant advances in human knowledge and technology acquired through living and working in space. The Institute will be the focal point of NASA sponsored space biomedical research. This statement has not been amended by NASA and remains the mission of the NSBRI.
Author
Research Facilities; Aerospace Medicine

20040031522 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine
Vu, Nicole T.; Zhu, Hua; Owuor, Edward D.; Huggins, Mark E.; White, Vicky L.; Chaturvedi, Arvind K.; Canfield, Dennis V.; Whinnery, James E.; January 2004; 11 pp.; In English
Contract(s)/Grant(s): FAA-AM-B-03-TOX-204
Report No.(s): DOT/FAA/AM-04/1; No Copyright; Avail: CASI; A03, Hardcopy

Gene expression studies in clinical diagnostic settings involve a large number of samples collected at different time points requiring effective methods for collection, transportation, storage, and isolation of RNA to maintain the integrity of expression profiles. Human whole blood is a vital source of RNA for analysis of environmental exposure since blood constituents maintain homeostasis, effect immunity or inflammation, participate in stress signaling, and mediate cellular communication in vascular associated tissues including those of the central nervous system. Isolation strategies using whole blood should recognize the limited quantities of useful RNA that must be protected from the hostile leukocyte ribonucleases, in addition to the abundance of preformed mRNA in reticulocytes, high protein content, and transcriptional activation of cells during sample processing in vitro. This paper presents data showing how the collection, treatment, and storage of collected blood samples can affect subsequent RNA isolation and analysis. It is further demonstrated that total RNA isolated from human whole blood, using a modified and optimized procedure of PAXgene(TM) Blood RNA reagent kits, performed well in cDNA microarray hybridization and kinetic RT-PCR. Preservation of expression patterns was observed for 96% of the mRNAs after 24 h storage at 4 C by hybridization analysis of 100 mRNA targets. There were no detectable changes in expression levels of 2 housekeeping genes, beta-actin and cyclophilin, for up to 10 days storage at 4 C by RT-PCR. This validated protocol was employed for isolation of RNA from blood samples collected in the study of acute ethanol effects on performance and characterization of ethanol inducible biomarkers related to performance impairment. The ultimate goal is to utilize gene expression analysis for aerospace accident investigation and prevention.
Author
Gene Expression; Diagnosis; In Vitro Methods and Tests; Ribonucleic Acids; Blood; Cells (Biology)

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20040031436 Institute for Defense Analyses, Alexandria, VA, USA
Human Behaviour Representation: Relevant Technologies and their Development
Jacobs, Robert; Brooks, Peter; Simulation of and for Military Decision Making; June 2003, pp. 15-1; In English; See also 20040031429; Copyright; Avail: CASI; A03, Hardcopy

The paper discusses human behaiour representation - relevant technologies and their development.
CASI
Human Behavior; Technology Assessment; Product Development

20040031442 North Atlantic Treaty Organization, The Hague, Netherlands
Human Behaviour Representation: Definition
Dompke, Uwe; Simulation of and for Military Decision Making; June 2003, pp. 11-1 - 11-12; In English; See also 20040031429; Copyright; Avail: CASI; A03, Hardcopy

The end of the Cold War has brought new military tasks and types of operations to NATO. These include regional contingency operations, Crisis Management and support of non-NATO missions (UN, PfP, WEU, etc). All these new types of missions have one newly emerging characteristic that implies a better modelling of human behaviour: they need methodologies to describe on various detail levels, how individuals and social entities (e.g. teams, groups) influence the course and outcome of military conflicts. Those emerging technologies will have a great impact on the implementation and on the military use of simulation systems in the future. Therefore, building better simulation systems and decision support tools, which include HBR, is of primary importance.
Author
Human Behavior; Military Operations

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*.

20040016361 Lawrence Livermore National Lab., Livermore, CA
Lawrence Livermore National Laboratory Site Specific Standard for Nonnuclear Safety Analysis
Failor, R.; Beach, D. R.; Brereton, S.; Hildrum, J. S.; Ingram, C.; 2003; 20 pp.; In English
Report No.(s): DE2003-15004397; No Copyright; Avail: Department of Energy Information Bridge

Lawrence Livermore National Laboratory (LLNL) and the NNSA Livermore Site Office teamed up to prepare a site specific work smart standard setting requirements for preparation of safety basis documents for LLNL nonnuclear operations and facilities. This standard documents how all hazards (biological, chemical, explosive, industrial, and radiological) shall be evaluated, classified, analyzed, and controls developed. This standard was developed to evaluate hazards at the facility level to mesh with LLNLs ISM system for reviewing hazards at the activity level. This standard presents an approach to establishing safety basis for nonnuclear operations and activities, taking a graded approach based on the potential for impacts to the health of collocated workers and the public. Direct worker safety is covered by LLNLs work activity level reviews and requirements. This standard includes streamlined mechanisms for classifying hazards based upon the unmitigated potential for human health impacts. A review or practices at several private industries, government laboratories, and DOE complex sites provided a benchmark and comparison of safety analysis processes. These approaches were compared with LLNLs existing systems, leading to a determination that facility specific safety basis documents added value to a rapid authorization for new work activities in LLNL facilities.
NTIS
Hazards; Laboratories; Safety

20040016442 National Defence Research Establishment, Linkoeping, Sweden
Overview of MSI Evaluation Methodology for Systems Development
Oskarsson, P. A.; Oct. 2002; 74 pp.; In Swedish
Report No.(s): PB2004-101772; FOI-R-0583-SE; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of the report is to give a general overview of common MSI (Man System interaction) evaluation methodologies for systems development. This is intended as the basis of an MSI evaluation audit for systems engineering. Usability efforts require iterative design processes where constructors/designers are given recurrent feedback from the results of performed evaluations. For usability efforts to be successful, it is also necessary to perform task- and user analyses before design is initiated to get recommendations on system design and functionality. In early design phases before functional prototypes are implemented, usability experts often evaluate system/prototype functionality by means of expert methods. When functional prototypes are implemented, user evaluations are generally performed. The most frequently used methods

of evaluation are discussed. Further, pros and cons of quantitative and qualitative methods are discussed. A basic structure of an MSI evaluation audit for systems engineering and design is suggested.
NTIS
Man Machine Systems; Systems Engineering; Systems Analysis

20040020091 National Defence Research Establishment, Linkoeping, Sweden
HFES 2002 Travelreport
Fransson, J.; Albinsson, P. A.; Dec. 2002; 28 pp.; In Swedish
Report No.(s): PB2004-101770; FOI-R-0656-SE; No Copyright; Avail: CASI; A03, Hardcopy

Within the scope of the LedFram project we visited the Human Factors and Ergonomics Society's annual meeting, HFES 2002. The conference is large and comprises many parallel sessions in several research areas. Our primary concern has been aspects relevant to the ongoing development of the command and control information systems SLB and IS MARK. The report summarizes some of the sessions we participated in and relates reported scientific results to our ongoing research and the potential relevance to the LedFram project.
NTIS
Human Factors Engineering; Conferences

20040021352 Lockheed Martin Space Operations, Moffett Field, CA, USA
Compaction of Space Mission Wastes
Fisher, John; Pisharody, Suresh; Wignarajah, K.; [2004]; 10 pp.; In English; 33rd International Conference on Enviornmental Systems, 7-10 Jul. 2003, Vancourver, British Columbia, Canada
Contract(s)/Grant(s): NAS2-14263; No Copyright; Avail: Other Sources; Abstract Only

The current solid waste management system employed on the International Space Station (ISS) consists of compaction, storage, and disposal. Wastes such plastic food packaging and trash are compacted manually and wrapped in duct tape footballs by the astronauts. Much of the waste is simply loaded either into the empty Russian Progress vehicle for destruction on reentry or into Shuttle for return to Earth. This manual method is wasteful of crew time and does not transition well to far term missions. Different wastes onboard spacecraft vary considerably in their characteristics and in the appropriate method of management. In advanced life support systems for far term missions, recovery of resources such as water from the wastes becomes important. However waste such as plastic food packaging, which constitutes a large fraction of solid waste (roughly 21% on ISS, more on long duration missions), contains minimal recoverable resource. The appropriate management of plastic waste is waste stabilization and volume minimization rather than resource recovery. This paper describes work that has begun at Ames Research Center on development of a heat melt compactor that can be used on near term and future missions, that can minimize crew interaction, and that can handle wastes with a significant plastic composition. The heat melt compactor takes advantage of the low melting point of plastics to compact plastic materials using a combination of heat and pressure. The US Navy has demonstrated successful development of a similar unit for shipboard application. Ames is building upon the basic approach demonstrated by the Navy to develop an advanced heat melt type compactor for space mission type wastes.
Author
Space Missions; Solid Wastes; Waste Disposal; Melting; Compacting; Plastics

20040021355 NASA Ames Research Center, Moffett Field, CA, USA
ALS Equivalent System Mass Guidelines Document
Levri, Julie; [2003]; 24 pp.; In English; Invited Presentation at Purdue University, 13 Mar. 2003, West Lafayette, IN, USA
Contract(s)/Grant(s): RTOP 131-20-10; No Copyright; Avail: CASI; A03, Hardcopy

This document is a viewgraph presentation which provides guidelines for performing an Equivalent System Mass (ESM) evaluation for trade study purposes. The document: 1) Defines ESM; 2) Explains how to calculate ESM; 3) Discusses interpretation of ESM results. The document is designed to provide detailed instructive material for researchers who are performing ESM evaluations for the first time.
Author (revised)
Life Support Systems; Mass; Mission Planning

20040027549 NASA Ames Research Center, Moffett Field, CA, USA
Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading
Whalen, Robert T.; Pelc, Norbert J.; Cleek, Tammy M.; Sode, Miki; January 10, 2004; 20 pp.; In English
Contract(s)/Grant(s): NCC5-434; No Copyright; Avail: CASI; A03, Hardcopy

Our Research Objective is to measure the spatial distribution of bone mass throughout the entire internal volume of a bone such as the human calcaneus or heel bone. Currently, x-ray computed tomography (CT) is the only practical three-dimensional imaging technology capable of measuring bone density within small contiguous volumetric regions of a bone. spectrum of energies in the x-ray beam producing the image. We have developed a computational method of correcting these errors, provided the x-ray spectrum is known or measured (Yan et al., 2000). Monitoring serial changes in volumetric bone density with age, disuse, exercise or A CT image contains measurement errors in bone density caused by the broad drug therapy also requires accurate image registration.
Author
Bones; Spatial Distribution; X Rays; Mass Distribution; Image Processing; Imaging Techniques

20040030456 Institute for Nutrition and Food Research TNO, Zeist, Netherlands
Feeding Behaviour and Motivation of Feeding Behaviour of (Experienced) Soldiers of Several Entities Concerning the Fighting Ration, Part 1, Development and Initial Studies
opdeWeegh, M. J.; Westenbrink, S.; Rubingh, C. M.; vanAken-Schneijder, P.; Stafleu, A.; vanErp-Baart, A. M. J.; April 2003; 67 pp.; In Dutch
Contract(s)/Grant(s): A02/KL/105; TNO Proj. 22050/01.02
Report No.(s): TD-2003-0173-Pt-1; V5205-Pt-1; Copyright; Avail: Other Sources
Recent studies on attitude toward military rations suggest that acceptance of available military rations is decreasing. Therefore a three year study is started, in which attitude and real consumption of military rations will be measured in a large group of military personnel with varying background. In this report the results of the first year of this study is reported. A self administered questionnaire is developed to measure behavior towards military rations and includes questions on attitude, self efficacy, social influences, barriers and skills and knowledge. For the establishment of the real consumption of combat rations a structured interview with a trained dietitian is used. The consumption during the previous 24 hours is recalled. Also, a proper selection procedure is developed for the recruitment of the final study population. It was concluded that the behavior questionnaire, after minor adaptations, can be used to obtain insight into behavior towards military rations. However, the structured dietary interview can only be used to measure exact ration consumption in a part of the study population: i.e. the soldier operating in a mobile environment. Soldiers operating on foot need an adapted version of the consumption questionnaire. They get their rations distributed for more days in one time.
Author
Rations; Human Behavior

59
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*.

20040016277 Lawrence Livermore National Lab., Livermore, CA
Multi-Resolution Modeling of Large Scale Scientific Simulation Data
Baldwin, C.; Abdulla, G.; Critchlow, T.; 2003; 10 pp.; In English
Report No.(s): DE2003-15004389; No Copyright; Avail: Department of Energy Information Bridge
This paper discusses using the wavelets modeling technique as a mechanism for querying large-scale spatio-temporal scientific simulation data. Wavelets have been used successfully in time series analysis and in answering surprise and trend queries. Our approach however is driven by the need for compression, which is necessary for viable throughput given the size of the targeted data, along with the end user requirements from the discovery process. Our users would like to run fast queries to check the validity of the simulation algorithms used. In some cases users are welling to accept approximate results if the answer comes back within a reasonable time. In other cases they might want to identify a certain phenomena and track it over time. We face a unique problem because of the data set sizes. It may take months to generate one set of the targeted data; because of its shear size, the data cannot be stored on disk for long and thus needs to be analyzed immediately before it is sent to tape. We integrated wavelets within AQSIM, a system that we are developing to support exploration and analyses of tera-scale size data sets. We will discuss the way we utilized wavelets decomposition in our domain to facilitate compression and in answering a specific class of queries that is harder to answer with any other modeling technique. We will also discuss

some of the shortcomings of our implementation and how to address them.
NTIS
Wavelet Analysis; Data Compression

20040016282 Lawrence Livermore National Lab., Livermore, CA
Modern Techniques in Acoustical Signal and Image Processing
Candy, J. V.; Apr. 04, 2002; 14 pp.; In English
Report No.(s): DE2003-15004645; UCRL-JC-146909; No Copyright; Avail: Department of Energy Information Bridge

Acoustical signal processing problems can lead to some complex and intricate techniques to extract the desired information from noisy, sometimes inadequate, measurements. The challenge is to formulate a meaningful strategy that is aimed at performing the processing required even in the face of uncertainties. This strategy can be as simple as a transformation of the measured data to another domain for analysis or as complex as embedding a full-scale propagation model into the processor. The aims of both approaches are the same---to extract the desired information and reject the extraneous, that is, develop a signal processing scheme to achieve this goal. In this paper, we briefly discuss this underlying philosophy from a 'bottom-up' approach enabling the problem to dictate the solution rather than visa-versa.
NTIS
Auditory Signals; Image Processing; Signal Processing

20040016286 Lawrence Livermore National Lab., Livermore, CA
SafePatch for Windows. Version 1.0 User Manual
Lim, D.; Meier, T.; May 01, 2003; 46 pp.; In English
Report No.(s): DE2003-15004619; UCRL-JC-153282; No Copyright; Avail: Department of Energy Information Bridge

SafePatch for Windows provides automated analysis of network-based Microsoft Windows computer systems to determine the status of security patches. SafePatch determines what patches need to be installed on a system or group of systems. SafePatch collects and packages the necessary patches and the script to install those patches for the selected remote systems. SafePatch for Windows also supports browsing the Microsoft patch database and the viewing of the bulletins associated with the patches.
NTIS
User Manuals (Computer Programs); Computer Systems Programs; Automatic Control

20040016287 Lawrence Livermore National Lab., Livermore, CA
Merlot Design
Ahern, S. D.; 2004; 16 pp.; In English
Report No.(s): DE2003-15004620; UCRL-MA-153588; No Copyright; Avail: Department of Energy Information Bridge

We describe Merlot, a system for delivery of digital imagery over high speed networks. We describe various use cases, the client/server interaction, and the image and network codecs. We also describe some possible applications using Merlot and future work.
NTIS
Systems Engineering; Imagery; Digital Systems; Computer Networks

20040016366 Lawrence Livermore National Lab., Livermore, CA
C++ Infrastructure for Automatic Introduction and Translation of OpenMP Directives
Quinlan, D.; Schordan, M.; Yi, Q.; de Supinski, B. R.; Jul. 2003; 18 pp.; In English
Report No.(s): DE2003-15004419; UCRL-JC-151964; No Copyright; Avail: Department of Energy Information Bridge

In this paper we describe a C++ infrastructure for source-to-source translation. We demonstrate the translation of a serial program with high-level abstractions to a lower-level parallel program in two separate phases. In the first phase OpenMP directives are introduced, driven by the semantics of high-level abstractions. Then the OpenMP directives are translated to a C++ program that explicitly creates and manages parallelism according to the specified directives.
NTIS
Parallel Programming; Architecture (Computers)

20040016369 Lawrence Livermore National Lab., Livermore, CA
Understanding the CCA Standard Through Decaf
Kumfert, G.; Apr. 17, 2003; 74 pp.; In English
Report No.(s): DE2003-15004625; UCRL-MA-148390; No Copyright; Avail: Department of Energy Information Bridge
This document is a tutorial on the CCA Standard as realized through the Decaf implementation. Decaf does not equal the CCA standard much in the same way that Microsoft Visual C++ is not ANSI/ISO C++.
NTIS
Architecture (Computers); Interoperability; C++ (Programming Language)

20040016374 Lawrence Livermore National Lab., Livermore, CA
Retrieval of Similar Objects in Simulation Data Using Machine Learning Techniques
Cantu-Paz, E.; Cheung, S. C.; Kamath, C.; Jun. 2003; 16 pp.; In English
Report No.(s): DE2003-15004415; UCRL-JC-153866; No Copyright; Avail: Department of Energy Information Bridge
Comparing the output of a physics simulation with an experiment is often done by visually comparing the two outputs. In order to determine which simulation is a closer match to the experiment, more quantitative measures are needed. This paper describes our early experiences with this problem by considering the slightly simpler problem of ending objects in a image that are similar to a given query object.
NTIS
Information Retrieval; Machine Learning

20040016439 Lawrence Livermore National Lab., Livermore, CA
Lawrence Livermore National Laboratory Probabilistic Seismic Hazard Codes Validation
Savy, J. B.; Sep. 08, 2003; 34 pp.; In English
Report No.(s): DE2003-15004907; UCRL-ID-155282; No Copyright; Avail: Department of Energy Information Bridge
Probabilistic Seismic Hazard Analysis (PSHA) is a methodology that estimates the likelihood that various levels of earthquake-caused ground motion will be exceeded at a given location in a given future time-period. LLNL has been developing the methodology and codes in support of the Nuclear Regulatory Commission (NRC) needs for reviews of site licensing of nuclear power plants, since 1978. A number of existing computer codes have been validated and still can lead to ranges of hazard estimates in some cases. Until now, the seismic hazard community had not agreed on any specific method for evaluation of these codes. The Earthquake Engineering Research Institute (EERI) and the Pacific Engineering Earthquake Research (PEER) center organized an exercise in testing of existing codes with the aim of developing a series of standard tests that future developers could use to evaluate and calibrate their own codes. Seven code developers participated in the exercise, on a voluntary basis. Lawrence Livermore National laboratory participated with some support from the NRC. The final product of the study will include a series of criteria for judging of the validity of the results provided by a computer code.
NTIS
Computer Programs; Earthquakes; Calibrating; Nuclear Power Plants

20040016449 Swedish Defence Research Establishment, Linkoeping
Mixed Reality in Military Applications. A Pilot Study with Certain Focus on Integration of Gaze-Tracker and Head Mounted Displays
Gustafsson, T.; Carleberg, P.; 2003; In Swedish
Report No.(s): PB2004-101784; FOI-R-0857-SE; No Copyright; Avail: National Technical Information Service (NTIS)
By the development of systems measuring an operator's gaze and head direction new possibilities to acquire, transfer, graphical generate, mix and display image information arises. Research work within this area belongs to the interdisciplinary field of research called 'Mixed Reality,' MR, which is described in the report. To achieve a greater perspective on how MR can be used in military applications, a number of individuals from the national defense, the defense industry and the university have been interviewed. Based upon these interviews a number of potential military applications are presented and discussed. MR techniques are able to give us fantastical systems from a technical point of view but the system must also fulfill its purpose from a human point of view. Human factors are a part of MR and related questions regarding this issue also considered. One MR application area is 'technical support,' where virtual image information (instructions, exploded view, etc.) is displayed in front of the eyes of an operator. Detecting the gaze direction in applications like this, crucial advantages can be obtained. The integration of a head-mounted micro-display system and a gaze direction sensor is therefore given extra attention in the report.

Finally, a perspicuous table of a probable evolution of MR-systems and their applications are presented.
NTIS
Display Devices; Defense Industry; Defense Program

20040016451 Lawrence Livermore National Lab., Livermore, CA
K-Means Re-Clustering Algorithmic Options with Quantifiable Performance Comparisons
Meyer, A. W.; Paglieroni, D. W.; Astaneh, C.; Dec. 17, 2002; 16 pp.; In English
Report No.(s): DE2003-15004890; UCRL-JC-151259; No Copyright; Avail: Department of Energy Information Bridge

This paper presents various architectural options for implementing a K-Means Re-Clustering algorithm suitable for unsupervised segmentation of hyperspectral images. Performance metrics are developed based upon quantitative comparisons of convergence rates and segmentation quality. A methodology for making these comparisons is developed and used to establish K values that produce the best segmentations with minimal processing requirements. Convergence rates depend on the initial choice of cluster centers. Consequently, this same methodology may be used to evaluate the effectiveness of different initialization techniques.
NTIS
Evaluation; Performance Tests; Cluster Analysis; Segments

20040020100 Agency for International Development, Washington, DC, USA
New Ways to Empower Indonesia with the Internet and ICTs
Sulaiman, I. F.; Aug. 26, 2003; 14 pp.
Report No.(s): PB2004-103009; No Copyright; Avail: CASI; A03, Hardcopy

Access to information is fundamental to so much of modern life. This phrase perhaps best describes the importance of local, national and global information and communications technology (ICT) tools and networks in our daily lives. It also can enable Indonesia to accelerate its development and improve its competitive advantage in the global marketplace. Such an enabling ICT environment can be achieved by implementing a set of shared common goals. Access to information can empower small and large businesses alike to face marketplace competition.
NTIS
Indonesia; Internets; Commerce

20040020101 Agency for International Development, Washington, DC, USA
Conditions of Internet Kiosks in Medan, Makassar, Bandung, Jogja and Jakart Suburban. A Survey Report in Both English and Indonesian
Utoyo, K. B.; Sulaiman, I. F.; Aug. 2003; 62 pp.
Report No.(s): PB2004-103010; No Copyright; Avail: CASI; A04, Hardcopy

According to a recent AC Nielsen research, there is an upsurge in the demand for accessing the cyberspace from Internet kiosks or cafes (locally known as 'Warung Internet' or Warnet) in Indonesia. In the year 2000, Warnets were used by 50% of the total users but by 2003, it is estimated that the figure has risen to 64%. Such an increase have been attributed to the decline of direct access from households from 13% in 2000 to only 6% of the total Internet users in 2003 with a corresponding decline in Internet access from offices from 42% in 2000 to 38% in 2003. Such major change in the composition of Internet user can have two major implications. Firstly, on the positive side, with the increase of the number of Warnet users, Warnet entrepreneurs are earning greater disposable income and re-invest some of their earnings so that some improvements of their services can be expected Secondly, on the negative side, the rapid expansion of Warnets in Indonesia has some dire implications which must be taken seriously as they can threaten and undermine not only e-commerce but also security at large not just in Indonesia but also in the rest of the world.
NTIS
Indonesia; Internets; Surveys

20040020102 Agency for International Development, Washington, DC, USA
Is Telkom-Flexi the New Telkom-Instan: Can it Level the Playing Field and Bridge the Digital Divide
Sulaiman, I. F.; Sep. 18, 2003; 14 pp.
Report No.(s): PB2004-103011; No Copyright; Avail: CASI; A03, Hardcopy

During the first three quarters of 2003, the issues surrounding the new product Telkom Flexi ('TF' or 'FLEXI') suggest that it is increasingly posing a serious threat to the competitiveness of non-incumbent telecommunication operators in

Indonesia. FLEXI appears to not only aggravate further the already unleveled playing field but also brushes aside the existing regulation and warnings from the regulator. There is every indication that the FLEXI rollout planned for urban areas is aimed mainly as a complementary product. Some announced pricing schemes for the Internet access are clearly giving FLEXI an added advantage and the rules governing local traffic will determine future competition. If this status quo is allowed to prevail, the likely outcome may not too different when Telkom introduced its Internet access 'Telkomnet Instan' (or T-instan) in 1999, in that such a new product will seriously affect its competitors. In the cellular market, FLEXI could rapidly reduce the market share of other GSM operators, particularly in Greater Jakarta and Surabaya Metropolitan areas. In the Internet access market, FLEXI could exert further pressure on the remaining ISP operators who have already lost much of their market shares as a result of T-instan. Any failure to thwart it must mean that Telkom will increase its dominance over its GSM competitor further as well as threaten some ISP competing services. The real tragedy is that Indonesia's tele-density will not be significantly increased either, contrary to the regulator's expressed wishes in ironically allowing the introduction of FLEXI.
NTIS
Indonesia; Technology Transfer; Telecommunication

20040020103 Agency for International Development, Washington, DC, USA
Why are Some e-Government Programs More Successful than Others. The Relevance of Performance Evaluations to Regional e-Government Preparations in Indonesia
Sulaiman, I. F.; May 07, 2003; 14 pp.
Report No.(s): PB2004-103012; No Copyright; Avail: CASI; A03, Hardcopy

There are many obstacles local or national governments may encounter along the e-government path. And to know how far you have traveled along the path you need performance evaluation-the milestone markers. Because using information communications technology ('ICT') to deploy e-government is Initially a costly and lengthy process, governments need to be aware of the goals, the pitfalls and learn experience of others before embarking on this journey. By promoting the larger goals of society and making government more responsive to its citizens-creating a citizen-centered, 'user-friendly' government-e-government can be a powerful tool in improving the quality of life. The US Government has been pursuing the objective of exchange of electronic documents at all levels of public administration and making available public sector services in the Internet environment as a worthwhile goal.
NTIS
Indonesia; Technology Transfer; Electron Energy; Energy Levels; Performance Tests

20040021364 NASA Ames Research Center, Moffett Field, CA, USA
Simplifying a Lifted Plan Graph Using Domain Splitting
Petrie, Karen; Pang, Wanlin; Golden, Keith; Frank, Jeremy; [2002]; 6 pp.; In English; 14th International Conference on Automated Planning and Scheduling, June 2004, Canada; Original contains black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

Image process planning, lifted plan graph and induced CSP splitting states and actions in lifted plan graph enables improved arc consistency in underlying CSP.
Author
Consistency; Simplification; Graphs (Charts); Domains

20040031429 Research and Technology Organization, Neuilly-sur-Seine, France
Simulation of and for Military Decision Making
June 2003; 168 pp.; In English; Simulation of and for Military Decision Making, 15-16 Oct. 2001, Rome, Italy; See also 20040031430 - 20040031444; Original contains color illustrations
Report No.(s): RTO-EN-017; AC/323(SAS-032)TP/26; Copyright; Avail: CASI; C01, CD-ROM; A08, Hardcopy

Modelling and Simulation (M&S) can be used as a tool to support the development and operational use of new military concepts and systems for the future. M&S also help to better train and use existing forces and equipment and to improve operations in the new environment. The simulation of the Military Decision Process is a critical part in the use of M&S for this purpose. Computer Generated Forces (CGF) and Human Behaviour Representation (HBR) can be used as a tool to support the development and operational use of new concepts and systems for the future. They also help to better train and use existing forces and equipment and to improve operations in the new environment. Emerging technologies will have a great impact on the implementation and on the military use of such CGF and HBR in the future. It offers support in different application areas; examples are thinking automated opposing forces (training and exercise), closed simulation systems (defence planning),

Decision Support Tools (support to operations), and virtual environments (acquisition). The use of such systems will have great military implications and will save money and personnel in the future. The aim of this Lecture Series is to provide an overview on the use of M&S of the Military Decision Process in the different application areas of training and exercising, support to operations, analysis and acquisition, and to provide a review of the state-of-the-art in the respective areas.
Author
Military Operations; Computerized Simulation; Command and Control

20040031433 Institute for Defense Analyses, Alexandria, VA, USA
Computer Generated Forces: Layout and Architecture
Jacobs, Robert; Brooks, Peter; Simulation of and for Military Decision Making; June 2003, pp. 8-1; In English; See also 20040031429; Copyright; Avail: CASI; A04, Hardcopy

No abstract available

Computer Techniques; Armed Forces

20040031434 Old Dominion Univ., Suffolk, VA, USA
Computer Generated Forces: Integration into the Operational Environment
Tolk, Andreas; Simulation of and for Military Decision Making; June 2003, pp. 9-1 - 9-18; In English; See also 20040031429; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

In closed combat simulation systems CGF modules are most often used to generate orders in given or perceived situations. They can be interpreted as command entities getting information about the battlefield and generating the respective orders, information messages, and requests for the superior command, their neighbors, and the subordinate command entities or units. In order to facilitate the reuse of CGF-modules as the reuse of observations of the real world of Command and Control, it is highly recommended to use a reference data model. This reference data model should address the information exchange requirements (IER) on the battlefield being used by real decision makers. A matured data model being developed by analyzing the IER of NATO and national military operations on all levels of command by data modeling experts from several NATO countries is the data model of the Army/Allied Tactical Command and Control Information System (ATCCIS), now becoming a NATO STANAG ADatP-32 as the Land C2 Information Exchange Data Model (LC2IEDM). This data model also is used for data management by the NATO Data Administration Group (NDAG) as well as by some national data management agencies. This paper gives the architecture, shows benefits and limitations, and introduces a way for real reuse of CGF modules within several federations. The High Level Architecture (HLA) builds the technical framework.
Author
Military Operations; Computer Techniques; Information Systems

20040031438 Institute for Defense Analyses, Alexandria, VA, USA
Computer Generated Forces: Future Needs
Jacobs, Robert; Brooks, Peter; Simulation of and for Military Decision Making; June 2003, pp. 10-1; In English; See also 20040031429; Copyright; Avail: CASI; A03, Hardcopy

No abstract available

Military Operations; Technology Assessment; Computer Techniques

20040031590 Lawrence Livermore National Lab., Livermore, CA
Numerical Errors: Reliable Numerical Simulations
Jameson, L.; Jul. 27, 2001; 14 pp.; In English
Report No.(s): DE2003-15004694; UCRL-JC-145054; No Copyright; Avail: Department of Energy Information Bridge

Understanding numerical errors in long calculations is a very subtle science and is critical to understanding the reliability of the final answer. We will carefully examine the accumulation of numerical errors over time and discuss how these can lead to reliability estimates. The primary focus will be on a newly uncovered understanding of mode resolution which is at the heart of all numerical computations.
NTIS
Numerical Analysis; Errors; Computerized Simulation; Reliability Analysis

60
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*.

20040027562 Mountain State Information Systems, Inc., Elkins, WV, USA
Completing the Loop: Linking Software Features to Failures
January 15, 2004; 4 pp.; In English
Contract(s)/Grant(s): NAS5-03090; No Copyright; Avail: CASI; A01, Hardcopy

The PITS Modification Script has been under development. Testing, debugging, and optimization of the script are in progress. MSIS has begun population of ODC values from historic issue data. Design of the Linker Tool is also continuing. The quarterly review meeting held on December 17,2003, allowed for a venue to discuss installing the PITS Modification Script to the production version of PITS upon completion and incorporation of ODC into an IV&V project s issue tracking process. Feedback from NASA was positive although any global implementation will likely be timed to coordinate with other activities such as establishment of an IV&V Work Breakdown Structure.
Author
Computer Systems Performance; System Failures

20040027735 Connecticut Univ., Storrs, CT, USA
A 10-Bit 10 GSPS Optical ADC for Radar Signal Processing
Donkor, Eric; Nov. 2003; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-1-0515; Proj-762D
Report No.(s): AD-A419738; AFRL-SN-RS-TR-2003-271; No Copyright; Avail: CASI; A03, Hardcopy

Next generation radar systems for tactical aircraft will need to improve aircraft survivability, allow for cooperative multistatic mode of operation, provide efficient anti-jamming features, and compensate for motion- induced clutter. Faster digital processors are required, in particular analog-to-digital converters (ADCs) for digital processing of X-band radar systems. This effort investigated and demonstrated an optoelectronic scheme for a high-speed optical ADC. The system was designed with the following objectives in mind: a) maintain the RF signal in the electrical domain throughout the conversion process and eliminate use of bulky optical components; b) low optical power budget (e.g. basic sampling circuit requires 50-60 m optical power); c) direct interface to electronic quantization circuits; and d) compact design. The effort achieved sampling rates of 4 GSPS. The limitation in conversion speed was dictated by the photodiode which had a 3dB-bandwidth of 5GHz. The following tasks were completed: 1) Pspice simulation of sampling circuit; 2) Design implementation and synchronization of the optical clocks needed for a) sampling of incoming RF signals, b) demultiplexing the sampled signals to lower data rate for electronic quantization; 3) Interface of optical sampling circuit with National Instrument LABVIEW data acquisition system for quantization of sampled signals to produce an 8-bit gray code digital output; and 4) Optical sampling circuit optimization resulting in a 50% reduction in optical power consumption.
DTIC
Signal Processing; Radio Signals; Analog to Digital Converters

20040027828 Massachusetts Inst. of Tech., Lexington, MA
Preliminary Design Review: PCA Integrated Radar- Tracker Application
Lebak, J. M.; Apr. 9, 2002; 10 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A419901; PR-PCA-IRT-1; ESC-TR-2003-069; No Copyright; Avail: CASI; A02, Hardcopy

The DARPA Polymorphous Computing Architecture (PCA) program is building advanced computer architectures that can reorganize their computation and communication structure to achieve better overall application performance. As part of the PCA program, MIT Lincoln Laboratory has been requested to provide examples of defense-oriented applications that will challenge the candidate architectures. This report presents a high-level description of an example application involving a ground moving target indicator (GMTI) radar application and a feature-aided tracker application that work together.
DTIC
Architecture (Computers); Moving Target Indicators

61
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.

20040016315 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Passive Superconducting Shielding: Experimental Results and Computer Models
Warner, B. A.; Kamiya, K.; September 2003; 7 pp.; In English; Cryogenic Engineering Conference, 22-26 Sep. 2003, Anchorage, AK, USA; Copyright; Avail: CASI; A02, Hardcopy

Passive superconducting shielding for magnetic refrigerators has advantages over active shielding and passive ferromagnetic shielding in that it is lightweight and easy to construct. However, it is not as easy to model and does not fail gracefully. Failure of a passive superconducting shield may lead to persistent flux and persistent currents. Unfortunately, modeling software for superconducting materials is not as easily available as is software for simple coils or for ferromagnetic materials. This paper will discuss ways of using available software to model passive superconducting shielding.
Author
Computerized Simulation; Ferromagnetic Materials; Superconductors (Materials); Shielding

20040016320 D. N. American, Inc., USA
FY 2002 Report on Software Visualization Techniques for IV and V
Fotta, Michael E.; [2002]; 1 pp.; In English
Contract(s)/Grant(s): CSIP2002-19; No Copyright; Avail: Other Sources; Abstract Only

One of the major challenges software engineers often face in performing IV&V is developing an understanding of a system created by a development team they have not been part of. As budgets shrink and software increases in complexity, this challenge will become even greater as these software engineers face increased time and resource constraints. This research will determine which current aspects of providing this understanding (e.g., code inspections, use of control graphs, use of adjacency matrices, requirements traceability) are critical to the performing IV&V and amenable to visualization techniques. We will then develop state-of-the-art software visualization techniques to facilitate the use of these aspects to understand software and perform IV&V.
Author
Program Verification (Computers); Software Engineering; Computer Techniques; Scientific Visualization

20040016341 bd Systems, Inc., Huntsville, AL, USA
Software Engineering Improvement Activities/Plan
[2003]; 2 pp.; In English
Contract(s)/Grant(s): NAS8-00114; NASA Order H-32848-D; No Copyright; Avail: CASI; A01, Hardcopy

bd Systems personnel accomplished the technical responsibilities for this reporting period, as planned. A close working relationship was maintained with personnel of the MSFC Avionics Department Software Group (ED14). Work accomplishments included development, evaluation, and enhancement of a software cost model, performing literature search and evaluation of software tools available for code analysis and requirements analysis, and participating in other relevant software engineering activities. Monthly reports were submitted. This support was provided to the Flight Software Group/ED 1 4 in accomplishing the software engineering improvement engineering activities of the Marshall Space Flight Center (MSFC) Software Engineering Improvement Plan.
Derived from text
Applications Programs (Computers); Computer Programs; Flight Control; Mathematical Models

20040016444 Spectral Sciences, Inc., USA
Software for Simulation of Hyperspectral Images
Richtsmeier, Steven C.; Singer-Berk, Alexander; Bernstein, Lawrence S.; October 31, 2002; 2 pp.; In English
Report No.(s): NASA/NP-2003-09-00039-SSC; No Copyright; Avail: Other Sources; Abstract Only

A package of software generates simulated hyperspectral images for use in validating algorithms that generate estimates of Earth-surface spectral reflectance from hyperspectral images acquired by airborne and spaceborne instruments. This software is based on a direct simulation Monte Carlo approach for modeling three-dimensional atmospheric radiative transport as well as surfaces characterized by spatially inhomogeneous bidirectional reflectance distribution functions. In this approach,

'ground truth' is accurately known through input specification of surface and atmospheric properties, and it is practical to consider wide variations of these properties. The software can treat both land and ocean surfaces and the effects of finite clouds with surface shadowing. The spectral/spatial data cubes computed by use of this software can serve both as a substitute for and a supplement to field validation data.
Author
Computer Programs; Computerized Simulation; Multispectral Photography

20040016450 University of Southern Mississippi, MS, USA
Intelligent Software for System Design and Documentation
May 08, 2002; 3 pp.; In English
Contract(s)/Grant(s): NCC13-01003
Report No.(s): NASA/NP-2002-05-00021-SSC; No Copyright; Avail: CASI; A01, Hardcopy

In an effort to develop a real-time, on-line database system that tracks documentation changes in NASA's propulsion test facilities, engineers at Stennis Space Center teamed with ECT International of Brookfield, WI, through the NASA Dual-Use Development Program to create the External Data Program and Hyperlink Add-on Modules for the promis*e software. Promis*e is ECT's top-of-the-line intelligent software for control system design and documentation. With promis*e the user can make use of the automated design process to quickly generate control system schematics, panel layouts, bills of material, wire lists, terminal plans and more. NASA and its testing contractors currently use promis*e to create the drawings and schematics at the E2 Cell 2 test stand located at Stennis Space Center.
Author
Computer Programs; Control Systems Design; Data Bases

20040020106 Colorado Univ., Boulder, CO, USA
Globe Teachers Guide and Photographic Data on the Web
Kowal, Dan; January 26, 2004; 1 pp.; In English
Contract(s)/Grant(s): NAG5-12654; No Copyright; Avail: CASI; A01, Hardcopy

The task of managing the GLOBE Online Teacher s Guide during this time period focused on transforming the technology behind the delivery system of this document. The web application transformed from a flat file retrieval system to a dynamic database access approach. The new methodology utilizes Java Server Pages (JSP) on the front-end and an Oracle relational database on the backend. This new approach allows users of the web site, mainly teachers, to access content efficiently by grade level and/or by investigation or educational concept area. Moreover, teachers can gain easier access to data sheets and lab and field guides. The new online guide also included updated content for all GLOBE protocols. The GLOBE web management team was given documentation for maintaining the new application. Instructions for modifying the JSP templates and managing database content were included in this document. It was delivered to the team by the end of October, 2003. The National Geophysical Data Center (NGDC) continued to manage the school study site photos on the GLOBE website. 333 study site photo images were added to the GLOBE database and posted on the web during this same time period for 64 schools. Documentation for processing study site photos was also delivered to the new GLOBE web management team. Lastly, assistance was provided in transferring reference applications such as the Cloud and LandSat quizzes and Earth Systems Online Poster from NGDC servers to GLOBE servers along with documentation for maintaining these applications.
Author
Protocol (Computers); Computer Programs; Java (Programming Language); Geophysics; Data Bases

20040021407 Lockheed Martin Corp., Bay Saint Louis, MS, USA
Software for Preprocessing Data From Rocket-Engine Tests
Cheng, Chiu-Fu; June 03, 2002; 2 pp.; In English
Report No.(s): NASA/NP-2002-06-00023-SSC; No Copyright; Avail: CASI; A01, Hardcopy

Three computer programs have been written to preprocess digitized outputs of sensors during rocket-engine tests at Stennis Space Center (SSC). The programs apply exclusively to the SSC 'E' test-stand complex and utilize the SSC file format. The programs are the following: 1) Engineering Units Generator (EUGEN) converts sensor-output-measurement data to engineering units. The inputs to EUGEN are raw binary test-data files, which include the voltage data, a list identifying the data channels, and time codes. EUGEN effects conversion by use of a file that contains calibration coefficients for each channel; 2) QUICKLOOK enables immediate viewing of a few selected channels of data, in contradistinction to viewing only after post test processing (which can take 30 minutes to several hours depending on the number of channels and other test

parameters) of data from all channels. QUICKLOOK converts the selected data into a form in which they can be plotted in engineering units by use of Winplot (a free graphing program written by Rick Paris); and 3) EUPLOT provides a quick means for looking at data files generated by EUGEN without the necessity of relying on the PVWAVE based plotting software.
Author
Computer Programs; Engine Tests; Preprocessing; Rocket Engines; Sensors

20040027494 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications
Davis, George; Cary, Everett; Higinbotham, John; Burns, Richard; Hogie, Keith; Hallahan, Francis; [2003]; 4 pp.; In English; Space Internet Workshop, 4-5 Jun. 2003, Cleveland, OH, USA; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy

The paper will provide an overview of the web-based distributed simulation software system developed for end-to-end, multi-spacecraft mission design, analysis, and test at the NASA Goddard Space Flight Center (GSFC). This software system was developed for an internal research and development (IR&D) activity at GSFC called the Distributed Space Systems (DSS) Distributed Synthesis Environment (DSE). The long-term goal of the DSS-DSE is to integrate existing GSFC stand-alone test beds, models, and simulation systems to create a 'hands on', end-to-end simulation environment for mission design, trade studies and simulations. The short-term goal of the DSE was therefore to develop the system architecture, and then to prototype the core software simulation capability based on a distributed computing approach, with demonstrations of some key capabilities by the end of Fiscal Year 2002 (FY02). To achieve the DSS-DSE IR&D objective, the team adopted a reference model and mission upon which FY02 capabilities were developed. The software was prototyped according to the reference model, and demonstrations were conducted for the reference mission to validate interfaces, concepts, etc. The reference model, illustrated in Fig. 1, included both space and ground elements, with functional capabilities such as spacecraft dynamics and control, science data collection, space-to-space and space-to-ground communications, mission operations, science operations, and data processing, archival and distribution addressed.
Derived from text
Computer Programs; Real Time Operation; Protocol (Computers); Spacecraft Control; Computerized Simulation; Aerospace Systems; Data Acquisition

20040027535 Institute for Scientific Research, MA, USA
Development of Methodologies for IV and V of Neural Networks
Taylor, Brian; Darrah, Marjorie; [2003]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-12069; Copyright; Avail: Other Sources; Abstract Only

Non-deterministic systems often rely upon neural network (NN) technology to 'lean' to manage flight systems under controlled conditions using carefully chosen training sets. How can these adaptive systems be certified to ensure that they will become increasingly efficient and behave appropriately in real-time situations? The bulk of Independent Verification and Validation (IV&V) research of non-deterministic software control systems such as Adaptive Flight Controllers (AFC's) addresses NNs in well-behaved and constrained environments such as simulations and strict process control. However, neither substantive research, nor effective IV&V techniques have been found to address AFC's learning in real-time and adapting to live flight conditions. Adaptive flight control systems offer good extensibility into commercial aviation as well as military aviation and transportation. Consequently, this area of IV&V represents an area of growing interest and urgency. ISR proposes to further the current body of knowledge to meet two objectives: Research the current IV&V methods and assess where these methods may be applied toward a methodology for the V&V of Neural Network; and identify effective methods for IV&V of NNs that learn in real-time, including developing a prototype test bed for IV&V of AFC's. Currently. no practical method exists. lSR will meet these objectives through the tasks identified and described below. First, ISR will conduct a literature review of current IV&V technology. TO do this, ISR will collect the existing body of research on IV&V of non-deterministic systems and neural network. ISR will also develop the framework for disseminating this information through specialized training. This effort will focus on developing NASA's capability to conduct IV&V of neural network systems and to provide training to meet the increasing need for IV&V expertise in such systems.
Author
Neural Nets; Proving; Flight Conditions; Flight Control; Adaptive Control; Computer Programs

20040027537 West Virginia Univ., WV, USA
Integrating Formal Methods and Testing 2002
Cukic, Bojan; [2002]; 1 pp.; In English
Contract(s)/Grant(s): USIP01-02; USIP02-02; No Copyright; Avail: Other Sources; Abstract Only

Traditionally, qualitative program verification methodologies and program testing are studied in separate research communities. None of them alone is powerful and practical enough to provide sufficient confidence in ultra-high reliability assessment when used exclusively. Significant advances can be made by accounting not only tho formal verification and program testing. but also the impact of many other standard V&V techniques, in a unified software reliability assessment framework. The first year of this research resulted in the statistical framework that, given the assumptions on the success of the qualitative V&V and QA procedures, significantly reduces the amount of testing needed to confidently assess reliability at so-called high and ultra-high levels (10-4 or higher). The coming years shall address the methodologies to realistically estimate the impacts of various V&V techniques to system reliability and include the impact of operational risk to reliability assessment. Combine formal correctness verification, process and product metrics, and other standard qualitative software assurance methods with statistical testing with the aim of gaining higher confidence in software reliability assessment for high-assurance applications. B) Quantify the impact of these methods on software reliability. C) Demonstrate that accounting for the effectiveness of these methods reduces the number of tests needed to attain certain confidence level. D) Quantify and justify the reliability estimate for systems developed using various methods.
Author
Assessments; Confidence Limits; Program Verification (Computers); Proving

20040027582 NASA Johnson Space Center, Houston, TX, USA
Interactive Software Fault Analysis Tool for Operational Anomaly Resolution
Chen, Ken; [2002]; 1 pp.; In English; OSMA Software Assurance Symposium 2002, 4-6 Sep. 2002, Berkley Springs, WV, USA
Contract(s)/Grant(s): CSIP-2002-42; No Copyright; Avail: Other Sources; Abstract Only

Resolving software operational anomalies frequently requires a significant amount of resources for software troubleshooting activities. The time required to identify a root cause of the anomaly in the software may lead to significant timeline impacts and in some cases, may extend to compromise of mission and safety objectives. An integrated tool that supports software fault analysis based on the observed operational effects of an anomaly could significantly reduce the time required to resolve operational anomalies; increase confidence for the proposed solution; identify software paths to be re-verified during regression testing; and, as a secondary product of the analysis, identify safety critical software paths.
Author
Anomalies; Computer Programs; Critical Path Method

20040027594 Army Research Inst. for the Behavioral and Social Sciences, Fort Benning, GA, USA
Training Effectiveness Evaluation of the Full Spectrum Command Game
Beal, Scott A.; Christ, Richard E.; Jan. 2004; 70 pp.; In English
Contract(s)/Grant(s): Proj-20262785A790
Report No.(s): AD-A419670; ARI-TR-1140; No Copyright; Avail: CASI; A04, Hardcopy

Fifty-four officers in the Infantry Captains Career Course at Fort Benning, Georgia, participated in a training effectiveness evaluation of a video game named Full Spectrum Command (FSC). Half were assigned to play FSC and participate in normal course work for commanding a light Infantry company in urban offensive operations; the other half did only the normal course work. Pre-FSC measures were for military experience, general cognitive ability, and decision- making style. A questionnaire administered to officers who played FSC documented their sense of personal involvement in the FSC environment, their perception of the training value of the game, and their opinions of FSC strengths and weaknesses. Officers in both groups were assessed individually for the adaptiveness of their decision-making behavior as the commander of a light Infantry company during a tactical exercise using the Janus simulation. Shortcomings in experimental procedures confounded between-groups comparisons for adaptive decision-making behaviors, but other results suggest FSC can provide tactical experiences with potential training value. Prior military experience was related to personal involvement with FSC, perceived training value of FSC, adaptive decision-making behavior in Janus, and decision- making style. Officers who played FSC identified its strengths and changes desired in future versions of the game.
DTIC
Virtual Reality; Mental Performance; Training Evaluation; Simulation

20040027701
Streams-C; Sc2 C-to-FPGA Compiler
Gokhale, Maya; Frigo, Janette; Ahrens, Christine; Popkin-Paine, Marc; Stone, Janice M.; Sep. 2002; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419860; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs from presentation of a compiler which synthesizes hardware circuits that run on reconfigurable hardware from parallel C programs.
DTIC
Compilers; Field-Programmable Gate Arrays; Circuits

20040027709 Massachusetts Inst. of Tech., Lexington, MA
Monolithic Compiler Experiments Using C++ Expression Templates
Mullin, Lenore R.; Rutledge, Edward; Bond, Robert; Sep. 2002; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A419866; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs from presentation of monolithic compiler experiments using C++ programming language templates.
DTIC
Compilers; Templates

20040027717
Streaming and Dynamic Compilers for High Performance Embedded Computing
Mattson, Peter; Springer, Jonathan; Garrett, Charles; Lethin, Richard; Sep. 2002; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419863; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs from presentation on the use of streaming and dynamic compilers for high performance embedded computing.
DTIC
Compilers; Embedding

20040027731 Georgia Inst. of Tech., Atlanta, GA
Design Space Exploration and Optimization of Embedded Cache Systems via a Compiler
Rabbah, Rodric M.; Palem, Krishna V.; Sep. 2002; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33165-99-1-1499; F30602-00-2-0564
Report No.(s): AD-A419871; No Copyright; Avail: CASI; A01, Hardcopy
Presentation on design space exploration and optimization of embedded cache systems via a compiler.
DTIC
Compilers; Design Optimization; Space Exploration

20040027737 Utah Univ., Salt Lake City, UT
A Java-Based Active Network Operating System (JANOS)
Lepreau, Jay; Nov. 2003; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0503; DARPA ORDER H136; Proj-H136
Report No.(s): AD-A419761; AFRL-IF-RS-TR-2003-259; No Copyright; Avail: CASI; A03, Hardcopy
The JANOS projects' primary objective was to develop a principle local operating system for active network nodes. The operating system is oriented toward executing untrusted Java bytecode, primarily for management and control.
DTIC
Java (Programming Language); Operating Systems (Computers)

20040027752
A New Approach to Blind Channel Identification for OFDM Systems
Ghogho, Mounir; Sep. 2003; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N62558-02-M-6387
Report No.(s): AD-A419876; No Copyright; Avail: CASI; A03, Hardcopy

Orthogonal frequency division multiplexing (OFDM) is, with substantial progress in digital signal processing, becoming an important part of the telecommunications arena. The most appealing feature of OFDM is the simplicity of the receiver design due to the efficiency with which OFDM can cope with the effects of frequency-selective multipath channels. Here, we address the problem of channel estimation for OFDM systems. Exploiting receive antenna diversity, a second-order statistics-based (SOS) blind technique is proposed. Our method differs from the existing SOS-based techniques in that channel estimation is carried out using the frequency domain (i.e., post-FFT) signals whereas existing methods use the time domain signals (i.e., pre-FFT). In the proposed method, channel identifiability is guaranteed regardless of the channels zeros locations, so long as any roots common to all the diversity channels are on the unit circle. Only short data records are required to achieve good performance. For PSK transmission, this method enables channel estimation even from a single OFDM symbol at high SNR. Further, when only a small number of subcarriers can be used for channel estimation because of computational complexity, we determine the optimal set of subcarriers in terms of estimation accuracy.
DTIC
Signal Processing; Digital Systems; Telecommunication

20040027757 Northeastern Univ., Boston, MA
A Library of Parameterized Hardware Modules for Floating Point Arithmetic and Its Use
Leeser, Miriam; Belanovic, Pavle; Sep. 2002; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419883; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs on presentation of parameterized hardware modules for floating point arithmetic and its uses.
DTIC
Floating Point Arithmetic; Modules

20040027777
Hybrid QR Factorization Algorithm for High Performance Computing Architectures
Vouras, Peter; Meyer, G. L.; Sep. 2002; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419884; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs from presentation on Hybrid QR factorization algorithms for high performance computer architectures.
DTIC
Architecture (Computers); Algorithms; Factorization

20040027778 Lockheed Sanders, Inc., Nashua, NH
Embedded High Performance Scalable Computing Systems
Ngo, David; Nov. 2003; 80 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-95-2-0013; Proj-C201
Report No.(s): AD-A419801; AFRL-SN-RS-TR-2003-272; No Copyright; Avail: CASI; A05, Hardcopy
The Embedded High Performance Scalable Computing Systems (EHPSCS) program is a cooperative agreement between Sanders, A Lockheed Martin Company and DARPA that ran for three years, from Apr 1995 - Apr 1998. The focus of the EHPSCS research program was on the development of a highly integrated, scalable multiprocessing architecture based on leading COTS technologies for environmentally constrained applications. The program developed an 11 GFLOPS embedded processor hardware/software testbed and software development tools to facilitate technology transfer, an advanced packaging insertion approach, and a second generation microarchitecture - the ReConfigurable Transport Engine.
DTIC
Computer Aided Design; Software Development Tools; Multiprocessing (Computers); Embedding

20040027797 Nippon Telegraph and Telephone Public Corp., Japan
Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks
Takahashi, Ryo; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 6-11; In English; See also 20040027787; Copyright; Avail: Other Sources
The ultimate goal is to construct a large-capacity photonic packet router that can process high-speed optical packets as needed. To deal with the explosive growth of IP traffic, it is essential that link capacity be increased by wavelength division multiplexing (WDM) while simultaneously increasing the packet transfer speed at nodes. That is why R&D in large-capacity photonic networks using optical technology has become quite active. Of particular interest here are optical packet-switched (OPS) networks that we expect to be the wave of the future. The key elements of such a network are large-capacity photonic

packet routers. Their development, however, means solving a number of technical problems, such as clock extraction from asynchronous-burst optical packets, high- speed optical label processing, large-capacity optical buffer memories, and bit-rate conversion. We certainly have a difficult journey ahead of us.
Derived from text
Wavelength Division Multiplexing; High Speed; Packets (Communication); Switching; Synchronism; Computer Programs

20040027804
Multidimensional Performance Modeling for Advanced Embedded Signal Processors
Stebnisky, Michael; Hein, Carl; Sep. 2002; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419886; No Copyright; Avail: CASI; A01, Hardcopy
Presentation of multidimensional performance modeling for advanced embedded signal processors.
DTIC
Architecture (Computers); Performance Prediction; Embedding

20040027840 California Univ., Irvine, CA
PROTEUS: Assessment and Adaptation Through Dynamic Architecture Technology
Nov. 2003; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0607; ARPA ORDER-K510; Proj-DASA
Report No.(s): AD-A419893; AFRL-IF-RS-TR-2003-273; No Copyright; Avail: CASI; A03, Hardcopy
The Proteus project at the University of California, Irvine (UCI) has created means for effective software reuse and dynamic application adaptation. The project leveraged core ideas in loosely coupled decentralized software architectures and provided a foundation that advanced state-of- art architecture-based application engineering. Technology based on this architecture-centric approach for modeling, design, assessment, implementation, validation, configuration management, and run-time evolution of complex software systems was evaluated by DARPA and non- DARPA technology users.
DTIC
Complex Systems; Proteus; Software Reuse

20040027849 Naval Postgraduate School, Monterey, CA, USA
Reduction of Total Ownership Cost
Boudreau, Michael W.; Naegle, Brad R.; Sep. 30, 2003; 106 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419826; NPS-GSBPP-03-004; No Copyright; Avail: CASI; A06, Hardcopy
Total Ownership Cost (TOC) is the current initiative to manage costs over the entire life cycle of a weapon system. There are several major categories of costs that contribute to Total Ownership Cost but the principal categories are (1) R&D, (2) Production, (3) Operating and Support, and (4) Disposal System TOC is the same as Life Cycle Cost (LCC) and has implications for Cost As an Independent Variable (CAIV), cost-performance tradeoffs, affordability, and cost to achieve required operational availability. The Program Manager (PM) is responsible for developing and managing system TOC, with input from key stakeholders, such as the sponsor and users. This paper addresses incentives that can be employed to encourage life cycle cost perspective. It examines the critical issues associated with understanding and implementing the TOC concept and provides recommendations to assist PMs to knowledgeably execute a TOC plan. Metrics necessary to ensure appropriate implementation are explored. Various methods of controlling and reducing TOC are evaluated, including communication among stakeholders, CAIV documentation, tradeoff analysis, Reliability-Centered Maintenance (RCM); Performance-Based Logistics (PBL), Commercial Operations & Support Savings Initiative (COSSI), Earned Value Management System (EVMS), Activity-Based Costing (ABC), Value Engineering, and lessons from R-TOC Pilots.
DTIC
Cost Estimates; Life Cycle Costs; Management Systems

20040027947 Army Research Lab., Aberdeen Proving Ground, MD
Migration of a SEDRIS Application for Dismounted Infantry Simulation
Neiderer, Andrew M.; Jul. 2003; 48 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-3TEDNC
Report No.(s): AD-A419840; ARL-TR-3009; No Copyright; Avail: CASI; A03, Hardcopy
The U.S. Army Research Laboratory Dismounted Infantry Simulator has been updated for Synthetic Environment Data Representation and Interchange Specification (SEDRIS) 3.1. 1 transmittal generation. Specifically, the SEDRIS 3. 0.3

specification. SEDRIS defines a comprehensive standard for the representation and distribution of environmental data. Our initial effort only involved two of the five components of the SEDRIS technology the Data Representation Model and the Application Programming Interface. The other three components will be added directly, if needed, since translation would not be necessary. It is our intent to not only present a unique solution but to also identify potential areas of concern for a general 3.0.3 103.1.1 migration.
DTIC
Computerized Simulation; Translating; Migration

20040027991 Stanford Univ., Stanford, CA, USA
A Domain Decomposition Parallelization of the Fast Marching Method
Herrmann, M.; Center for Turbulence Research Annual Research Briefs 2003; [2003], pp. 213-225; In English
Contract(s)/Grant(s): NCC2-1371; No Copyright; Avail: CASI; A03, Hardcopy

In this paper, the first domain decomposition parallelization of the Fast Marching Method for level sets has been presented. Parallel speedup has been demonstrated in both the optimal and non-optimal domain decomposition case. The parallel performance of the proposed method is strongly dependent on load balancing separately the number of nodes on each side of the interface. A load imbalance of nodes on either side of the domain leads to an increase in communication and rollback operations. Furthermore, the amount of inter-domain communication can be reduced by aligning the inter-domain boundaries with the interface normal vectors. In the case of optimal load balancing and aligned inter-domain boundaries, the proposed parallel FMM algorithm is highly efficient, reaching efficiency factors of up to 0.98. Future work will focus on the extension of the proposed parallel algorithm to higher order accuracy. Also, to further enhance parallel performance, the coupling of the domain decomposition parallelization to the G(sub 0)-based parallelization will be investigated.
Author
Models; Decomposition; Parallel Processing (Computers)

20040028044 Brigham Young Univ., Provo, UT
Unified Debug Environment for Adaptive Computing Systems
Hutchings, Brad; Nelson, Brent; Wirthlin, Mike; Wilde, Doran; Sep. 2003; 81 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-99-C-1502; Proj-ARPI
Report No.(s): AD-A419973; AFRL-IF-WP-TR-2003-1545; No Copyright; Avail: CASI; A05, Hardcopy

Adaptive computing systems (ACS) are hardware systems based around FPGA technology. Historically, design and debug tools for such systems have been based on ASIC technology. However, FPGA technology provides features which suggest different approaches be used for debug. For example, readback is a feature available in many FPGA devices which provides the ability to query an executing FPGA device for its entire internal state, providing unprecedented visibility into the executing design. The central element of the debug environment developed in this work is a debug services module (DSM). It provides a unified simulation/hardware execution debug environment which allows the user to debug the executing hardware in the context of the original design environment. This means signal values in the executing hardware can be viewed and manipulated using their original signal names from the design source. In addition, the DSM provides the following support for designs running on ACS platforms: checkpointing, multitasking, remote access, and interfacing with external high-level design tools. Finally, the DSM provides support for the automatic synthesis of debug circuitry to enable rapid instrumentation of FPGA designs for debug purposes. This report summarizes the debug system and a number of the experiments completed using it.
DTIC
Adaptation; Checkout; Computer Programming; Application Specific Integrated Circuits

20040030403 California Inst. of Tech., Pasadena, CA
Direct Write Laser Lithography System
Scherer, Axel; Jan. 2002; 7 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0347
Report No.(s): AD-A419981; AFRL-SR-AR-TR-04-0069; No Copyright; Avail: CASI; A02, Hardcopy

The Heidelberg Instruments laser writer was purchased in July 2002, arrived in November 2002, and was fully operational after several months of optimization and hardware troubleshooting in April 2003. At present, this instrument is used for optical beam-writing of UV lithography masks, and will be employed in tandem with a recently purchased MA6/BA6 mask aligner

for rapid prototyping in nanobiotechnology and nanophotonics research at Caltech. It is presently also used for direct-writing of microfluidic replication molding dies, and has enabled the demonstration of the first integrated elastomeric one-way microfluidic valve. It has been successfully applied towards the microfabrication of electrostatic contacts onto optical devices that are back- filled with liquid crystals and electro-optic polymers with the goal of constructing electrically tuneable optical devices.
DTIC
Ultraviolet Radiation; Lithography; Maintenance

20040030453 Physics and Electronics Lab. TNO, The Hague, Netherlands, Prins Maurits Lab. TNO, Rijswijk, Netherlands
Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations
Bakema, G. H.; Barbier, R. R.; Cable, D. R. M.; Kamstra, M.; Knijnenburg, S. G.; Otter, H.; Smeenk, B. J. E.; vanSon-de-Waard, E. N.; March 2003; 112 pp.; In English
Contract(s)/Grant(s): A01/KL/697; A01/KL/467; TNO Proj. 015.21047; TNO Proj. 014.12922
Report No.(s): TD-2003-0178; FEL-03-A009; PML-2003-A004; Copyright; Avail: Other Sources

Within phase 2 of the Soldier Modernisation Programme (SMP) [l], [2], [3] TNO Defence Research (TNO-DO) has conducted a project in the research area of close combat modelling and analysis with three main objectives: To make the close combat simulation models Close Action Environment (CAEh) and Integrated Unit Simulation System (IUSS) applicable for SMP-research [4]; To carry out two case studies where it is highly desirable that the study results contribute to solving existing problems of the Royal Netherlands Army (RNLA) To establish whether, in addition to close combat simulation, other Operations Research (OR) techniques can contribute to answering SMP-related questions. 151; The case study that has been conducted in 2002 and completed in 2003, addressed a new command & control (C2) component of the dismounted soldier, called the Soldier Digital Assistant (SDA). The case study supports the familiarisation with IUSS which is the main computer simulation tool for effectiveness studies supporting the Soldier Modernisation Programme.
Author
Combat; Computerized Simulation

20040030472 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Technical Design for the TTA Component of the 120mm HE C2 Mortar Ammunition
Bokkers, W. C.; May 2003; 24 pp.; In Dutch
Contract(s)/Grant(s): A01/KL/4UF; TNO Proj. 014.13000
Report No.(s): TD-2002-0223; PML-2003-C48; Copyright; Avail: Other Sources

The Royal Netherlands Army is introducing the AFSIS-Bn (Advanced Fire Support Information System-Batallion (AFSIS-Bn). Part of AFSIS-Bn is a so-called Technical Target Analysis (TTA), which tells the user how many munitions should be delivered in order to reach a certain probability of kill, given operational conditions such as: target size, target type, range, target location error, etc. To facilitate the use of the TTA, a software component was written for the TTA for the 120mm HE, 104 C2 mortar ammunition, which should replace the tables printed on paper used so far. This report describes the design of the software component.
Author
Software Engineering; Computer Programs; Information Systems; Military Technology

20040030522 General Accounting Office, Washington, DC, USA
Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs
Ensign, John; Akaka, Daniel K.; Hefley, Joel; Ortiz, Solomon P.; Curtin, Neal P.; Feb. 2003; 70 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420018; GAO-03-393; No Copyright; Avail: CASI; A04, Hardcopy

The Department of Defense (DOD) spends more than $17 billion annually for military schools that offer nearly 30, 000 military training courses to almost 3 million military personnel and DOD civilians, much of it to maintain readiness. To better meet the diverse defense challenges of the future, DOD is transforming its forces, including its training, for a post-Cold War environment that favors more rapid deployment and responsiveness. DOD's Training Transformation Strategy emphasizes the use of advanced distributed learning (ADL) programs such as Internet-based training as critical to achieving the department's training and overarching transformation goals and to deliver the highest quality training cost effectively anytime, anywhere, whether active duty, reserve, or civilian personnel. ADL is instruction that does not require an instructor's presence; can use

more than one media; and emphasizes the use of reusable content, networks, and learning management systems. The authors initiated this review of DOD's ADL programs, pursuant to their basic legislative responsibilities, because of the importance DOD has placed on them as a key to achieving the department's transformation efforts. Specifically, they addressed the following questions: (1) What are DOD's expectations for the programs? (2) How is DOD managing ADL and what progress is being made in implementing the programs? and (3) What major challenges are affecting the programs' implementation? The authors did not assess the effectiveness of the programs at this time because most are in the early stages of implementation; thus, their objective was to provide a baseline document concerning the focus, status, and magnitude of DOD's ADL programs. In late August and early September 2002, GAO briefed Congress on the results of their work. This report summarizes and updates the major observations provided at those briefings. Army, Navy, and Marine Corps, Air Force, and Joint Staff ADL plans are included.
DTIC
Computer Networks; Deployment; Management Systems; Defense Program; Education

20040031430 Research and Technology Organization, Neuilly-sur-Seine, France
NATO Modelling and Simulation (M and S) Orientation Course
Burrows, G.; Ameyugo, G.; Igarza, J. L.; Simulation of and for Military Decision Making; June 2003, pp. 1-1; In English; See also 20040031429; Copyright; Avail: Other Sources; Paper was not available at the time of publication

The paper discusses the NATO modeling and simulation orientation course.
CASI
North Atlantic Treaty Organization (NATO); Computerized Simulation

20040031431 Institute for Defense Analyses, Alexandria, VA, USA
Computer Assisted Exercises: Background
Jacobs, Robert; Brooks, Peter; Simulation of and for Military Decision Making; June 2003, pp. 2-1; In English; See also 20040031429; Copyright; Avail: CASI; A04, Hardcopy

The paper discusses computer assister exercises.
CASI
Computer Techniques; Computers

20040031439 North Atlantic Treaty Organization, The Hague, Netherlands
Military Operational Requirements for Computer Assisted eXercises (CAX) in NATO
Coppieters, D.; Simulation of and for Military Decision Making; June 2003, pp. 3-1; In English; See also 20040031429; Copyright; Avail: CASI; A03, Hardcopy

Training followed by exercises enables individuals and teams to acquire and perfect knowledge and skills. In addition exercises provide an opportunity to acquire knowledge on strategies for the employment of newly acquired skills. However the ability to measure knowledge and skill acquisition decreases with the complexity of exercises. From a NATO perspective various types of exercises involve one or two echelons of command and focus primarily on the employment of joint and combined forces in a wide spectrum of operations. To exercise effectively a combination of simulation, data, mediation software and personnel is required. It is necessary to invest in the development of a CAX support team to ensure that suitable simulations are selected and that they are employed effectively. Configuring the data required by simulations and the measures of performance that can be collected for exercise control and analysis purposes, can also be supported by this team. Training of augmentation personnel needs to be incorporated in the exercise preparation process. Finally the necessary support needs to be provided to ensure that headquarters can employ their regular command and control systems. C2 capabilities must be initialized with data that is consistent with the exercise setting, they receive must regular stimuli in the form of messages of sensor input and their formal tasking should transmitted as efficiently as possible to the exercising environment.
Author
Military Operations; Computer Techniques; Computerized Simulation

62
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.

20040021322 NASA, Washington, DC, USA
Real-Time Data Processing Onboard Remote Sensor Platforms: Annual Review #3 Data Package
Cook, Sid; Harsanyi, Joe; December 12, 2003; 103 pp.; In English
Report No.(s): MCR-03-502; No Copyright; Avail: CASI; A06, Hardcopy

The current program status reviewed by this viewgraph presentation includes: 1) New Evaluation Results; 2) Algorithm Improvement Investigations; 3) Electronic Hardware Design; 4) Software Hardware Interface Design.
CASI
Real Time Operation; Onboard Data Processing; Remote Sensors

20040027677 Massachusetts Inst. of Tech., Lexington, MA
Preliminary Design Review: Kinematic Tracking for the PCA Integrated Radar-Tracker Application
Coate, W. G.; Feb. 6, 2004; 38 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A419855; PR-PCA-IRT-4; DARPA-ESC-TR-2003-072; No Copyright; Avail: CASI; A03, Hardcopy

A kinematic tracker is a classical tracking system. The idea behind kinematic tracking is to store positions and velocities and then, using this information, associate incoming targets with the stored profiles. Using these new targets, the tracker updates its information about positions and velocities to prepare to do the entire process again when it is given the next set of targets.
DTIC
Kinematics; Radar Tracking; Targets

20040027679 Mitre Corp., Bedford, MA
Trends in HPC and HPEC Convergence
Games, Richard; Sep. 2002; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419858; No Copyright; Avail: CASI; A03, Hardcopy

Viewgraphs from presentation on current trends in the convergence between high performance computing and high performance embedded computing.
DTIC
Architecture (Computers); Convergence; Embedding

20040027769 Kansas Univ., Lawrence, KS, USA
Application of Operating System Concepts to Coordination in Pervasive Sensing and Computing Systems
Davis, Jesse M.; Evans, Joseph B.; Ewy, Benjamin J.; Sanders, Larry M.; Sep. 2002; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419799; No Copyright; Avail: CASI; A01, Hardcopy

Viewgraphs of presentation on the applications of operating systems concepts to coordinate sensing and computing systems.
DTIC
Integrated Circuits; Operating Systems (Computers); Detection

20040027789 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Scalable Content Delivery Technology
Akiba, Junya; Abe, Hirofumi; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 68-72; In English; See also 20040027787; Copyright; Avail: Other Sources

Our scalable content delivery system can deliver content to hundreds or thousands of sites. It uses ‘leaf-to-leaf delivery’, in which content is transferred between terminals, and ‘on-the-fly transfer’, in which content is forwarded while it is being

received, to achieve high-speed and reliable content delivery to a large number os sites, which is difficult with conventional content delivery technology.
Author
Operating Systems (Computers); Technology Utilization; Computer Networks; Computer Systems Programs

20040027838 University of Southern California, Marina del Rey, CA
System Level Applications of Adaptive Computing (SLAAC)
Parker, Robert; Schott, Brian; French, Matt; Riley, Ronald; Hutchings, Brad; Nov. 2003; 621 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0220; Proj-D002
Report No.(s): AD-A419779; AFRL-IF-RS-TR-2003-255; No Copyright; Avail: CASI; A99, Hardcopy

SLAAC assembled a multidisciplinary team with expertise in signal processing, design tools and adaptive architectures to develop distributed adaptive computing systems (ACS) and methodologies for Defense processing. SLAAC was organized around challenge applications that collectively guided the research, including: Synthetic Aperture Radar/Automatic Target Recognition (SAR/ ATR), SONAR Beamforming, Wide-Band RF Receiver Processing Hyperspectral Image Processing, Electronic Counter Measures (ECM), and Infrared ATR. The challenges were selected to stress ACS systems in dimensions of computational density, memory bandwidth and latency, I/O bandwidth, and scalability. SLAAC had technology transitions in SAR, SONAR and ECM.
DTIC
Adaptation; Synthetic Aperture Radar; Infrared Radiation; Radar Targets

20040028050 NASA Glenn Research Center, Cleveland, OH, USA
Securing Mobile Networks in an Operational Setting
Ivancic, William D.; Stewart, David H.; Bell, Terry L.; Paulsen, Phillip E.; Shell, Dan; January 2004; 14 pp.; In English; Computer Communications Workshop, 20-21 Oct. 2003, Laguna Niguel, CA, USA
Contract(s)/Grant(s): WBS 22-258-70-03
Report No.(s): NASA/TM-2004-212894; E-14312; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes a network demonstration and three month field trial of mobile networking using mobile-IPv4. The network was implemented as part of the US Coast Guard operational network which is a '.mil' network and requires stringent levels of security. The initial demonstrations took place in November 2002 and a three month field trial took place from July through September of 2003. The mobile network utilized encryptors capable of NSA-approved Type 1 algorithms, mobile router from Cisco Systems and 802.11 and satellite wireless links. This paper also describes a conceptual architecture for wide-scale deployment of secure mobile networking in operational environments where both private and public infrastructure is used. Additional issues presented include link costs, placement of encryptors and running routing protocols over layer-3 encryption devices.
Author
Satellite Networks; Architecture (Computers); Topology; Computer Networks; Mobile Communication Systems

20040031363 Physics and Electronics Lab. TNO, The Hague, Netherlands
Reference Document for Management of Tactical Infrastructure Networks
Boltjes, B.; Beijk, A. F.; Koster, A. J.; July 2003; 52 pp.; In English
Contract(s)/Grant(s): TNO Proj. 30761
Report No.(s): TD-2003-0059; FEL-03-A011; Copyright; Avail: Other Sources

This reference documents is intended to give guidance for anyone who needs to be introduced in the vast and complex world of Directory Enabled Network management. The main goal here is to answer the question: How suitable is Directory Enabled Networking (DEN) and directory-based network related data storage for Theatre Independent Tactical Army and Airforce Network (TITAAN)? This document is intended to serve as a reference to help pinpoint inconsistencies between network management standards and chosen vendor specific solutions. Key issues such as standardization bodies, standards, management protocols, et cetera, are described in this document to provide designers of TITAAN, presently and in the future, with references to implement the vital services paradigm and to resolve problems which surface due to a mix of COTS/MOTS and vendor specific solutions. As other standards in data communication, most of the standards for network management are initiated and worked out by international workgroups and committees in which vendors, researchers et cetera participate. Chapter 2 will give an overview of these committees, the standards on which they work, their purpose and their relevance for

TITAAN. Chapter 3 given a description of the compliance of TITAAN network operating and management software and devices to DEN. Chapter 4 answers the DEN related C2SC questions. For easy access, the posed questions and related definitions are listed in Appendix A. A collection of conclusions are given in Chapter 5.
Author (revised)
Computer Systems Programs; Tactics; Computer Networks

20040031432 North Atlantic Treaty Organization, The Hague, Netherlands
CAX System Architecture and Services
Dompke, Uwe; Simulation of and for Military Decision Making; June 2003, pp. 4-1 - 4-13; In English; See also 20040031429; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

The architecture of CAX Systems can be seen from three different perspectives: the Logical or Functional Perspective, the CAX System Topology and the System Physical Architecture. Each of these different views with its different layouts will be described in the paper. A comparison of different CAX Architectural Options based on the functional architecture and assessment criteria such as User Satisfaction, Implementation/Operation & Maintenance Cost, Security, Technological Trends and Flexibility follows. The trend in the development of complex software systems goes to the use of so-called services. This approach and services to be used in building CAX systems are described.
Author
Architecture (Computers); Complex Systems; Computer Programming

20040031437 North Atlantic Treaty Organization, The Hague, Netherlands
Computer Generated Forces: Background, Definition and Basic Technologies
Dompke, Uwe; Simulation of and for Military Decision Making; June 2003, pp. 7-1 - 7-14; In English; See also 20040031429; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

The paper starts with some background information on the requirements regarding the use of Computer Generated Forces (CGF). The term itself will be defined based on a definition already given by the US DoD. Basic or relevant technologies are described and an overview on their development given.
Author
Computer Programs; Computer Aided Design; Technology Transfer; Computer Techniques

20040031440 Schmidt (Walter H. P.), Koessen, Austria
Automated Command and Control Information Systems (ACCIS) and CAX
Schmidt, Walter H. P.; Simulation of and for Military Decision Making; June 2003, pp. 5-1 - 5-13; In English; See also 20040031429; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper provides an introduction to the relationship between an Automated Command and Control Information System (ACCIS) and Computer Assisted Exercises (CAX). After a brief historical review the paper gives an overview of existing definitions and descriptions of ACCIS and CAX. Based on a common sense understanding of the phenomena, the term 'Operational Environment Simulation (OES)' is introduced. Common capabilities of ACCIS and OES are then identified as Common Services. It is concluded that both the ACCIS and the OES have much in common. It is recommended that future developments of ACCIS should follow the same standards and guidelines in order to maximize training benefit of CAXes and in order to minimize costs of development, operations and management of both systems. The NATO ACCIS architecture attempts to do exactly this.
Author
Automatic Control; Command and Control; Information Systems; Computer Techniques

20040031441 North Atlantic Treaty Organization, The Hague, Netherlands
Practical Examples and Future Needs for Computer Assisted Exercises at the Operational Level of Military Decision Making
Coppieters, D.; Simulation of and for Military Decision Making; June 2003, pp. 6-1 - 6-17; In English; See also 20040031429; Copyright; Avail: CASI; A03, Hardcopy

Computer assisted exercises have developed over the last ten years into the most cost-effective method to perform collective headquarters training in NATO. Considerable advance has been made to support the concept of 'train as you fight or operate' by achieving close integration between simulation environments and command and control information systems. Key factors for the success of CAXes are the selected simulation, the level of training and competence of exercise planners

and support personnel and the ability to mediate effectively between simulation and CCIS used by the exercising headquarters. For operational level exercises, the Joint Theater Level Simulation was selected as the preferred exercise driver. Effective methods for exercise planner training and simulation data base development have been developed combining clearly defined organisational concepts and tools. The methods of training have been refined but remain manpower intensive. Exercise management has been addressed more recently and is showing great potential for effective formalisation and support. Based on current practice and technological investigations, future avenues that will contribute significantly to this field are simulation composability through interoperability, advanced distributed learning and highly flexible data collection and analysis.
Author
Computer Techniques; Decision Making; Information Systems; Cost Effectiveness; Command and Control

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*.

20040021366 Alabama Univ., Huntsville, AL, USA
Semantic Metrics for Object Oriented Design
Etzkorn, Lethe; [2003]; 1 pp.; In English
Contract(s)/Grant(s): CI-03-582; No Copyright; Avail: Other Sources; Abstract Only

The purpose of this proposal is to research a new suite of object-oriented (OO) software metrics, called semantic metrics, that have the potential to help software engineers identify fragile, low quality code sections much earlier in the development cycle than is possible with traditional OO metrics. With earlier and better Fault detection, software maintenance will be less time consuming and expensive, and software reusability will be improved. Because it is less costly to correct faults found earlier than to correct faults found later in the software lifecycle, the overall cost of software development will be reduced. Semantic metrics can be derived from the knowledge base of a program understanding system. A program understanding system is designed to understand a software module. Once understanding is complete, the knowledge-base contains digested information about the software module. Various semantic metrics can be collected on the knowledge base. This new kind of metric measures domain complexity, or the relationship of the software to its application domain, rather than implementation complexity, which is what traditional software metrics measure. A semantic metric will thus map much more closely to qualities humans are interested in, such as cohesion and maintainability, than is possible using traditional metrics, that are calculated using only syntactic aspects of software.
Author
Object-Oriented Programming; Software Engineering; Semantics; Computer Systems Design

20040021409 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA, NASA Stennis Space Center, Bay Saint Louis, MS, USA
NASA's Virtual Product Laboratory: An Overview
Gasser, Jerry; Blonski, Slawomir; Cao, Chang-Yong; McConnell, Ken; Ryan, Robert; Zanoni, Vicki; September 17, 1999; 10 pp.; In English; International Symposium on Spectral Sensing Research 1999, 31 Oct. - 4 Nov. 1999, Las Vegas, NV, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-1999-09-00021-SSC; No Copyright; Avail: CASI; A02, Hardcopy

The Virtual Product Laboratory (VPL) developed by NASA's Commercial Remote Sensing Program at the John C. Stennis Space Center is a tool that enables simulation, design, and verification of remote sensing systems within a software (virtual) environment. The VPL can serve industry, government, and university communities by providing a means to conduct system trade studies, optimization, visual modeling, and data product simulations entirely in a virtual environment. The VPL can serve as a complete end-to-end simulation tool capable of producing system and subsystem performance characterizations, system optimization, and simulated data products or as a means of evaluating any one component of a remote sensing system. In this paper, we present an overview of the VPL capabilities. The VPL functional areas include Requirements, Design & Analysis, Simulation, Project Management, Knowledge Base, and Help. A description of each function along with the tools and techniques used to accomplish these functions will be provided. When possible, sample VPL displays and products will be used in the presentation.
Author
NASA Programs; Virtual Reality; General Overviews; Remote Sensing; Computer Systems Design

20040027790 Nippon Telegraph and Telephone Public Corp., Chiba, Japan
Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T
Tatsuta, Tsutomu; Yoshida, Yukihiro; Maeda, Yoichi; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 89-93; In English; See also 20040027787; Copyright; Avail: Other Sources

While the main factor drivig the increase in access line speeds in Japan is the popularity of ADSL (asymmetric digital subscriber line), the number of customers using FITH (fiber to the home) services, such as our B-FLET's service, is also increasing by leaps and bounds. NTT has been contributing to standardization activities to promote FITH. In this article, we explain the latest FITH standardization activities in ITU-T. The standard is called G-PON (Gigabit passive optical network).
Author
Optical Communication; Communication Networks; Standardization; Bits; Telecommunication

20040027792 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions
Kitagawa, Yukako; Tamaki, Motonori; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 73-78; In English; See also 20040027787; Copyright; Avail: Other Sources

In call centers, responding quickly and accurately to inquiries from customers regarding services and problems is important from the perspective of customer satisfaction. NTT Cyber Solutions Laboratories is developing a highly accurate system for retrieving similar cases using two-word linked expressions. The goal of the system is to effectively utilize cases from past inquiries.
Author
Expert Systems; Information Retrieval; Technology Utilization; Computer Systems Programs

20040027793 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Image Systems Using RFID Tag Positioning Information
Nakagawa, Shinichi; Soh, Kenichiro; Mine, Shinichi; Saito, Hiroshi; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 79-83; In English; See also 20040027787; Copyright; Avail: Other Sources

We have developed a system that automatically selects images from particular cameras based on RFID (radio frequency identification) tags that identify individual persons or objects, thus enabling each user to receive desired images via IP networks. For example, if an RFID tag is inserted in the nametag of a kindergarten child and several cameras are installed in the kindergarten, the system automatically switches the transmitted images according to the child's movements so that the parents can watch their own child from home or the office.
Author
Radio Frequencies; Image Processing; Information Management; Systems Engineering; Automatic Control

20040027848 NASA Glenn Research Center, Cleveland, OH, USA
Sonoluminescence Bubble Measurements using Vision-Based Algorithms
Hall, Nancy R.; Mackey, Jeffrey R.; Matula, Thomas J.; [2003]; 8 pp.; In English; SPIE International Symposium, Photonics East, 27-30 Oct. 2003, Providence, RI, USA
Contract(s)/Grant(s): NAG3-2379; 22-400-32-30-09; No Copyright; Avail: CASI; A02, Hardcopy

Vision-based measurement methods were used to measure bubble sizes in this sonoluminescence experiment. Bubble imaging was accomplished by placing the bubble between a bright light source and a microscope-CCD camera system. A collimated light-emitting diode was operated in a pulsed model with an adjustable time delay with respect to the piezo-electric transducer drive signal. The light-emitting diode produced a bubble shadowgraph consisting of a multiple exposure made by numerous light pulses imaged onto a charge-couple device camera. Each image was transferred from the camera to a computer-controlled machine vision system via a frame grabber. The frame grabber was equipped with on-board memory to accomodate sequential image buffering while images were transferred to the host processor and analyzed. This configuration allowed the host computer to perform diameter measurements, centroid position measurements and shape estimation in 'real-time' as the next image was being acquired. Bubble size measurement accuracy with an uncertainty of 3 microns was achieved using standard lenses and machine vision algorithms. Bubble centroid position accuracy was also within the 3 micron tolerance of the vision system. This uncertainty estimation accounted for the optical spatial resolution, digitization errors and the edge detection algorithm accuracy. The vision algorithms include camera calibration, thresholding, edge detection, edge

position determination, distance between two edges computations and centroid position computations.
Author
Algorithms; Bubbles; Computer Vision; Imaging Techniques; Sonoluminescence; Light (Visible Radiation)

20040030404
Adaptive Framework for Automated Mapping and Architecture Trades for Embedded Heterogeneous Systems
Venkataramana, Raju D.; May 21, 2003; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419986; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents a framework that can be adapted to perform automated mapping/scheduling and architecture trades for embedded computing environments. The framework is based on a learning automata model whose adaptable nature makes it invaluable in tools that provide end- to-end solutions for embedded systems development. The framework has been incorporated into one such tool, Systems and Applications Genesis Environment (SAGE). The paper begins with an introduction to learning automata and the architecture of the framework. The following sections discuss how algorithms for automated mapping/scheduling and architecture trades are constructed within the framework.
DTIC
Learning; Embedding; Computer Aided Mapping; Automata Theory; Automatic Control

20040031444 Old Dominion Univ., Suffolk, VA, USA
Human Behavior Representation: Recent Developments
Tolk, Andreas; Simulation of and for Military Decision Making; June 2003, pp. 14-1 - 14-10; In English; See also 20040031429; Original contains color illustrations; Copyright; Avail: CASI; A02, Hardcopy

Until recently, the command and control processes and especially the decision process were - if at all - hard-coded in the closed combat simulation models. Although in other application areas expert systems and rule systems as well as neural nets were used to find solutions to similar problems, in the closed combat community these approaches are still not used sufficiently. The problem with hard-coded decisions is always, that they are evaluated only for a special environment. Being transferred to another environment the decision model is seldom capable to meet the new requirements. Self-optimization and the skill to adapt to new situations are nowadays more often required by such systems. This lecture introduces adjustable rule sets and neural networks as alternatives to generate orders in a given situation. The results and the possibilities for further improvement and evaluation of the results are given. In addition, some technical aspects of coupling the results in form of CGF federates with legacy systems and the challenge of structural variances are copied. Further actual developments in the modeling of Human Behavior Representation come from Germany, where a new approach trying to catch the insight from latest psychology findings as well as modern agent technology are merged to a new solution of the well-known problems.
Author
Military Operations; Neural Nets

20040031515 Vanderbilt Univ., Nashville, TN, USA
Robot Acquisition of Active Maps Through Teleoperation and Vector Space Analysis
Peters, Richard Alan, II; October 14, 2003; 14 pp.; In English
Contract(s)/Grant(s): NAG9-1428
Report No.(s): Rept-4-22-420-3504; No Copyright; Avail: CASI; A03, Hardcopy

The work performed under this contract was in the area of intelligent robotics. The problem being studied was the acquisition of intelligent behaviors by a robot. The method was to acquire action maps that describe tasks as sequences of reflexive behaviors. Action maps (a.k.a. topological maps) are graphs whose nodes represent sensorimotor states and whose edges represent the motor actions that cause the robot to proceed from one state to the next. The maps were acquired by the robot after being teleoperated or otherwise guided by a person through a task several times. During a guided task, the robot records all its sensorimotor signals. The signals from several task trials are partitioned into episodes of static behavior. The corresponding episodes from each trial are averaged to produce a task description as a sequence of characteristic episodes. The sensorimotor states that indicate episode boundaries become the nodes, and the static behaviors, the edges. It was demonstrated that if compound maps are constructed from a set of tasks then the robot can perform new tasks in which it was never explicitly trained.
Author
Robotics; Teleoperators; Vector Spaces; Artificial Intelligence; Topology

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20040016274 Department of the Navy, Washington, DC
Detection of Randomness in Sparse Data Set of Three Dimensional Time Series Distributions
O'Brian, Francis J., Jr, Inventor; Oct. 6, 2003; 41 pp.; In English
Patent Info.: Filed 6 Oct. 2003; US-Patent-Appl-SN-10679686
Report No.(s): AD-D020117; No Copyright; Avail: Other Sources

A two-stage method is provided for automatically characterizing the spatial arrangement among data points of a three-dimensional time series distribution in a data processing system wherein the classification of said time series distribution is required. The two-stage method utilizes Cartesian grids to determine the following: (1) the number of cubes in the grids containing at least one input data point of the time series distribution, (2) the expected number of cubes that would contain at least one data point in a statistically determined random distribution in said grids, and (3) an upper and lower probability of false alarm above and below said expected value utilizing a second discrete probability relationship to analyze the randomness characteristic of the input time series distribution. (5 figures)
DTIC
Signal Processing; Time Series Analysis; White Noise; Cartesian Coordinates; Data Processing Equipment

20040016350 NASA Marshall Space Flight Center, Huntsville, AL, USA
Testing Fractal Methods on Observed and Simulated Solar Magnetograms
Adams, M.; Falconer, D. A.; Lee, J. K.; Jones, C.; [2003]; 1 pp.; In English; American Astronomical Society Meeting, 4-8 Jan. 2004, Atlanta, GA, USA; No Copyright; Avail: Other Sources; Abstract Only

The term 'magnetic complexity' has not been sufficiently quantified. To accomplish this, we must understand the relationship between the observed magnetic field of solar active regions and fractal dimension measurements. Using data from the Marshall Space Flight Center's vector magnetograph ranging from December 1991 to July 2001, we compare the results of several methods of calculating a fractal dimension, e.g., Hurst coefficient, the Higuchi method, power spectrum, and 2-D Wavelet Packet Analysis. In addition, we apply these methods to synthetic data, beginning with representations of very simple dipole regions, ending with regions that are magnetically complex.
Author
Magnetic Fields; Fractals; Wavelet Analysis

20040020115 NASA Glenn Research Center, Cleveland, OH, USA
Tensor Fields for Use in Fractional-Order Viscoelasticity
Freed, Alan D.; Diethelm, Kai; October 29, 2003; 6 pp.; In English; First IFAC Workshop on Fractional Differentiation and its Applications, 19-20 Jul. 2004, Bordeaux, France
Contract(s)/Grant(s): SAA3-516; DAMD17-01-1-0673
Report No.(s): Rept-1; No Copyright; Avail: CASI; A02, Hardcopy

To be able to construct viscoelastic material models from fractional0order differentegral equations that are applicable for 3D finite-strain analysis requires definitions for fractional derivatives and integrals for symmetric tensor fields, like stress and strain. We define these fields in the body manifold. We then map them ito spatial fields expressed in terms of an Eulerian or Lagrangian reference frame where most analysts prefer to solve boundary problems.
Author
Tensors; Viscoelasticity; Mathematical Models

20040027577 NASA Glenn Research Center, Cleveland, OH, USA
Effect of Scattering on the Combined Reflection and Thermal Radiation Emission of a Typical Semitransparent TBC Material
Spuckler, Charles M.; [2004]; 6 pp.; In English; 28th International Cocoa Beach Conference and Exposition on Advanced Ceramics and Composites, 25-30 Jan. 2004, Cocoa Beach, FL, USA
Contract(s)/Grant(s): 22-714-20-09; No Copyright; Avail: CASI; A02, Hardcopy

A parametric study was undertaken to examine the effects of scattering on the combined reflection and thermal radiation

emission of a typical semi-transparent thermal barrier coating material. A one dimensional model was used.
Author (revised)
Thermal Control Coatings; Scattering

20040027678 Carnegie-Mellon Univ., Pittsburgh, PA
Short Vector SIMD Code Generation for DSP Algorithms
Franchetti, Franz; Ueberhuber, Christoph; Pueschel, Markus; Moura, Jose; Sep. 2002; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-98-1-0004
Report No.(s): AD-A419857; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs of presentation on short vector SIMD code generation for digital signal processing algorithms.
DTIC
Signal Processing; Algorithms; Transformations (Mathematics)

20040027708
Rational Approximations of the Power Spectral Density of Atmospheric Turbulence Arising in Adaptive Optics
Bagchi, Arunabha; Nurdin, Hendra I.; Sep. 15, 2003; 45 pp.; In English
Contract(s)/Grant(s): FA8655-02-M-4082
Report No.(s): AD-A419861; EOARD-SPC-02-4082; No Copyright; Avail: CASI; A03, Hardcopy
This report results from a contract tasking University of Twente as follows: Contractor will provide research in control theory of with nonrational spectra. He will perform a total of 220 hours research and provide associated publications and reports.
DTIC
Adaptive Optics; Approximation

20040027744 Washington Univ., Saint Louis, MO
Power Consumption of Customized Numerical Representations for Audio Signal Processing
Chamberlain, Roger; Chew, Yen H.; DeAlwis, Varuna; Hemmeter, Eric; Lockwood, John; Sep. 2002; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 1R4-3DC04028-02
Report No.(s): AD-A419808; No Copyright; Avail: CASI; A03, Hardcopy
Presentation on the power consumption of customized numerical representations for audio signal processing.
DTIC
Auditory Signals; Energy Consumption; Signal Processing; Numerical Analysis

20040027779 Carnegie-Mellon Univ., Pittsburgh, PA
Generation of Custom DSP Transform IP Cores: Case Study Walsh-Hadamard Transform
Fang, Fang; Hoe, James C.; Pueschel, Markus; Misra, Smarahara; Sep. 2002; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419800; No Copyright; Avail: CASI; A03, Hardcopy
Presentation of a case study on the generation of custom digital signal processing transform information processing cores.
DTIC
Digital Data; Data Processing

20040027805 Wisconsin Univ., Madison, WI
Optimal Scheduling With Flexible Resources
Shi, Leyuan; Aug. 31, 2003; 75 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0222
Report No.(s): AD-A419887; AFRL-SR-AR-TR-04-0040; No Copyright; Avail: CASI; A04, Hardcopy
In this project, the PI has developed an efficient optimization framework, the Nested Partitions (NP) method, for difficult combinatorial optimization problems (see publications). In particular, the Job Shop Total Inventory Minimization Problem (JSTIMP) and the Multicommodity Distribution System Design (MDSD) Problem were investigated. It has been demonstrated that the NP framework can be integrated with many well-known optimization algorithms/methods to provide hybrid

algorithms for efficiently solving many large-scale combinatorial optimization problems.
DTIC
Computer Programs; Algorithms; Scheduling; Design Analysis

20040027807 National Cheng Kung Univ., Tainan, Taiwan, Province of China
A Modified Grey Forecasting Model for Long-Term Prediction
Hsu, Che-Chiang; Chen, Chia-Yon; Journal of the Chinese Institute of Engineers; 2003; Volume 26, No. 3, pp. 301-308; In English; Copyright; Avail: Other Sources

Grey theory is a truly multidisciplinary and generic theory that deals with sys- tems which are characterized by poor information and /or for which information is lacking. In this paper, a modified grey model, combined with a simple statistical method to determine the model coefficient and a sectional model, by using another variable to modify the original grey prediction model for long-term forecasting, is proposed. This new method not only can improve the prediction accuracy of the origi- nal grey model, but also can make it suitable for long-term forecasting. Finally, we use power demand forecasting in Taiwan for our case study to test the efficiency and accuracy of the proposed method.
Author
Forecasting; Prediction Analysis Techniques

20040027819 National Cheng Kung Univ., Tainan, Taiwan, Province of China
Multi-Random PWM Inverter with Fixed Switching Frequency
Chen, Jiann-Fuh; Shyu, Juei-Lung; Liang, Tsorng-Juu; Journal of the Chinese Institute of Engineers; 2003; Volume 26, No. 3, pp. 309-320; In English
Contract(s)/Grant(s): NSC-89-2213-E-006-182; Copyright; Avail: Other Sources

A novel multi-random pulse width modulation (MRPWM) technique for improving the spectrum performance of an inverter is analyzed. MRPWM combines a new random time-shift PWM scheme and a random pulse position PWM scheme, both driven at the same fixed switching frequency. Theoretical analysis of MRPWM is presented. Also, the output characteristics of various random pulse width PWM schemes are evaluated and compared. Finally, computer simulation results and experimental results are presented, confirming the theoretical predictions that the proposed MRPWM method offers better performance than single random PWM (SRPWM) schemes.
Author
Pulse Duration Modulation; Inverters

20040027829 I-Shou Univ., Ta-Hsu, Taiwan, Province of China
Simple Instability Criteria for a Family of Complex-Coefficient Polynomials
Sun, Yeong-Jeu; Journal pf the Chinese Institute of Engineers; 2003; Volume 26, No. 3, pp. 371-374; In English
Contract(s)/Grant(s): NSC-89-2218-E-214-006; NSC-91-2213-E-214-008; Copyright; Avail: Other Sources

In this paper, the A [r , R) stability and A [r , R) instability are introduced. The instability of a family of complex-coefficient polynomials is investigated. Simple instability criteria are derived to guarantee the instability of such polynomials. Finally, a numerical example is provided to illustrate the main results.
Author
Polynomials; Theorems

20040027830 National Taiwan Univ., Taipei, Taiwan, Province of China
Fast and Accurate Fault Detection/Location Algorthms for Double-Circuit/Three-Terminal Lines using Phasor Measurement Units
Chen, Ching-Shan; Liu, Chih-Wen; Journal of the Chinese Institute of Engineers; 2003; Volume 26, No. 3, pp. 289-299; In English
Contract(s)/Grant(s): NSC-91-2213-E-002-121; Copyright; Avail: Other Sources

This paper presents new PMU-based fault detection/location algorithms for double-circuitithree-terminal transmission lines. The development of the algorithms is based on distributed transmission line models and synchronized positive sequence voltage and current phasors. The proposed fault detector is very sensitive, such that it can quickly identify faults. In particular, high impedance faults can be easily detected. A fault direction discriminator is also developed to distinguish between internal and external faults with respect to the protected zone. When an internal fault occurs, the discriminator starts the process of fault locating. The methods d o not require fault type identification and their computational costs are very low since they do

not re- quire iterative operations. Moreover, the algorithms provide excellent performance for transposed and untransposed lines. The EMTP/ATP simulator was used to verify the performance of the methods. The simulation studies show that the algorithms can detect faults quickly, discriminate fault direction correctly, and provide a high degree of accuracy in fault location. The algorithms are independent of various fault and system conditions such as fault types, fault positions, fault path resistance, pre-fault load flows, mutual coupling effect of lines, and line shunt capacitance.
Author
Algorithms; Transmission Lines; Fault Detection

20040027831 National Taiwan Univ., Taipei, Taiwan, Province of China
Sub-Optimal Finite Dimensional Observer-Based Boundary Controller Design for Distributed Parameter Systems on a Planar Domain
Lu, Shin-Hao; Fong, I.-Kong; Journal of the Chinese Institute of Engineers; 2003; Volume 26, No. 3, pp. 279-288; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NSC-88-2213-E-002-089; Copyright; Avail: Other Sources

In this paper, a certain class of distributed parameter systems is considered. We propose a three-step design method for finding finite dimensional observer-based boundary feedback controllers. The first step is called the boundary-equation normalization, which transforms the boundary and system equations into a normal form. The second step is called the boundary input transformation, which integrates the boundary input equation into the system equation, and forms a type of distributed parameter system called the general boundary input system. The final step is to de- sign the desired finite dimensional controller, based on the general boundary input system model. The design procedure utilizes the finite dimensional linear quadratic optimal control theory, so well-developed computation tools can be applied. Though the acquired controllers are only sub-optimal for the distributed parameter systems, an estimation of the performance degradation from that of the ideal case is derived for comparison purpose.
Author
Distributed Parameter Systems; Boundary Conditions

20040027835 Southern Taiwan Univ. of Technology, Tainan, Taiwan, Province of China
Successive Bit-Vector Search Algorithm for CELP Vocoders
Lin, Rong-San; Yang, Jar-Ferr; Ho, David; Journal of the Chinese Institute of Engineers; 2003; Volume 26, No. 3, pp. 261-270; In English
Contract(s)/Grant(s): NSC-87-NSPO-A-006-01; Copyright; Avail: Other Sources

In this paper, we propose a successive bit-vector search approach to reduce the computational complexity of coded excited linear predictive coding (CELP) speech coders. By decomposing each code vector into several bit-vectors, the convolution process of the linear predictive coding model can be simplified. With a suggested matching criterion, the proposed method removes a portion of unlikely code vectors in a bit-vector by bit-vector fashion. Theoretical analyses and simulation results show that the proposed search method reduces a lot of the computational load for general codebook searches and maintains nearly the same speech quality as the traditional search approach. The proposed method, which reduces the complexity of the CELP speech coders in VLSI realization, can be flexibly embedded with a simple RISC processor to achieve a low-cost speech coder.
Author
Algorithms; Vocoders

20040031344 Building and Construction Research TNO, Delft, Netherlands
Influence of Rubber Honeycomb on Shock Response
vandenEikhoff, J.; July 16, 2003; 66 pp.; In English
Contract(s)/Grant(s): A01/KM/116/13757; TNO Proj. 006.38120/01.01
Report No.(s): TD-2003-004; TNO-2003-CMC-R029; Copyright; Avail: Other Sources

The objectives treated in this report are: Numerical evaluation of the degree of shock protection in case of utilization of rubber 'honeycomb' tiles Determination of the material data for a coating on the wet hull of a navy vessel, such that an effective on the wet hull; protection against shock is achieved. In this project a number of calculations were performed. First a very simple model for modelling the frigate was derived and tested. Then this model was used to get the response on a reasonable shock in order to be able to compare the results with hull protection. This shock is situated right below the simple frigate model. Second a reasonable approximation was fabricated for the behaviour of a rubber honeycomb. Rather

unfavourable (stiff) rubber properties were used in order to be conservative. The simple frigate model with a honeycomb protection was subjected to the same shock and the result was compared with the unprotected result It appeared that usage of a Blatz-Ko material model was too complicated and not necessary. Therefore, the problem with the 'gravity initialization' within ZDCAV for this material was not solved. An 'air entrapped rubber' material model instead of a rubber model in the model used in [13 lead to such a rapid compression of the 'rubber coating', that the timesteps in 2DCAV became so small, that it would take much too much computer time. These models could not be used. Maybe a combination with the rubber model as used in this project, will be usable. Two calculations, with different stiffnesses were performed with the model used in [13, where the behaviour of the honeycomb rubber was simulated by using elastic material with a low value of the poisson's ratio.
Derived from text
Hulls (Structures); Rubber

20040031503 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Wavelet based Suboptimal Kalman Filter for Assimilation of Stratospheric Chemical Tracer Observations
Tangborn, Andrew; Auger, Ludovic; [2003]; 1 pp.; In English; IUGG 2003, 30 Jun. - 11 Jul. 2003, Sapporro, Japan; No Copyright; Avail: Other Sources; Abstract Only

A suboptimal Kalman filter system which evolves error covariances in terms of a truncated set of wavelet coefficients has been developed for the assimilation of chemical tracer observations of CH4. This scheme projects the discretized covariance propagation equations and covariance matrix onto an orthogonal set of compactly supported wavelets. Wavelet representation is localized in both location and scale, which allows for efficient representation of the inherently anisotropic structure of the error covariances. The truncation is carried out in such a way that the resolution of the error covariance is reduced only in the zonal direction, where gradients are smaller. Assimilation experiments which last 24 days, and used different degrees of truncation were carried out. These reduced the covariance size by 90, 97 and 99 % and the computational cost of covariance propagation by 80, 93 and 96 % respectively. The difference in both error covariance and the tracer field between the truncated and full systems over this period were found to be not growing in the first case, and growing relatively slowly in the later two cases. The largest errors in the tracer fields were found to occur in regions of largest zonal gradients in the constituent field. This results indicate that propagation of error covariances for a global two-dimensional data assimilation system are currently feasible. Recommendations for further reduction in computational cost are made with the goal of extending this technique to three-dimensional global assimilation systems.
Author
Wavelet Analysis; Kalman Filters; Stratosphere; Chemical Analysis

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20040030460 NASA Goddard Space Flight Center, Greenbelt, MD
Nonlinear Internal Waves in the South China Sea During ASIAEX
Liu, Antony K.; Tang, David T.; Ramp, Steve R.; Dec. 2002; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0275
Report No.(s): AD-A419773; No Copyright; Avail: CASI; A03, Hardcopy

No abstract available
Oceanography; Acoustic Sounding; Nonlinearity; Internal Waves

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20040027601 Massachusetts Inst. of Tech., Cambridge, MA
From Materials to Missions. Assess-Predict- Optimize: A Computational Approach to Adaptive Design
Patera, Anthony T.; Dec. 11, 2003; 11 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0458
Report No.(s): AD-A419682; No Copyright; Avail: CASI; A03, Hardcopy

We develop an Assess-Predict-Optimize (APO) strategy for the adaptive design of optimal missions for critical components and systems. We first assess the system through non-destructive inverse procedures for evaluating the system characteristics of interest: this yields the many possible realizations of the system. We then Predict future behavior of the system through various modeling and computational procedures: this translates the uncertainties in system characterization into ranges of performance. Finally, we Optimize the system mission through mathematical programming methods: this provides the best possible configuration and deployment schedule relative to the design objectives and now-identified (but uncertain) system characteristics. The essential mathematical ingredients of our approach are twofold. First, we employ Reduced-Basis Output Bound Methods: dimension reduction the rational construction of highly efficient ('real-time' response) system-specific approximation spaces that reflect the low-dimensional parametric manifold on which a component 'evolves' during design and operation; and apostertori error estimation relaxations of the classical error-residual equality that provide inexpensive bounds for the prediction error. Second, we employ Mathematical Programming Methods: techniques which incorporate our reduced-basis output bounds for efficient minimization of objective functions with strict adherence to constraints even in the presence of uncertainty.
DTIC
Computation; Mathematical Programming; Manifolds (Mathematics); Optimization

20040027795 Nippon Telegraph and Telephone Public Corp., Japan
For Further Innovation
Kawachi, Masao; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 1; In English; See also 20040027787; Copyright; Avail: Other Sources

NTT Science and Core Technology Laboratory Group is undertaking the cutting-edge R&D needed to support future ubiquitous and broadband services. R&D activities are being conducted at Atsugi, Musashino, Yokosuka, and Keihanna. While the other two laboratory groups (NTT Cyber Communications Laboratory Group and NTT Information Sharing Laboratory Group) aim to boost NTT business in the near future, we are targeting the more distant future. Most of our research topics are expected to bloom in 5 to 10 years, though the basic research laboratories in our group are aiming to create trends that will be seen in 10 to 20 years.
Derived from text
Research and Development; Technologies; Communication

20040027832 University of Southern California, Los Angeles, CA
An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications
Bakshi, Amol B.; Ou, Jingzhao; Prasanna, Viktor K.; May 21, 2003; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-C-00-1633
Report No.(s): AD-A419822; No Copyright; Avail: CASI; A01, Hardcopy

Networks of inexpensive, low-power sensing nodes that can monitor the environment, perform limited processing on the samples, and detect events of interest in a collaborative fashion are fast becoming a reality. Examples of such monitoring and detection include target tracking based on acoustic signatures and line -of-bearing estimation, climate control, intrusion detection, etc. The advances in low-power radio technology are making wireless communication within sensor networks an attractive option. However, it is typically difficult or impossible to replenish energy resources available to a portable sensor node, once it is deployed. Maximizing the life of sensor nodes is an overriding priority, and different energy optimization techniques are being developed to address computation/communication tradeoffs. A large number of research efforts are focusing on different aspects of the general problem of designing efficient sensor network-based systems - where the metrics to measure efficiency vary from system to system. With technological advancements such as silicon-based radios expected to become a reality in a few years, designers of sensor network-based systems will be faced with an extremely large set of design decisions. Each choice will affect the overall system performance in ways that might not always be cleanly modeled. In addition to the research challenges in design and optimization, the practical aspects of designing real-world sensor networks will become equally important. For example, the ability of the design framework to allow rapid specification and evaluation of a particular network configuration is critical for a more exhaustive exploration of the design space. A design environment for future sensor networks should provide tools and formal methodologies that will allow designers to model, analyze, optimize, and simulate such systems.
DTIC
Integrated Circuits; Sensors; Communication Networks; Acoustic Sounding; Design Optimization

20040027870 Pittsburgh Univ., Pittsburgh, PA

Enhancements of Systems Based on Bayesian Networks and Structural Equation Models for Command and Control Support

Druzdzel, Marek J.; Jul. 20, 2000; 29 pp.; In English

Contract(s)/Grant(s): F4620-00-1-0112

Report No.(s): AD-A419906; AFRL-SR-AR-TR-04-0046; No Copyright; Avail: CASI; A03, Hardcopy

The performed project focused on a new paradigm of planning systems that are based on a combination of Bayesian networks and structural equation models. We focused on theoretical issues that surround combining the two in a practical planning system, developing the foundations for, and building a prototype of such system. The approach and the system built allow for efficient, yet normatively correct, treatment of various types of information, uncertainty, and utility. It is especially powerful in complex situations where the available information is heterogeneous and consists of a mixture of deterministic and uncertain relationships among discrete and continuous variables. Our main contributions are: (1) two state of the art stochastic sampling algorithm for approximate inference in graphical models, both (2) analysis of problems related to combining probabilistic information, (3) an module for interactive construction of causal graphical models and search for opportunities, (4) algorithm for learning graphical models from small data sets, and (5) a prototype of the system, used by over 5,000 people world-wide.

DTIC

Mathematical Models; Bayes Theorem; Algorithms

20040030497 NASA Ames Research Center, Moffett Field, CA, USA

System Modeling and Diagnostics for Liquefying-Fuel Hybrid Rockets

Poll, Scott; Iverson, David; Ou, Jeremy; Sanderfer, Dwight; Patterson-Hine, Ann; June 2003; 135 pp.; In English

Contract(s)/Grant(s): UPN 721-24-28

Report No.(s): NASA/TM-2003-212270; No Copyright; Avail: CASI; A07, Hardcopy

A Hybrid Combustion Facility (HCF) was recently built at NASA Ames Research Center to study the combustion properties of a new fuel formulation that burns approximately three times faster than conventional hybrid fuels. Researchers at Ames working in the area of Integrated Vehicle Health Management recognized a good opportunity to apply IVHM techniques to a candidate technology for next generation launch systems. Five tools were selected to examine various IVHM techniques for the HCF. Three of the tools, TEAMS (Testability Engineering and Maintenance System), L2 (Livingstone2), and RODON, are model-based reasoning (or diagnostic) systems. Two other tools in this study, ICS (Interval Constraint Simulator) and IMS (Inductive Monitoring System) do not attempt to isolate the cause of the failure but may be used for fault detection. Models of varying scope and completeness were created, both qualitative and quantitative. In each of the models, the structure and behavior of the physical system are captured. In the qualitative models, the temporal aspects of the system behavior and the abstraction of sensor data are handled outside of the model and require the development of additional code. In the quantitative model, less extensive processing code is also necessary. Examples of fault diagnoses are given.

Author

Hybrid Propellant Rocket Engines; Hybrid Propellants; Systems Health Monitoring

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*.

20040016278 Lawrence Livermore National Lab., Livermore, CA

Level Densities and Radiative Strength Functions in (170, 171) Yb

Agvaanluvsan, U.; Schiller, A.; Becker, J. A.; Bernstein, L. A.; Guttormsen, M.; Jun. 09, 2003; 14 pp.; In English

Report No.(s): DE2003-15004543; UCRL-ID-153593; No Copyright; Avail: Department of Energy Information Bridge

Level densities and radiative strength functions in (sup 171) Yb and (sup 170)Yb nuclei have been measured with the (sup 171)Yb((sup 3)He,(sup 3)He gamma)(sup 171)Yb and (sup 171)Yb((sup 3)He, alpha gamma)(sup 170)Yb reactions. A simultaneous determination of the nuclear level density and the radiative strength function was made. The present data adds to and is consistent with previous results for several other rare earth nuclei. The method will be briefly reviewed and the result

from the analysis will be presented. The radiative strength function for (sup 171)Yb is compared to previously published work.
NTIS
Nuclear Structure; Nuclei (Nuclear Physics)

20040016284 Lawrence Livermore National Lab., Livermore, CA
NLC Gamma-Gamma Beam Dump Face Calculations
Hill, T. S.; Jun. 18, 2002; 16 pp.; In English
Report No.(s): DE2003-15004659; UCRL-ID-148773; No Copyright; Avail: Department of Energy Information Bridge

The NLC beam dump face is a thin copper plate. Energy deposition in the copper face has two sources - primary and secondary electromagnetic showers. Primary showers are those where the incoming beam particle initiates an electromagnetic cascade. Secondary showers are those that occur after a nuclear interaction of a beam particle with the copper. An upper limit for the nuclear transmutation rate is also estimated.
NTIS
Particle Beams; Nuclear Interactions; Mathematical Models

20040016285 Stanford Linear Accelerator Center, USA
Measurement of B(sup 0) -> D(sub s)(*)+D*- Branching Fractions and B(sup 0) ->D(sup s)*- Polarization with a Partial Reconstruction Technique
Aubert, B.; Barate, R.; Boutigny, D.; Feb. 2003; 14 pp.; In English
Report No.(s): DE2003-812635; BABAR-PUB-03/01; SLAC-PUB-9644; No Copyright; Avail: Department of Energy Information Bridge

Precise knowledge of the branching fractions of exclusive Beta decay modes provides a test of the factorization Approach. Factorization neglects final state interactions between the quarks of the two final state mesons.
NTIS
Polarization; Branching (Physics); Radioactive Decay

20040016289 Massachusetts Univ., Amherst, MA, USA, Stanford Linear Accelerator Center, Stanford, CA, USA
Precision Measurement of the Proton and Deuteron Spin Structure Functions g(sub 2)*
Rock, S.; Feb. 2003; 10 pp.; In English
Report No.(s): DE2003-812643; SLAC-PUB-9656; No Copyright; Avail: Department of Energy Information Bridge

We have measured the spin structure functions g (sup p) (sub 2) and g (sup d) (sub 2) by scattering 29.1 and 32. 3 GeV longitudinally polarized electrons from transversely polarized NH (sub 3) and (sup 6)LiD targets. g (sub 2) approximately follows the twist-2 Wandzura-Wilczek calculation. The twist-3 reduced matrix elements d (sup p) (sub 2) and d (sup n) (sub 2) are less than two standard deviations from zero. The data are inconsistent with the Burkhardt-Cottingham sum rule if there is no pathological behavior as x yields 0. The Efremov-Leader-Teryaev integral is consistent with zero.
NTIS
Precision; Protons; Deuterons

20040016290 Victoria Univ. of Manchester, UK, Stanford Linear Accelerator Center, Stanford, CA, USA
Search for the Lepton Number Violating Decay (tau)(yields)(mu)(gamma)
Brown, C.; Feb. 2003; 12 pp.; In English
Report No.(s): DE2003-812952; SLAC-PUB-9660; No Copyright; Avail: Department of Energy Information Bridge

Using data collected with the BABAR detector between 1999 and 2001, we describe a preliminary search for the neutrinoless decay gamma yields micro gamma. This data sample includes data collected both on and of the Gamma(4S) resonance and corresponds to 56 x 10 the the sixth power produced tau pair events. The search has an efficiency of 5.2 plus or minus 0:1(MCstat) plus or minus 0:5(sys)% and an expected background rate of 7.8 plus or minus 1.4 events. We select 13 events in the final sample. As there is no evidence for a signal in this data, we set a preliminary upper limit of B(gamma yields micro gamma) less than 2:0 X10 to the minus 6th power at 90% CL.
NTIS
Leptons; Particle Decay

20040016291 Stanford Linear Accelerator Center, Stanford, CA, USA
Observation of a Near-Threshold Enhancement in the p-anti-p Mass Spectrum from Radiative J/psi -> gamma-p-anti-p Decays
Bai, J. Z.; Ban, Y.; Bian, J. G.; Cai, X.; Chang, J. F.; Apr. 2003; 10 pp.; In English
Report No.(s): DE2003-813004; SLAC-PUB-9709; No Copyright; Avail: Department of Energy Information Bridge
We observe a narrow enhancement near 2m(sub p) in the invariant mass spectrum of p(bar p) pairs from radiative J/(psi)(yields)(gamma)p(bar p) decays. No similar structure is seen in J/(psi)(yields)(pi)(sup 0) p(bar p) decays. The results are based on an analysis of a 58 million event sample of J/(psi) decays accumulated with the BESII detector at the Beijing electron-positron collider. The enhancement can be fit with either an S- or P-wave Breit Wigner resonance function.
NTIS
Mass Spectra; Protons

20040016299 Stanford Linear Accelerator Center, Stanford, CA, USA
Measurement of the Branching Fractions of Lambda(C)+ -> P Anti-K N(Pi)
Jessop, C. P.; 2003; 12 pp.; In English
Report No.(s): DE2003-813045; SLAC-PUB-9740; No Copyright; Avail: Department of Energy Information Bridge
Using data recorded by the CLEO-II detector at CESR, we report new measurements of the branching fractions for the decays of the charmed baryon(Lambda)(sub c)(sup+) into pK(sup -)(pi)(sup+)(pi)(sup 0), p(bar K)(sup 0), p(bar K)(sup 0)(pi)(sup+)(pi)(sup -), and p(bar K)(sup 0)(pi)(sup 0), all measured relative to pK(sup -)(pi)(sup+). The relative branching fractions are 0. 67(+-) 0.04(+-) 0.11, 0.46(+-) 0.02(+-) 0.04, 0.52(+-) 0.04(+-) 0.05, and 0.66(+-) 0.05(+-) 0.07 respectively.
NTIS
Charm (Particle Physics); Branching (Physics); Baryons

20040016300 Stanford Linear Accelerator Center, Stanford, CA, USA
Study of Semileptonic Decays of B Mesons to Charmed Baryons
2003; 14 pp.; In English
Report No.(s): DE2003-813060; SLAC-PUB-9757; No Copyright; Avail: Department of Energy Information Bridge
Using data collected by the CLEO II detector at a center-of-mass energy on or near the (Upsilon)(4S) resonance, we have determined the 90% confidence level upper limit (Beta)((bar B)(yields)(Lambda)(sub c)(sup+)e(sup -) X)/(Beta)((bar B)(yields) ((Lambda)(sub c)(sup+) or(bar(Lambda))(sub c)(sup -))X) < 0.05 for electrons with momentum above 0.6 GeV/c. We have also obtained the limit (Beta)(B(sup -)(yields)(Lambda)(sub c)(sup+)(bar p)e(sup -)((bar(nu))(sub e))/(Beta)((bar B)(yields)(Lambda)(sub c)(sup+)(bar p)X)< 0.04 at the 90% confidence level and measured the ratio(Beta)((bar B)(yields)(Lambda)(sub c)(sup+)(bar p)X)/(Beta)((bar B)(yields) ((Lambda)(sub c)(sup+) or(bar(Lambda))(sub c)(sup -))X)= 0.57(+-) 0.05(+-) 0.05.
NTIS
Charm (Particle Physics); Baryons; Confidence Limits; Center of Mass

20040016301 Oklahoma State Univ., Stillwater, OK, USA, Stanford Linear Accelerator Center, Stanford, CA, USA
Finding the Radiation Amplitude Zero in W gamma Production-Is it Unique to the Standard Model
Samuel, M. A.; 2003; 10 pp.; In English
Report No.(s): DE2003-813064; SLAC-PUB-9762; No Copyright; Avail: Department of Energy Information Bridge
In the light of recent experimental observation of the Radiation Amplitude Zero (RAZ) in W(gamma) production by CDF at Fermilab, we consider its consequences. Is the RAZ unique to the Standard Model (S.M.). Although it is not for (bar(nu))(sub e)e(sup -)(yields) W(sup -)(gamma), in the case of d(bar u)(yields) W(sup -)(gamma), which is the case of experimental interest, observation of the RAZ implies that the S.M. must be correct.
NTIS
Radiation; Amplitudes

20040016353 Lawrence Livermore National Lab., Livermore, CA
Molecular Dynamics Study of Void Growth and Dislocations in Dynamic Fracture of FCC and BCC Metals
Seppala, E. T.; Belak, J.; Rudd, R. E.; Jun. 2003; 10 pp.; In English
Report No.(s): DE2003-15004396; UCRL-JC-151375; No Copyright; Avail: Department of Energy Information Bridge
Void growth with concomitant dislocation formation has been studied in single crystal face-centered-cubic and

body-centered-cubic metals using molecular dynamics method with Embedded-Atom and Finnis-Sinclair potentials for copper and tantalum, respectively. We have concentrated on the quantitative analysis of the void shape evolution, on the structure of dislocations, which emerge from the void, and on the continuum measures such as plastic strain. The effects of strain-rate, differences between lattice structures, and loading conditions as uniaxial, biaxial, and triaxial expansion on the shape of the void and on the dislocations have been investigated.
NTIS
Voids; Tantalum; Molecular Dynamics

20040016373 Lawrence Livermore National Lab., Livermore, CA
Partial Dynamical Symmetry in Nuclear Systems
Escher, J.; Jun. 2003; 16 pp.; In English
Report No.(s): DE2003-15004410; UCRL-JC-153573; No Copyright; Avail: Department of Energy Information Bridge
Partial dynamical symmetry (PDS) extends and complements the concept of exact and dynamical symmetry. It allows one to remove undesired constraints from an algebraic theory, while perserving some of the useful aspects of a dynamical symmetry, and to study the effects of symmetry breaking in a controlled manner.
NTIS
Broken Symmetry; Algebra

20040016376 Lawrence Livermore National Lab., Livermore, CA
Volume Rendering for Curvilinear and Unstructured Grids
Max, N.; Williams, P.; Silva, C.; Cook, R.; Mar. 2003; 12 pp.; In English
Report No.(s): DE2003-15004404; UCRL-JC-152187; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Unstructured Grids (Mathematics); Spherical Coordinates

20040016411 Lawrence Livermore National Lab., Livermore, CA
Transport Methods Conquering the Seven-Dimensional Mountain
Graziani, F. R.; Olson, G. L.; Jul. 21, 2003; 12 pp.; In English
Report No.(s): DE2003-15004858; UCRL-JC-154432; No Copyright; Avail: Department of Energy Information Bridge
In a wide variety of applications, a significant fraction of the momentum and energy present in a physical problem is carried by the transport of particles. Depending on the circumstances, the types of particles might involve some or all of photons, neutrinos, charged particles, or neutrons. In application areas that use transport, the computational time is usually dominated by the transport calculation. Therefore, there is a potential for great synergy; progress in transport algorithms could help quicken the time to solution for many applications.
NTIS
Particles; Charged Particles; Kinetic Energy

20040016416 Lawrence Livermore National Lab., Livermore, CA
Molecular Dynamics Simulations of Coulomb Explosion
Bringa, E. M.; May 17, 2002; 30 pp.; In English
Report No.(s): DE2003-15004808; UCRL-JC-148480; No Copyright; Avail: Department of Energy Information Bridge
A swift ion creates a track of electronic excitations in the target material. A net repulsion inside the track can cause a 'Coulomb Explosion', which can lead to damage and sputtering of the material. Here we report results from molecular-dynamics (MD) simulations of Coulomb explosion for a cylindrical track as a function of charge density and neutralization/quenching time,(tau). Screening by the free electrons is accounted for using a screened Coulomb potential for the interaction among charges. The yield exhibits a prompt component from the track core and a component, which dominates at higher excitation density, from the heated region produced. For the cases studied, the number of atoms ejected per incident ion, i.e. the sputtering yield Y, is quadratic with charge density along the track as suggested by simple models. Y((tau)= 0.2 Debye periods) is nearly 20% of the yield when there is no neutralization ((tau)(yields)(infinity)). The connections between 'Coulomb explosions', thermal spikes and measurements of electronic sputtering are discussed.
NTIS
Coulomb Potential; Molecular Dynamics; Atoms; Thermal Stability

20040016435 Lawrence Livermore National Lab., Livermore, CA
Test Stand for Linear Induction Accelerator Optimization
Ong, M.; DeHope, B.; Griffen, K.; Goerz, D.; Kihara, R.; Jun. 03, 2003; 10 pp.; In English
Report No.(s): DE2003-15004893; UCRL-JC-151424; No Copyright; Avail: Department of Energy Information Bridge

Lawrence Livermore National Laboratory has designed and constructed a test stand to improve the voltage regulation in our Flash X-Ray (FXR) accelerator cell. The goal is to create a more mono-energetic electron beam that will create an x-ray source with a smaller spot size. Studying the interaction of the beam and pulse-power system with the accelerator cell will improve the design of high-current accelerators at Livermore and elsewhere. On the test stand, a standard FXR cell is driven by a flexible pulse-power system and the beam current is simulated with a switched center conductor. The test stand is fully instrumented with high-speed digitizers to document the effect of impedance mismatches when the cell is operated under various full-voltage conditions.
NTIS
Linear Accelerators; Test Stands; Voltage Regulators; X Ray Sources; Analog to Digital Converters

20040016437 Lawrence Livermore National Lab., Livermore, CA
Mixed Electromagnetic and circuit Simulations using Higher-Order Elements and Bases
Rockway, J. D.; Champagne, N. J.; Handhyala, V.; Jun. 18, 2003; 10 pp.; In English
Report No.(s): DE2003-15004902; UCRL-JC-153834; No Copyright; Avail: Department of Energy Information Bridge

In this paper, an approach to couple higher-order electromagnetic surface integral equations to circuit simulations is presented. Terminals are defined that connect circuit elements to contacts modeled on the distributed electromagnetic domain. A modified charge-current continuity equation is proposed for a generalized KCL connection at the contacts. The distributive electromagnetic integral equations are developed using higher-order bases and elements that allow both better convergence and accuracy for modeling. The resulting scheme enables simultaneous solution of electromagnetic integral equations for arbitrarily-shaped objects and SPICE-like modeling for lumped circuits, and permits design iterations and visualization of the interaction between the two domains.
NTIS
Electromagnetic Interactions; Simulation; Circuits

20040020049
Observation of an Excited Charmed Baryon Decaying into xi(c)0 pi+
2003; 16 pp.; In English
Report No.(s): DE2003-813214; No Copyright; Avail: Department of Energy Information Bridge

Using data recorded by the CLEO-II detector at CESR, they report the first observation of an excited charmed baryon decaying into(Xi)(sub c)(sup 0)(pi)(sup+). The state has mass difference M((Xi)(sub c)(sup 0)(pi)(sup+))= M((Xi)(sub c)(sup 0)) of 174.3(+-) 0. 5(+-) 1.0 MeV/c(sup 2), and a width of 3.1 MeV/c(sup 2) (90% confidence level limit). They identify the new state as the(Xi)*(sub c)(sup+), the isospin partner of the recently discovered(Xi)*(sub c)(sup 0).
NTIS
Baryons; Charm (Particle Physics); Particle Decay; Excitation; Observation

20040020050
Measurement of B(D0 -> K-pi+ pi0)/B(D0 -> K- pi+)
2003; 16 pp.; In English
Report No.(s): DE2003-813217; SLAC-PUB-9936; No Copyright; Avail: Department of Energy Information Bridge

Using a sample of 3.1 fb(sup -1) integrated luminosity accumulated with the CLEO II detector at the Cornell Electron Storage Ring, they measure the ratio of branching fractions(Beta)(D(sup 0)(yields) K(sup -)(pi)(sup+)(pi)(sup 0))/(Beta)(D(sup 0)(yields) K(sup -)(pi)(sup+))= 3.81(+-) 0.07(+-) 0.26, the most precise determination of this quantity to date.
NTIS
Luminosity; Storage Rings (Particle Accelerators); Particle Decay; Branching (Physics)

20040020051
Measurement of the Branching Fraction for D(S) -> phi pi-
2003; 20 pp.; In English
Report No.(s): DE2003-813218; SLAC-PUB-9937; No Copyright; Avail: Department of Energy Information Bridge

The authors present a model-independent measurement of(Beta)(D(sub s)(sup -)(yields)(phi)(pi)(sup -))/(Beta)(D(sup 0)(yields) K(sup -)(pi)(sup+)) by partially reconstructing the decay(bar B)(sup 0)(yields) D*(sup+)D*(sub s)(sup -). Using data collected with the CLEO II detector at CESR, they determine(Beta)(D(sub s)(sup -)(yields)(phi)(pi)(sup -))/(Beta)(D(sup 0)(yields) K(sup -)(pi)(sup+))= 0. 92(+-) 0.20(stat.)(+-) 0.11(syst.). Their measurement of(Beta)(D(sup 0)(yields) K(sup -)(pi)(sup+)) then gives(Beta)(D(sub s)(sup -)(yields)(phi)(pi)(sup -))= (3.59(+-) 0.77(+-) 0.48)%.
NTIS
Particle Decay; Branching (Physics); Mathematical Models

20040020052 Oak Ridge National Lab., TN, USA
Alternate Energy Sources for Thermoplastic Binding Agent Consolidation
Frame, B. J.; Oct. 1998; 30 pp.; In English
Report No.(s): DE2003-814560; ORNL/TM-13744; No Copyright; Avail: Department of Energy Information Bridge
;Table of Contents: Abstract; Introduction; Background; Experimental; Technology assessment; Conclusions; Acknowledgments; References and Distribution.
NTIS
Technology Assessment; Thermoplasticity; Electric Generators

20040020062 Lawrence Livermore National Lab., Livermore, CA
CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility
Schmid, G. J.; Koch, J. A.; Moran, M. J.; Lerche, R. A.; Izumi, N.; Aug. 22, 2003; 16 pp.; In English
Report No.(s): DE2003-15005142; UCRL-JC-155158; No Copyright; Avail: Department of Energy Information Bridge
Synthetic diamond crystals produced by the Chemical Vapor Deposition (CVD) technique can serve as fast, radiation hard, neutron sensors for the National Ignition Facility (NIF). Here we explore the stability issues, such as charge trapping and high-flux saturation, that will be relevant to operation at the NIF.
NTIS
Vapor Deposition; Stability; Ignition; Diamonds; Detectors

20040020066 Lawrence Livermore National Lab., Livermore, CA
Gas Ionization by Beam Electron Collisions and by Electron Avalanching in the Self Ez Field of a 2 kA Relativistic Electron Beam Focused on a Conducting Target
Lauer, E.; May 23, 2003; 16 pp.; In English
Report No.(s): DE2003-15005181; UCRL-ID-153582; No Copyright; Avail: Department of Energy Information Bridge
Flash x-ray radiography for hydrodynamics testing requires that the electron beam have non-time dependent focusing on the target. Positive ions produced by gas ionization can cause disruption of the spot size on the converter target. We review two gas ionization processes.
NTIS
Electron Beams; Relativistic Electron Beams; Targets; Gas Ionization; Electron Scattering

20040021332 Stanford Linear Accelerator Center, Stanford, CA, USA
Observation of the Decay Beta(sup 0) approximately Tau(sup 0)Tau(sup 0)
Aubert, B.; Barate, R.; Boutigny, D.; Gaillard, J. M.; Hicheur, A.; Aug. 2003; 12 pp.; In English
Report No.(s): DE2003-815241; SLAC-PUB-10092; BABAR-PUB-03/028; No Copyright; Avail: Department of Energy Information Bridge
We present an observation of the decay B(sup 0)(yields)(pi)(sup 0)(pi)(sup 0) based on a sample of 124 million B(bar B) pairs recorded by the BABAR detector at the PEP-II asymmetric-energy B Factory at SLAC. We observe 46(+-) 13(+-) 3 events, where the first error is statistical and the second is systematic, corresponding to a significance of 4.2 standard deviations including systematic uncertainties. We measure the branching fraction(Beta)(B(sup 0)(yields)(pi)(sup 0)(pi)(sup 0))= (2.1(+-) 0.6(+-) 0. 3) x 10(sup -6), averaged over B(sup 0) and(bar B)(sup 0) decays.
NTIS
Particle Decay; Standard Deviation; Asymmetry

20040027687 Air Force Research Lab., Wright-Patterson AFB, OH
Magneto-Aerodynamic Hypersonics
Witzeman, F.; Dec. 2003; 7 pp.; In English
Contract(s)/Grant(s): Proj-2307
Report No.(s): AD-A419720; AFRL-VA-WP-TM-2004-3001; AFRL-VA-WP-TM-2004-3001; No Copyright; Avail: CASI; A02, Hardcopy

Favorable interactions of electromagnetic fields and weakly ionized air for flow control have been recognized since the late 1950s. Potential applications of flow control to hypersonic flight vehicles were recently demonstrated by Russian research and concepts. The scientific knowledge base of this interdisciplinary area (i.e., fluid dynamics, electromagnetics, and chemical and thermal nonequilibrium gas dynamics) is extremely sparse. Therefore, controversy and even misunderstandings are abundant in the research community. This report documents the in-house research project that was initiated to develop a validated magneto-aerodynamic hypersonic analysis capability. The project combined experimental and computational simulations of high-speed gas dynamics in order to verify the scientific findings and define the usable scope for practical hypersonic flight. Sponsorship was provided by the U.S. Air Force Research Laboratory's Office of Scientific Research (AFOSR) as part of an Entrepreneurial Research Initiative over the period 3 January 1999 through 30 September 2003.
DTIC
Electromagnetic Fields; Air Flow; Ionization

20040027691 Defence Research and Development Canada, Ottawa, Ontario, Canada
On the Implementation of Iterative Detection in Real-World MIMO Wireless Systems
DE Jong, Yvo; Dec. 2003; 55 pp.; In English
Report No.(s): AD-A419732; DRDC-TR-2003-242; CRC-RP-2003-009; No Copyright; Avail: CASI; A04, Hardcopy

Theoretically. multiple-input multiple-output (MIMO) wireless systems can achieve remarkably high spectral efficiency as compared to conventional, single-antenna systems. This report identifies a number of problems which need to be solved in order to implement practical MIMO systems: channel estimation, correlated fading, slow fading, asynchronous reception, and frequency-selective fading. The effects of these non-ideal conditions on the performance of MIMO systems are evaluated. and directions are explored in which solutions may be found. The focus of the report is on MIMO systems employing an iterative ('turbo') receiver. The results presented are based on the iterative tree search (ITS) detection scheme developed recently at CRC, but are expected to be typical of most iterative detectors that have been proposed in the MIMO literature. The main conclusion of the report is that iterative channel estimation and further development of an ITS-based detection scheme for asynchronous and wideband reception are the two most promising topics for future research in this area.
DTIC
Mimo (Control Systems); Wireless Communication; Iteration; Detection; Radiotelephones

20040027755 Fraunhofer-Inst. fuer Treib- und Explosivstoffe, Pfinztal-Berghausen
Characterization of the Microstructure of Fine Energetic Materials
Herrmann, Michael J.; Nov. 2003; 21 pp.; In English
Contract(s)/Grant(s): FA8655-02-M-4066
Report No.(s): AD-A419749; EOARD-SPC-02-4066; No Copyright; Avail: CASI; A03, Hardcopy

This report results from a contract tasking Fraunhofer Institut fur Chemische Technologie as follows: Lattice defects in energetic materials will be measured using X-ray diffraction. The method shall be tested for its ability to characterize lattice defects in RDX and HMX, where dislocations gliding and deformation twinning are believed to dominate mechanical behavior. X-ray diffraction patterns will be evaluated relating to phase, residual strain, crystallite size and micro strain. The occurring phases and the lattice parameters of the samples will be determined by Rietveld - method using literature data. Micro strain and crystallite size will be determined with the Williamson Hall method by plotting reciprocal peak widths versus reciprocal lattice distances. New routines for size/strain evaluation, implemented in Rietveld programs will be tested and compared with the Williamson Hall method.
DTIC
Microstructure; Crystal Defects; Diffraction Patterns

20040030512 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Approximating the Helium Wavefunction in Positronium-Helium Scattering
DiRienzi, Joseph; Drachman, Richard J.; [2003]; 1 pp.; In English; International Conference on Positron Annihilation 13, 7-13 Sep. 2003, Kyoto, Japan; No Copyright; Avail: Other Sources; Abstract Only

In the Kohn variational treatment of the positronium- hydrogen scattering problem the scattering wave function is approximated by an expansion in some appropriate basis set, but the target and projectile wave functions are known exactly. In the positronium-helium case, however, a difficulty immediately arises in that the wave function of the helium target atom is not known exactly, and there are several ways to deal with the associated eigenvalue in formulating the variational scattering equations to be solved. In this work we will use the Kohn variational principle in the static exchange approximation to d e t e e the zero-energy scattering length for the Ps-He system, using a suite of approximate target functions. The results we obtain will be compared with each other and with corresponding values found by other approximation techniques.
Author
Helium Atoms; Wave Functions; Approximation; Scattering

20040031549 Lawrence Livermore National Lab., Livermore, CA
Barrier Foil Heating Simulations Using LASNEX
Ho, D. D. M.; Mar. 12, 2002; 18 pp.; In English
Report No.(s): DE2003-15004651; UCRL-ID-147750; No Copyright; Avail: Department of Energy Information Bridge
It is necessary to place a barrier foil in front of the X-ray converter target to prevent the backstreaming ions. This research note presents the simulations of foil heating using the latest EOS tables. LASNEX simulations are carried out using both DARHT-I1 and ETA-I1 beam parameters. Results for all the foils studied here, using the DARHT-I1 beam parameters, show that the integrated line density along the axis at the end of the 4th pulse remains essentially unchanged even if the foils are heated by beams with relatively small beam spot sizes. The temperature can reach up to 3000 degree C on graphite foil but can only reach several hundred degree Celsius on Mylar foil. Simulations also show that ETA-I1 beam can create a 'burn-through' hole on all the foils except graphite and diamond foils, which may require pre-heat. The threshold beam spot size required for hole formation will be compared with LASNEX simulation for the purpose of code verification.
NTIS
Computerized Simulation; Graphite; Carbon

20040031551 Lawrence Livermore National Lab., Livermore, CA
Hydrodynamic Modeing of a Multi-Pulse X-Ray Converter Target for DARHT-II
Ho, D. D. M.; Chen, Y. J.; Harte, J.; Young, D.; Jun. 28, 2001; 16 pp.; In English
Report No.(s): DE2003-15005028; UCRL-JC-144265; No Copyright; Avail: Department of Energy Information Bridge
In phase two of the Dual-Axis Radiographic Hydrodynamic Test facility (DARHT-II), four electron beam pulses of variable pulse length strike an X-ray converter target to produce time-resolved X-ray image. An important requirement for the converter target is to minimize the hydrodynamic expansion of the converter material so that there is enough material to generate the required X-ray dose for all four pulses. Minimizing the hydrodynamic expansion is also important from the standpoint of beam transport. If there is too much expansion of the converter material, the spot-size of the beam will deteriorate due to the charge neutralization of the beam by the target plasma. The beam spot size can also be deteriorated by backstreaming ions. However, this effect can be minimized by placing a barrier foil in front of the target. In this paper, we present a converter target design, based on the simulations using the radiation hydrodynamics code LASNEX and the Monte Carlo radiation transport code MCNP, that can produce the required X-ray dose for all four pulses with tolerable X-ray spot size variation. Our calculations also show that the barrier foil may block the backstreaming ions for all four pulses.
NTIS
X Rays; Accelerators; Radiation Transport

20040031553 Lawrence Livermore National Lab., Livermore, CA
Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels
Takagi, M.; Cook, R.; McQuillan, B.; Elsner, F.; Stephens, R.; Jun. 07, 2002; 20 pp.; In English
Report No.(s): DE2003-15005032; UCRL-ID-148920; No Copyright; Avail: Department of Energy Information Bridge
All planned National Ignition Facility (NIF) capsule targets except machined beryllium require a plastic mandrel upon which the ablator is applied. This mandrel must at least meet if not exceed the symmetry and surface finish requirements of the final capsule. The mandrels are produced by a two-step process. In the first step a thin-walled poly(alpha-methylstyrene)(PaMS) shell is produced using microencapsulation techniques. This shell is overcoated with 10 to 15 pm of glow discharge polymer (GDP) and then pyrolyzed at 300 degrees C. This pyrolysis causes the PaMS to depolymerize to gas phase monomer that diffuses away through the more thermally stable plasma polymer shell, which retains all the symmetry of the original PaMS shell. Thus our challenge has been to produce 2-mm-diameter PaMS shells to serve as these initial

'decomposable' mandrels that meet or exceed the current NIF design specifications.
NTIS
Glow Discharges; Coatings; Polymers; Plasmas (Physics)

20040031557 Lawrence Livermore National Lab., Livermore, CA
Investigation of Explosively Driven Fragmentation of Metals-Two=Dimensional Fracture and Fragmentation of Metal Shells: Progress Report II
Grady, D.; Feb. 01, 2003; 96 pp.; In English
Report No.(s): DE2003-15005042; UCRL-CR-152264; No Copyright; Avail: Department of Energy Information Bridge

During the current report period key features regarding the physics and statistics of dynamic fragmentation, within the scope of the approaches pursued initially by Mott and later by the present author, have fallen nicely into place. The largely statistical ideas of Mott, and the later energy-based concepts, are shown here to be sensibly compatible. Based on very reasonable assumptions this fragmentation theory is extended to the general dynamic breakup of an expanding metal shell. The fragmentation theory is joined with a physical model for the prediction of the amount of expansion strain the shell can accommodate before onset of fracture. With the joining of the theories quite general calculations regarding the statistical temporal and spatial breakup of the shell can be made. Preliminary engineering codes have been pursued to exercise the failure and fragmentation models. Demonstration calculations with these codes have been performed. Continued efforts need to focus in further detail on some of the key fracture and fragmentation phenomena essential to the underlying model physics. This addition study will be nicely driven by new experimental methods that are being pursued. Also, additional development and verification of the engineering codes will be needed. This effort will also benefit from emerging experimental results.
NTIS
Fragmentation; Detonation Waves; Shells (Structural Forms); Metal Shells; Mathematical Models

20040031583 Lawrence Livermore National Lab., Livermore, CA
Atomic-Based Calculations of Two-Detector Doppler-Broadening Spectra
Sterne, P. A.; Asoka-Kumar, P.; Howell, R. H.; Dec. 11, 2001; 16 pp.; In English
Report No.(s): DE2003-15004691; UCRL-JC-144719; No Copyright; Avail: Department of Energy Information Bridge

We present a simplified approach for calculating Doppler broadening spectra based purely on atomic calculations. This approach avoids the need for detailed atomic positions, and can provide the characteristic momentum spectra for any element. We demonstrate the power of this method by comparing theory and experiment for a number of elemental metals and alkali halides. In the alkali halides, the annihilation appears to be entirely with halide electrons.
NTIS
Alkali Halides; Annihilation Reactions; Doppler Effect

20040031594 Lawrence Livermore National Lab., Livermore, CA
Electron Cyclotron Heating and Current Drive for Maintaining Minimum q in Negative Central Shear Discharges
Casper, T. A.; Kaiser, T. B.; Jong, R. A.; LoDestro, L. L.; Moller, J.; Apr. 2003; 32 pp.; In English
Report No.(s): DE2003-15004711; UCRL-JC-152890; No Copyright; Avail: Department of Energy Information Bridge

Toroidal plasmas created with negative magnetic shear in the core region offer advantages in terms of MHD stability properties. These plasmas, transiently created in several tokamaks, have exhibited high performance as measured by normalized stored energy and neutron production rates. A critical issue with extending the duration of these plasmas is the need to maintain the off-axis-peaked current distribution required to support the minimum in the safety factor q at large radii. We present equilibrium and transport simulations that explore the use of electron cyclotron heating and current drive to maintain this negative shear configuration. Using parameters consistent with DIII-D tokamak operation, we find that with sufficiently high injected power, it is possible to achieve steady-state conditions employing well aligned electron cyclotron and bootstrap current drive in fully non-inductively current-driven configurations.
NTIS
Electron Cyclotron Heating; Current Distribution; Magnetohydrodynamic Stability

20040031598 Lawrence Livermore National Lab., Livermore, CA
Modern Trends in Induction Accelerator Technology
Caporaso, G. J.; Jun. 17, 2003; 42 pp.; In English
Report No.(s): DE2003-15004849; UCRL-JC-150731; No Copyright; Avail: Department of Energy Information Bridge

Recent advances in solid-state modulators now permit the design of a new class of high current accelerators. These new accelerators will be able to operate in burst mode at frequencies of several MHz with unprecedented flexibility and precision in pulse format. These new modulators can drive accelerators to high average powers that far exceed those of any other technology and can be used to enable precision beam manipulations. New insulator technology combined with novel pulse forming lines and switching may enable the construction of a new type of high gradient, high current accelerator.
NTIS
Modulators; Solid State; Accelerators; Technology Utilization

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*.

20040016448 Lawrence Livermore National Lab., Livermore, CA
Acoustic Propagation in a Water-Filled Cylindrical Pipe
Sullivan, E. J.; Candy, J. V.; Jun. 2003; 26 pp.; In English
Report No.(s): DE2003-15004932; UCRL-ID-153887; No Copyright; Avail: Department of Energy Information Bridge
This study was concerned with the physics of the propagation of a tone burst of high frequency sound in a steel water-filled pipe. The choice of the pulse was rather arbitrary, so that this work in no way can be considered as recommending a particular pulse form. However, the MATLAB computer codes developed in this study are general enough to carry out studies of pulses of various forms. Also, it should be pointed out that the codes as written are quite time consuming. A computation of the complete field, including all 5995 modes, requires several hours on a desktop computer. The time required by such computations as these is a direct consequence of the bandwidths, frequencies and sample rates employed. No attempt was made to optimize these codes, and it is assumed that much can be done in this regard.
NTIS
Acoustic Propagation; Cylindrical Bodies; Pulses

20040027703 Georgia Inst. of Tech., Atlanta, GA
Low-Frequency Shallow Water Reverberation and Bottom Scattering Model
Li, Fenghua; Liu, Jianjun; Zhang, Renhe; Zhou, Jixun; Oct. 2002; 41 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419785; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs on presentation of low-frequency shallow water reverberation and bottom scattering mode as observed in the South China Sea.
DTIC
Low Frequencies; Reverberation; Shallow Water; China; Ocean Bottom

20040027710 Georgia Inst. of Tech., Atlanta, GA
Preliminary Analysis of Reverberation Data in ASIAEX Experiment
Liu, Jianjun; Li, Fenghua; Zhang, Renhe; Zhou, Jixun; Oct. 2002; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419787; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs on presentation of analysis of reverberation data in the ASIAEX experiment.
DTIC
Reverberation; Underwater Explosions

20040027711 Naval Postgraduate School, Monterey, CA
Direct Path Fluctuations Due to Shallow Water Volume Variability
Karpi, Stephen; Smith, Kevin B.; Ramp, Steve; Dahl, Peter H.; Oct. 2002; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419791; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs for presentation on direct path fluctuations due to shallow water volume variability as observed in the East China Sea.
DTIC
China; Seas; Shallow Water; Variability

20040027718 Washington Univ., Seattle, WA
The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation
Ramp, Steven R.; Chiu, Ching-Sang; Bahr, Fred; Lynch, James; Duda, Tim; Oct. 2002; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419789; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs on presentation of the shelf-edge environment in the Central East China Sea and its impact on low frequency acoustic wave propagation.
DTIC
Acoustic Propagation; China; Low Frequencies; Seas

20040027719 Naval Postgraduate School, Monterey, CA
Frequency Dependence of Effective Bottom Attenuation Due to Environmental Variability
Smith, Kevin B.; Nickila, James D.; Oct. 2002; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419792; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs on presentation of frequency dependence of effective bottom attenuation due to environmental variability as observed in the East China Sea.
DTIC
Frequency Distribution; Acoustic Attenuation; Frequencies; Variability; Underwater Acoustics

20040027725 JAYCOR, San Diego, CA
Hand-Held Ultrasonic Through-the-Wall Monitoring of Stationary and Moving People
Wild, Norbert; Nov. 2003; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-C-0196; Proj-CWDP
Report No.(s): AD-A419758; AFRL-IF-RS-TR-2003-268; No Copyright; Avail: CASI; A03, Hardcopy
A prototype system for monitoring respiration and movement through metallic and non-metallic walls has been developed and demonstrated. The man-portable sensor uses high energy ultrasonic pulses and ultra low noise amplification of the return pulse echoes to detect the breathing or motion of individuals in an enclosed space. A real-time video display on the hand-held transducer assembly provides the user with a measure of the location of the detected motion to within one- foot accuracy, out to a maximum range of thirty feet. Pulse forming circuitry, data acquisition and processing electronics, and battery power are stowed in a backpack. The sensor was designed to penetrate through a variety of wall materials and configurations; however, a limitation exists on its ability to penetrate through multi-layer wall configurations, such as are commonly found in residential and commercial buildings, where a significant air gap might exist between the inner and outer wall layers. Potential applications for this sensor include search and rescue, law enforcement, and vehicle and container inspection.
DTIC
Rescue Operations; Monitors; Display Devices; Indicating Instruments

20040027785 Florida Atlantic Univ., Boca Raton, FL
Seabed Attenuation Estimated From Chirp Sonar Data Collected Along Acoustic Propagation Lines During ASIAEX in the South China Sea
Schock, S. G.; Oct. 2002; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419781; No Copyright; Avail: CASI; A03, Hardcopy
Briefing charts on presentation of seabed attenuation estimated from chirp sonar data collected along acoustic propagation lines in the South China Sea.
DTIC
Acoustic Attenuation; Sonar; Data Acquisition

20040027809 Woods Hole Oceanographic Inst., MA, USA
ASIAEX South China Sea Acoustic Fluctuations (and Physical Oceanography)
Duda, Tim; Wu, Lixin; Lynch, Jim; Oct. 2002; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419782; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs of presentation on acoustic fluctuations and physical oceanography in the South China Sea.
DTIC
Acoustic Properties; Ocean Dynamics; Oceanography; Variations

20040027810 Bolt, Beranek, and Newman, Inc., Arlington, VA, USA
Frequency and Angular Dependence of Low Frequency East China Sea Bottom Scattering Strengths
Dorfman, Y.; Cable, P. G.; Knobles, D. P.; Yudichak, T. W.; Oct. 2002; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419788; No Copyright; Avail: CASI; A03, Hardcopy

Viewgraphs for a progress report on the frequency and angular dependence of low frequency bottom scattering strengths as observed in the East China Sea.
DTIC
Acoustic Scattering; Angular Distribution; Frequencies; Low Frequencies

20040027811 Naval Research Lab., Washington, DC
Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS)
Wolf, Stephen N.; Pasewark, Bruce H.; Orr, Marshall H.; Mignerey, Peter C.; Lynch, James F.; Oct. 2002; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419783; No Copyright; Avail: CASI; A03, Hardcopy

Viewgraphs on presentation of acoustic horizontal coherence and beamwidth variability observed in the South China Sea.
DTIC
Acoustic Properties; Coherent Radiation

20040027812 Washington Univ., Seattle, WA
Mid-Frequency Bottom Backscatter, Environmental Measurements, Model/data Comparison, and Implications to Reverberations
Tang, Dajun; Oct. 2002; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419784; No Copyright; Avail: CASI; A03, Hardcopy

Viewgraphs on presentation of mid-frequency bottom backscatter, environmental measurements, model/data comparisons and implications to reverberations as measured in the South China Sea.
DTIC
Backscattering; Ocean Bottom; Environment Models; Reverberation

20040027959 NASA Langley Research Center, Hampton, VA, USA
Temporal Characterization of Aircraft Noise Sources
Grosveld, Ferdinand W.; Sullivan, Brenda M.; Rizzi, Stephen A.; [2004]; 11 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAS1-00135; 781-20-11-01
Report No.(s): AIAA Paper 2004-1029; No Copyright; Avail: CASI; A03, Hardcopy

Current aircraft source noise prediction tools yield time-independent frequency spectra as functions of directivity angle. Realistic evaluation and human assessment of aircraft fly-over noise require the temporal characteristics of the noise signature. The purpose of the current study is to analyze empirical data from broadband jet and tonal fan noise sources and to provide the temporal information required for prediction-based synthesis. Noise sources included a one-tenth-scale engine exhaust nozzle and a one-fifth scale scale turbofan engine. A methodology was developed to characterize the low frequency fluctuations employing the Short Time Fourier Transform in a MATLAB computing environment. It was shown that a trade-off is necessary between frequency and time resolution in the acoustic spectrogram. The procedure requires careful evaluation and selection of the data analysis parameters, including the data sampling frequency, Fourier Transform window size, associated time period and frequency resolution, and time period window overlap. Low frequency fluctuations were applied to the synthesis of broadband noise with the resulting records sounding virtually indistinguishable from the measured data in initial subjective evaluations. Amplitude fluctuations of blade passage frequency (BPF) harmonics were successfully characterized for conditions equivalent to take-off and approach. Data demonstrated that the fifth harmonic of the BPF varied more in frequency than the BPF itself and exhibited larger amplitude fluctuations over the duration of the time record. Frequency fluctuations were found to be not perceptible in the current characterization of tonal components.
Author
Jet Aircraft Noise; Noise Prediction (Aircraft); Methodology; Temporal Resolution; Aeroacoustics

20040027965 Northwestern Polytechnical Univ., Xian
Broadband Geoacoustic Matched Field Inversion with Multi-step Strategy from ASIAEX 2001
Yang, Kunde; Ma, Yuanliang; Oct. 2002; 52 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419846; No Copyright; Avail: CASI; A04, Hardcopy

Viewgraphs from presentation on broadband geoacoustic matched field inversion with multi-step strategies used in ASIAEX 2001.
DTIC
Inversions; Acoustic Properties

20040028004 Georgia Inst. of Tech., Atlanta, GA
Seabottom Acoustics Parameters from Reverberation Vertical Coherence in Shallow Water
Zhou, Jin-Xun; Zhang, Xue-Zhen; Oct. 2002; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419847; No Copyright; Avail: CASI; A03, Hardcopy
Viewgraphs from presentation of seabottom acoustics parameters from reverberation vertical coherence in shallow water.
DTIC
Reverberation; Underwater Acoustics

20040030402 Interior Dept., Washington, DC, USA
Nutrients in the Upper Mississippi River: Scientific Information to Support Management Decisions. The Upper Mississippi River - Values and Vulnerability
Jul. 2003; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419980; No Copyright; Avail: CASI; A02, Hardcopy
The Upper Mississippi River (UMR) flows south about 1,300 miles from its head-waters in Minnesota to its confluence with the Ohio River at Cairo, Illinois. The river gains volume along its path as it drains nearly 190,000 square miles (490,000 sq km) of land, extending over parts of South Dakota, Minnesota, Wisconsin, Iowa, Illinois, and Missouri. The UMR is valued as a multiple-use resource where commercial navigation, water supply, and recreational demands coexist with valued natural resources. Some 780 million tons of commodities are transported on the river annually. More than 30 million residents rely on river water for uses such as public and industrial supplies and power plant cooling. The river hosts about 12 million recreational visitors annually. When the public has been asked to identify priorities for the river, however, environmental uses were considered more important. The river is home to a wide variety of wildlife, fish, and aquatic invertebrates. Added to these year- round residents are the many bird species that migrate through the corridor or stop seasonally to breed or over-winter. The fact that three major National Wildlife Refuge complexes and several National Park units have been established along the corridor of the UMR reflects the river's importance to the natural resources of the Nation.
DTIC
Resources; National Parks; Aquatic Plants; Water Consumption; Mississippi River (Us)

20040031554 Department of the Navy, Washington, DC
Decision Feedback Equalization Pre-Processor with Turbo Equalizer
Blackmon, Fletcher A., Inventor; Sep. 15, 2003; 21 pp.; In English
Patent Info.: Filed 15 Sep. 2003; US-Patent-Appl-SN-10663054
Report No.(s): AD-D020119; No Copyright; Avail: Other Sources
The present invention provides a receiver for underwater acoustic telemetry that combines a decision feedback adaptive-equalizer structure with a turbo-equalizer structure. The turbo-equalizer structure is of significantly reduced complexity because the decision feedback adaptive- equalizer structure is operable to pre-process a plurality of data channels to provide a single symbol data output stream for application to the input of the turbo equalizer. The turbo- equalizer structure is also of reduced complexity due to use of a correlator to provide channel response data to the turbo equalizer. The channel response data is produced by comparing received data comprising a training sequence with a locally produced training sequence. (2 figures)
DTIC
Underwater Acoustics; Channels (Data Transmission); Correlators; Telemetry

20040031563 NASA Glenn Research Center, Cleveland, OH, USA
Computing Axisymmetric Jet Screech Tones using Unstructured Grids
Jorgenson, Philip C. E.; Loh, Ching Y.; [2003]; 20 pp.; In English
Contract(s)/Grant(s): 22-708-87-25; No Copyright; Avail: CASI; A03, Hardcopy
The purpose of this paper is to show that computations with an aeroacoustic feedback loop, the jet screech noise, can be obtained using truly unstructured grid technology. Numerical results are presented for a nozzle with two different lip

thicknesses which will be referred to in this paper as a thin and a thick lip nozzle respectively. The space-time conservation element and solution element (CE/SE) method is used to solve the conservation laws of the compressible axisymmetric Navier-Stokes equations. The equations are time marched to predict the unsteady flow and the near-field screech tone noise issuing from an underexpanded circular jet. The CE/SE method uses an unstructured grid based data structure. The unstructured grids for these calculations are generated based on the method of Delaunay triangulation. Comparisons of numerical results with available experimental data are shown for flows corresponding to several different jet Mach numbers. Generally good agreement is obtained in terms of flow physics, screech tone frequency, and sound pressure level.
Author
Unstructured Grids (Mathematics); Screech Tones; Aeroacoustics; Axisymmetric Flow; Nozzle Geometry

20040031572 NASA Glenn Research Center, Cleveland, OH, USA
Investigations of High Pressure Acoustic Waves in Resonators with Seal-like Features
Daniels, Christopher; Steinetz, Bruce; Finkbeiner, Joshua; [2003]; 22 pp.; In English; NASA Seal/Secondary Air Flow Systems Workshop, 5-6 Nov. 2003, Cleveland, OH, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-840; WBS 22-708-28-15; No Copyright; Avail: CASI; A03, Hardcopy

A conical resonator (having a dissonant acoustic design) was tested in four configurations: (1) baseline resonator with closed ends and no blockage, (2) closed resonator with internal blockage, (3) ventilated resonator with no blockage, and (4) ventilated resonator with an applied pressure differential. These tests were conducted to investigate the effects of blockage and ventilation holes on dynamic pressurization. Additionally, the investigation was to determine the ability of acoustic pressurization to impede flow through the resonator. In each of the configurations studied, the entire resonator was oscillated at the gas resonant frequency while dynamic pressure, static pressure, and temperature of the fluid were measured. In the final configuration, flow through the resonator was recorded for three oscillation conditions. Ambient condition air was used as the working fluid.
Author
High Pressure; Resonators; Sound Waves; Seals (Stoppers)

20040031587 NASA Langley Research Center, Hampton, VA, USA
Broadband Trailing Edge Noise Predictions in the Time Domain
Casper, Jay; Farassat, Fereidoun; [2003]; 38 pp.; In English
Contract(s)/Grant(s): 781-10-11-01; No Copyright; Avail: CASI; A03, Hardcopy

A recently developed analytic result in acoustics, 'Formulation 1B,' is used to compute broadband trailing edge noise from an unsteady surface pressure distribution on a thin airfoil in the time domain. This formulation is a new solution of the Ffowcs Willliams-Hawkings equation with the loading source term, and has been shown in previous research to provide time domain predictions of broadband noise that are in excellent agreement with experimental results. Furthermore, this formulation lends itself readily to rotating reference frames and statistical analysis of broadband trailing edge noise. Formulation 1B is used to calculate the far field noise radiated from the trailing edge of a NACA 0012 airfoil in low Mach number flows, by using both analytical and experimental data on the airfoil surface. The acoustic predictions are compared with analytical results and experimental measurements that are available in the literature. Good agreement between predictions and measurements is obtained.
Author
Aeroacoustics; Broadband; Trailing Edges; Computational Fluid Dynamics; Noise Prediction (Aircraft); Mathematical Models; Time Domain Analysis

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*.

20040028042 Army Research Lab., Adelphi, MD
In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols
Gurton, Kristan P.; Ligon, David; Dahmani, Rachid; Sep. 2003; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419908; ARL-TR-3071; No Copyright; Avail: CASI; A03, Hardcopy

We conducted a series spectral extinction measurements on a variety of aerosolized chemical and biological simulants

over the spectral range 3-13 microns using conventional Fourier transform infrared (FTIR) aerosol spectroscopy. Samples consist of both aerosolized particulates and atomized liquids. Materials considered include Bacillus Subtilis endospores (BG), lyophilized ovalbumin, polyethylene glycol (PEG), dimethicone (SF-96 grade 50), and three common background materials (Kaolin clay HYDRATED ALUMINUM SILICATEL, Arizona road dust PRIMARILY SiO2, and diesel soot). Aerosol size distributions and mass density were measured simultaneously with the FTIR spectra. As a result all optical parameters presented here are mass-normalized, i.e., (m2/g).
DTIC
Aerosols; Infrared Spectroscopy; In Situ Measurement; Polyethylenes; Silicon Dioxide; Spectrum Analysis

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*.

20040016279 Lawrence Livermore National Lab., Livermore, CA
Scoping Inventory Calculations for the Rare Isotope Accelerator
Ahle, L. E.; Boles, J. L.; Jul. 25, 2003; 16 pp.; In English
Report No.(s): DE2003-15004552; UCRL-ID-154783; No Copyright; Avail: Department of Energy Information Bridge

This document is a report on our activities in FY03 exploring nuclear safety and hazard analysis issues relevant to the Rare Isotope Accelerator (RIA). It is not clear whether DOE will classify the RIA as an accelerator facility subject to the accelerator-specific safety requirements of DOE Order 420.2A or as a nonreactor nuclear facility subject to the requirements of 10 CFR 830. The final outcome of this issue will have significant impact on the construction and operation of the facility and the quality assurance requirements for items or services that may affect nuclear safety. The resolution of this issue will be an important earlier decision for the RIA project team and will require early consultation with the appropriate DOE authorities. For nuclear facilities, facility hazard classification depends on the inventory of releasable radionuclides; therefore, some simplistic, scoping inventory calculations for some assumed targets and beams are done to estimate the hazard category of RIA if it is declared a nuclear facility.
NTIS
Radiation Protection; Radioactive Isotopes; Safety; Inventories; Computation

74
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*.

20040016280 Lawrence Livermore National Lab., Livermore, CA
Novel EUV Mask Blank Defect Repair Developments
Hau-Riege, S. P.; Barty, A.; Mirkarimi, P.; Mar. 31, 2003; 24 pp.; In English
Report No.(s): DE2003-15004555; No Copyright; Avail: Department of Energy Information Bridge

The development of defect-free reticle blanks is an important challenge facing the commercialization of extreme ultraviolet lithography (EUVL). The basis of EUVL reticles are mask blanks consisting of a substrate and a reflective Mo/Si multilayer. Defects on the substrate or defects introduced during multilayer deposition can result in critical phase and amplitude defects. Amplitude- or phase-defect repair techniques are being developed with the goal to repair many of these defects. In this report, we discuss progress in two areas of defect repair: (1) We discuss the effect of the residual reflectance variation over the repair zone after amplitude-defect repair on the process window. This allows the determination of the maximum tolerable residual damage induced by amplitude defect repair. (2) We further performed a quantitative assessment of the yield improvement due to defect repair. We found that amplitude- and phase-defect repair have the potential to significantly improve mask blank yield. Our calculations further show that yield can be maximized by increasing the number of Mo/Si bilayers.
NTIS
Reticles; Lithography; Masking; Extreme Ultraviolet Radiation

20040016281 Lawrence Livermore National Lab., Livermore, CA

National Ignition Facility: The World's Largest Optics and Laser System

Moses, E. I.; Campbell, J. H.; Stolz, C. J.; Wuest, C. R.; Jan. 27, 2003; 22 pp.; In English

Report No.(s): DE2003-15004617; UCRL-JC-151593; No Copyright; Avail: Department of Energy Information Bridge

The National Ignition Facility, a center for the study of high energy density plasma physics and fusion energy ignition, is currently under construction at the Lawrence Livermore National Laboratory. The heart of the NIF is a frequency tripled, flashlamp-pumped Nd: glass laser system comprised of 192 independent laser beams. The laser system is capable of generating output energies of 1.8MJ at 351nm and at peak powers of 500 TW in a flexible temporal pulse format. A description of the NIF laser system and its major components is presented. We also discuss the manufacture of nearly 7500 precision large optics required by the NIF including data on the manufactured optical quality vs. specification. In addition, we present results from an on-going program to improve the operational lifetime of optics exposed to high fluence in the 351-nm section of the laser.

NTIS

Optics; Plasma Physics; Laser Beams

20040016313 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope

Bos, Brent; Davila, Pam; Jurotich, Matthew; Hobbs, Gurnie; Lightsey, Paul; Contreras, Jim; Whitman, Tony; [2003]; 1 pp.; In English; SPIE Meeting on Astronomical Telescopes and Instrumentation, 21-24 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

The James Webb Space Telescope (JWST) is a space-based, infrared observatory designed to study the early stages of galaxy formation in the Universe. The telescope will be launched into an elliptical orbit about the second Lagrange point and passively cooled to 30-50 K to enable astronomical observations from 0.6 to 28 microns. A group from the NASA Goddard Space Flight Center and the Northrop Grumman Space Technology prime contractor team has developed an optical and mechanical layout for the science instruments within the JWST field of view that satisfies the telescope s high-level performance requirements. Four instruments required accommodation within the telescope's field of view: a Near-Infrared Camera (NIRCam) provided by the University of Arizona; a Near-Mared Spectrometer (NIRSpec) provided by the European Space Agency; a Mid-Infrared Instrument (MIRI) provided by the Jet Propulsion Laboratory and a European consortium; and a Fine Guidance Sensor (FGS) with a tunable filter module provided by the Canadian Space Agency. The size and position of each instrument's field of view allocation were developed through an iterative, concurrent engineering process involving the key observatory stakeholders. While some of the system design considerations were those typically encountered during the development of an infrared observatory, others were unique to the deployable and controllable nature of JWST. This paper describes the optical and mechanical issues considered during the field of view layout development, as well as the supporting modeling and analysis activities.

Author

Cameras; Field of View; James Webb Space Telescope; Layouts; Systems Engineering; Optical Equipment; Mechanical Engineering

20040016324 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Constellation-X Observatory

Weaver, Kimberly; [2003]; 1 pp.; In English; American Physical Society Meeting, 5-7 Apr. 2003, Philadelphia, PA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Constellation X-ray mission will revolutionize X-ray spectroscopy and will provide a key component of NASA's '!Beyond Einstein' program. Over the past 35 years, X-ray astronomy has grown from infancy to near-maturity and is now an indispensable astrophysical tool. Constellation-X will transform this field from the exploratory spectroscopic era of Chandra and XMM to an era of fully comprehensive spectroscopic studies. The mission will consist of four 1.6-meter X-ray telescopes orbiting the Earth/Sun system. By providing a factor of 100 increase in throughput over previous missions, as well as high spectral resolution and a broad energy bandpass, Constellation-X will obtain high quality spectra for all classes of X-ray sources over a wide range of luminosity and redshift. It will study the warping of space and time near black holes, determine the distribution of ordinary matter, dark matter and dark energy, and probe detailed physical processes that occur at temperatures, densities and pressures far beyond those achievable in Earth-bound laboratories.

Author

Constellations; X Rays; Missions; X Ray Spectroscopy; Spectral Resolution; Red Shift; Dark Matter

20040016356 Lawrence Livermore National Lab., Livermore, CA
Wavefront Control for Extreme Adaptive Optics
Poyneer, L. A.; Jul. 2003; 18 pp.; In English
Report No.(s): DE2003-15004429; UCRL-JC-154631; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Adaptive Optics; Mirrors

20040016357 Lawrence Livermore National Lab., Livermore, CA
Scene-Based Wave-Front Sensing for Remote Imaging
Poyneer, L. A.; La Fortune, K.; Chan, C.; Jul. 2003; 18 pp.; In English
Report No.(s): DE2003-15004430; UCRL-JC-154654; No Copyright; Avail: Department of Energy Information Bridge
Scene-based wave-front sensing (SBWFS) is a technique that allows an arbitrary scene to be used for wave-front sensing with adaptive optics (AO) instead of the normal point source. This makes AO feasible in a wide range of interesting scenarios. This paper first presents the basic concepts and properties of SBWFS. Then it discusses that application of this technique with AO to remote imaging. For the specific case of correction of a lightweight optic. End-to-end simulation results establish that in this case, SBWFS can perform as well as point-source AO. Design considerations such as noise propagation, number of subapertures and tracking changing image content are analyzed.
NTIS
Adaptive Optics; Noise Propagation; Point Sources

20040016401 Lawrence Livermore National Lab., Livermore, CA
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments
Cowan, T. E.; Hunt, A. W.; Johnson, J.; Perry, M. D.; Fountain, W.; Sep. 09, 1999; 18 pp.; In English
Report No.(s): DE2003-15004763; UCRL-JC-137797; No Copyright; Avail: Department of Energy Information Bridge
The Petawatt laser at Lawrence Livermore National Laboratory has opened a new regime of high-energy laser-matter interactions in which the quiver motion of plasma electrons is fully relativistic with energies extending well above the threshold for nuclear processes. We have observed that, in addition to the large flux of several MeV electrons ponderomotively expelled from the ultra-intense laser focus, there is a high energy component of electrons extendmg to approx. 100 MeV, apparently from relativistic self-focusing and plasma acceleration in the underdense pre-formed plasma. The generation of hard bremsstrahlung cascade as these electrons traverse the solid target material, and the resulting photo-nuclear reactions, nuclear fission, and positron-electron pair production are described.
NTIS
Nuclear Fission; Electromagnetic Interactions; Photonuclear Reactions; Plasmas (Physics); Electrons

20040016403 Lawrence Livermore National Lab., Livermore, CA
Endoscopic Subsurface Imaging in Tissues
Demos, S.; Staggs, M.; Radousky, H. B.; Feb. 12, 2001; 10 pp.; In English
Report No.(s): DE2003-15004764; UCRL-JC-139493; No Copyright; Avail: Department of Energy Information Bridge
The objective of this work is to develop endoscopic subsurface optical imaging technology that will be able to image different tissue components located underneath the surface of the tissue at an imaging depth of up to 1 centimeter. This effort is based on the utilization of existing technology and components developed for medical endoscopes with the incorporation of the appropriate modifications to implement the spectral and polarization difference imaging technique. This subsurface imaging technique employs polarization and spectral light discrimination in combination with image processing to remove a large portion of the image information from the outer layers of the tissue which leads to enhancement of the contrast and image quality of subsurface tissue structures.
NTIS
Endoscopes; Polarization; Imaging Techniques

20040016404 Lawrence Livermore National Lab., Livermore, CA
RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source
Le Sage, G. P.; Anderson, S. G.; Cowan, T. E.; Crane, J. K.; Ditmire, T.; Aug. 15, 2000; 20 pp.; In English
Report No.(s): DE2003-15004767; UCRL-JC-140148; No Copyright; Avail: Department of Energy Information Bridge
An important motivation in the development of thc next generation x-ray light sources is to achieve picosecond and sub-ps

pulses of hard x-rays for dynamic studies of a variety of physical, chemical and biological processes. Present hard x-ray sources are either pulse-width or intensity limited, which allows ps-scale temporal resolution only for signal averaging of highly repetitive processes. A much faster and brighter hard x-ray source is being developed at LLNL, based on Thomson scattering of fs-laser pulses by a relativistic electron beam, which will enable x-ray characterization of the transient structure of a sample in a single shot. Experimental and diagnostic techniques relevant to the devclopment of next generation sources including the Linac Coherent Light Source can be tested with the Thomson scattering hard x-ray source. This source will combine an RF photoinjector with a 100 MeV S-band linac. The photoinjector and linac also provide an ideal test-bed for examining space-charge induced emittance growth effects.
NTIS
Photocathodes; Linear Accelerators; Chemical Reactions; Pulse Duration; Radio Frequencies; Relativistic Electron Beams

20040016410 Lawrence Livermore National Lab., Livermore, CA
New Crystalline Materials for Nonlinear Frequency Conversion, Electro-Optic Modulation, and Mid-Infrared Gain Media
Adams, J. J.; Aug. 09, 2002; 232 pp.; In English
Report No.(s): DE2003-15004811; UCRL-LR-149658; No Copyright; Avail: Department of Energy Information Bridge

The Lawrence Livermore National Laboratory (LLNL,) has programs that involve the development and deployment of many different kinds of new and novel laser systems for research applications. One example of the work being conducted at LLNL is the development of near-infrared (1 (micro)m) lasers for fusion energy research and material processing. Novel near-infrared laser systems such as these utilize nonlinear crystals for frequency conversion (since many applications require the second or third harmonic of the fundamental wavelength) and for polarization antrol (Pockels cells). As state-of-the-art laser systems are engineered, unique requirements are placed on the nonlinear crystals used for frequency conversion that are not easily satisfied by commercially available nonlinear crystals. Therefore as frequency conversion requirements extend to unprecedented regimes, new nonlinear crystals need to be identified and developed. Another example of new lasers being developed at LLNL is tunable mid-infrared solid-state lasers for use in remote sensing and laser radar. Tunable mid-infrared (>2 (micro)m) laser materials are scarce which makes the development of these systems. In order to satisfy these demands for tunable mid-infrared solid-state lasers, new mid-infrared laser crystals need to be discovered.
NTIS
Frequency Converters; Modulation; Laser Applications

20040016414 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Simultaneous X-Ray and Optical Timing Observations of GX 339-4
Kaaret, Philip; Mushotzky, Richard F., Technical Monitor; January 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-10627
Report No.(s): Rept-2; No Copyright; Avail: Other Sources; Abstract Only

The goal of this proposal is to perform the first comprehensive study of the correlated X-ray and optical variability of the Galactic accreting black hole candidate GX 339-4 using the X-ray and optical instruments on XMM-Newton. With these observations, we hope to make significant progress in understanding the coupled inflow - outflow system around a persistently accreting stellar mass black hole. The data is now all reduced. This includes the data analysis for all of the instruments on XMM-Newton, the EPIC - PN, the EPIC - MOS, the RGS, and the OM. We are currently preparing the results for publication.
Author
Black Holes (Astronomy); Time Measurement; Variability; X Ray Optics

20040016445 Swedish Defence Research Establishment, Linkoeping
Protection Against Microsecond Laser Pulses
Nilsson, C.; Kariis, H.; Lopes, C.; Svensson, S.; 2003; In Swedish
Report No.(s): PB2004-101780; FOI-R-0586-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Protection against nanosecond laser pulses with self-activating materials is soon a reality. This report describes a measurement method of optical power limiting of microsecond laser pulses. The limiting properties of porphyrins, naphtalocyanine, tiophen, alcynylplatinum(II), carbon black suspension (CBS), C (sub60) and iodine were analyzed at the wavelength 582nm. The best clamping of micro-laser was attained at approx. -1 micro-subJ for the materials CBS and SiNc

(50% photopic transmission). Further research is needed to develop new materials that can limit laser light of different pulse lengths.
NTIS
Protection; Optical Measurement; Pulsed Lasers

20040016457 Lawrence Livermore National Lab., Livermore, CA
X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultra-short X-ray Pulses with Matter
Kuba, J.; Wootton, A.; Bionta, W. M.; Shepherd, R.; Fill, E. E.; Apr. 16, 2003; 12 pp.; In English
Report No.(s): DE2003-15005030; UCRL-JC-147682-R1; No Copyright; Avail: Department of Energy Information Bridge

Free electron lasers operating in the 0.1 to 1.5 nm wavelength range have been proposed for the Stanford Linear Accelerator Center (USA) and DESY (Germany). The unprecedented brightness and associated fluence predicted for pulses less than 300 fs pose new challenges for optical components. A criterion for optical component design is required, implying an understanding of x-ray - matter interactions at these extreme conditions. In our experimental effort, the extreme conditions are simulated by currently available sources ranging from optical lasers, through x-ray lasers (at 14.7 nm) down to K-alpha sources (approx. 0.15 nm). In this paper we present an overview of our research program, including (1) Results from the experimental campaign at a short pulse (100 fs - 5 ps) power laser at 800 nm, (2) K-a experiments, and (3) Computer modeling and experimental project using a tabletop high brightness ps x-ray laser at the Lawrence Livermore National Laboratory.
NTIS
Free Electron Lasers; Linear Accelerators; X Ray Optics; Coherent Light; Light Sources

20040016460 Lawrence Livermore National Lab., Livermore, CA
Adaptive Optics Applications in Vision Science
Olivier, S. S.; Mar. 17, 2003; 12 pp.; In English
Report No.(s): DE2003-15005079; UCRL-JC-152883; No Copyright; Avail: Department of Energy Information Bridge

Adaptive optics can be used to correct the aberrations in the human eye caused by imperfections in the cornea and the lens and thereby, improve image quality both looking into and out of the eye. Under the auspices of the NSF Center for Adaptive Optics and the DOE Biomedical Engineering Program, Lawrence Livermore National Laboratory has joined together with leading vision science researchers around the country to develop and test new ophthalmic imaging systems using novel wavefront corrector technologies. Results of preliminary comparative evaluations of these technologies in initial system tests show promise for future clinical utility.
NTIS
Adaptive Optics; Vision; Lenses

20040020046 Lawrence Livermore National Lab., Livermore, CA
Parametric Techniques for Extreme-Contrast, High-Energy Petawatt Pulses
Jovanovic, I.; Wattellier, B.; Barty, C. P. J.; Sep. 05, 2003; 10 pp.; In English
Report No.(s): DE2003-15005066; UCRL-JC-152486; No Copyright; Avail: Department of Energy Information Bridge

Prepulses are of great concern in high-power lasers: if their intensity is sufficiently high, they can heat and/or destroy a target before the arrival of the main pulse. For ultrahigh peak power lasers, for which focused intensity can exceed 1O to the 21st power W/sq. cm., a contrast of at least 10 to the eighth power is the minimum requirement to avoid preionization of solid targets. Conventional preamplication stages do not meet this requirement, primarily due to prepulse originating from regenerative amplification. Optical parametric amplification (OPA) is wellknown to generate pulses with a prepulse contrast equal to the gain of the amplifier, but it does not remove pre-existing prepulses. In this paper we describe a novel technique for contrast enhancement in cascaded optical parametric amplifiers (COPA). Based on cascaded idler utilization, COPA represents a versatile technique with a potentially infinite prepulse contrast enhancement. We have experimentally demonstrated COPA, producing a prepulse contrast of IO8, limited by the sensitivity of measurement. A simple modjfication of the front end of a petawatt-type laser that utilizes optical parametric chirped pulse amplification (OPCPA) can yield unprecedented levels of prepulse contrast.
NTIS
Amplification; Augmentation; Parametric Amplifiers

20040020059 Iowa State Univ. of Science and Technology, Ames, IA
Device Optimization and Transient Electroluminescence Studies of Organic Light Emitting Devices
Zou, L.; 2003; 106 pp.; In English
Report No.(s): DE2003-816439; No Copyright; Avail: Department of Energy Information Bridge

Organic light emitting devices (OLEDs) are among the most promising for flat panel display technologies. They are light, bright, flexible, and cost effective. And while they are emerging in commercial product, their low power efficiency and long-term degradation are still challenging. The aim of this work was to investigate their device physics and improve their performance. Violet and blue OLEDs were studied. The devices were prepared by thermal vapor deposition in high vacuum. The combinatorial method was employed in device preparation. Both continuous wave and transient electroluminescence (EL) were studied. A new efficient and intense UV-violet light emitting device was developed. At a current density of 10 mA/sq cm, the optimal radiance R could reach 0.38 mW/sq cm, and the quantum efficiency was 1.25%. using the delayed EL technique, electron mobilities in DPVBi and CBP were determined to be(approx) 10(sup -5) sq cm/Vs and(approx) 10(sup -4) sq cm/Vs, respectively. Overshoot effects in the transient El of blue light emitting devices were also observed and studied. This effect was attributed to the charge accumulation at the organic/organic and organic/cathode interfaces.
NTIS
Electroluminescence; Organic Lasers; Light (Visible Radiation); Emitters

20040020063 Lawrence Livermore National Lab., Livermore, CA
Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses
Ehrmann, P. R.; Carlson, K.; Campbell, J. H.; Click, C. A.; Brown, R. K.; Sep. 02, 2003; 34 pp.; In English
Report No.(s): DE2003-15005145; UCRL-JC-155337; No Copyright; Avail: Department of Energy Information Bridge

Non-radiative losses due to OH fluorescence quenching of the Nd(3+)(sup 4)F(sub 3/2) state are quantified over a range of OH concentrations from 4 x 10(sup 18)/qu cm to 4 x 10(sup 20)/qu cm and Nd doping levels from 0.4 to 9 x 1020/qu cm in two K(sub 2)0-Mg0-A1(sub2) 0(sub3)-P(sub2)0(sub5) metaphosphate glasses having different WMg ratios (-l/l and 2/1). The quenching rate is found to vary linearly with the Nd and OH concentrations as predicted by Forster-Dexter theory. However, in contrast to theory the OH quenching rate extrapolates to a non-zero value at low Nd(sup3+) doping levels. It is proposed that at low Nd(sup3+) concentrations the OH is correlated with Nd sites in the glass. The quenching strength of OH on a per ion basis is found to be weak compared to other common transition metal impurities (e.g. Fe2+, Co2+, Ni2+, Cu2+). Nevertheless, OH dominates the Nd quenching in phosphate glass because under most processing conditions OH is present at concentrations l0(sup 2) to l0(sup 3)greater than transition metal ion impurities. A correlation of the quenching strength of OH and common-metal impurity ions with the degree of spectral overlap of the impurity absorption bands and the four (sup 4)F(sub3/2) to (sup 4) 1(sub 3) transitions shows good agreement.
NTIS
Lasers; Fluorescence; Neodymium; Absorption Spectra

20040020065 Lawrence Livermore National Lab., Livermore, CA
All Fiber Technology for High-Energy Petawatt Front End Laser Systems
Dawson, J. W.; Liao, Z. M.; Jovanovic, I.; Wattellier, B.; Beach, R.; Sep. 05, 2003; 10 pp.; In English
Report No.(s): DE2003-15005171; UCRL-JC-152561; No Copyright; Avail: Department of Energy Information Bridge

We are developing an all fiber front end for the next generation high-energy petawatt (HEPW) laser at Lawrence Livermore National Laboratory (LLNL). The ultimate goal of the LLNL HEPW effort is to generate 5-kJ pulses capable of compression to 5ps at 1053nm, enabling advanced x-ray backlighters and possible demonstration of fast ignition. We discuss the front-end of the laser design from the fiber master oscillator, which generates the mode-locked 20nm bandwidth initial pulses through the 10mJ output of the large flattened mode (LFM) fiber amplifier. Development of an all fiber front end requires technological breakthroughs in the key areas of the master oscillator and fiber amplification. Chirped pulse amplification in optical fibers has been demonstrated to 1mJ. Further increase is limited by the onset of stimulated Raman scattering (SRS). We have recently demonstrated a new flattened mode fiber technology, which reduces peak power for a given energy and thus the onset of SRS. Controlled experiments with 1st generation fibers yielded 0.5mJ of energy while significantly increasing the point at which nonlinear optical effects degrade the amplified pulse. In this paper we will discuss our efforts to extend this work to greater than 20mJ using our large flattened mode fiber amplifier.
NTIS
Lasers; Optical Fibers; Technology Assessment

20040020068 Iowa State Univ. of Science and Technology, Ames, IA
Electric and Optical Properties of Doped Small Molecular Organic Light-Emitting Devices
Cheon, K. O.; 2003; 114 pp.; In English
Report No.(s): DE2003-816444; No Copyright; Avail: Department of Energy Information Bridge

Organic light-emitting devices (OLEDs) constitute a new and exciting emissive display technology. In general, the basic OLED structure consists of a stack of fluorescent organic layers sandwiched between a transparent conducting-anode and metallic cathode. When an appropriate bias is applied to the device, holes are injected from the anode and electrons from the cathode; some of the recombination events between the holes and electrons result in electroluminescence (EL). Until now, most of the efforts in developing OLEDs have focused on display applications, hence on devices within the visible range. However some organic devices have been developed for ultraviolet or infrared emission. Various aspects of the device physics of doped small molecular OLEDs were described and discussed. The doping layer thickness and concentration were varied systematically to study their effects on device performances, energy transfer, and turn-off dynamics.
NTIS
Energy Transfer; Optical Properties; Electrical Properties; Electroluminescence; Ultraviolet Emission

20040020069
(Sigma)QL: A Decision Support Tool for Target Recognition in a Multisensor Environment
Jungert, E.; Horney, T.; Folkesson, M.; Groenwall, C.; Silvervarg, K.; Dec. 2002; 68 pp.; In Swedish
Report No.(s): PB2004-102656; FOI-R-0692-SE; No Copyright; Avail: CASI; A04, Hardcopy

Sigma(QL) is a query language for target recognition designed for an environment of multiple sensor data sources where sensor data fusion plays an important role. The main purpose of this query language is to use it as a decision support tool integrated into a command and control system. Currently, the attached sensors are laser-radar, IR-camera and CCD-camera. The sensors can be attached to various types of platforms. The query language is designed for simple user interaction where the queries are applied in a sensor in sensor data independent way. The consequence of this is that the end-users are allowed to apply their queries without any concern for sensor technology or how sensor data are analyzed, i.e. they just need to focus their attention on their primary work. A further purpose of the query language is to give support to situation analysis and contribute to the generation of a consistent operational picture (COP). The decision support system can be subdivided into five separate parts, i.e. the query language, and four modules for respectively sensor data analysis, multisensor data fusion, terrain modeling and situation analysis. These modules and the status of the demonstrator subject to implementation are described in this report. The decision support system is based on an architecture that allows scalability, which is an essential aspect for network-based environments. To properly handle varying sets of sensors the architecture is designed to be sensor data independent; this is controlled by an ontological knowledge-base. Finally, the system will be possible to use in intelligence, reconnaissance, surveillance and other applications where support for situation analysis is required.
NTIS
Target Recognition; Query Languages; Decision Support Systems

20040020096 NASA Marshall Space Flight Center, Huntsville, AL, USA
Status Report and Lessons Learned from the Univ. of Arizona NMSD
Baiocchi, Dave; Burge, Jim; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We will present the latest generation of space mirror technology being developed at the Univ. of Arizona (UA). Unlike conventional monolithic mirrors, the UA mirrors are completely active in their operation. This allows greater flexibility in the mass, volume and performance specifications. The UA mirror design uses a thin flexible substrate for the optical surface and an actuated lightweight structure for surface accuracy and support. We provide an update on the UA NGST Mirror System Demonstrator (NMSD). The 2-m, f/5 NMSD mirror uses a 2 mm thick glass substrate and weighs 86 pounds. We review the mirror's design, discuss the mythology schemes used to actuate the figure, and present a list of the lessons learned.
Author
Mirrors; Technology Assessment; Functional Design Specifications

20040021403 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data
Ranson, K. J.; Sun, G.; Kharuk, V. I.; Kovacs, K.; [2004]; 33 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Monitoring the dynamics of the circumpolar boreal forest (taiga) and Arctic tundra boundary is important for understanding the causes and consequences of changes observed in these areas. This ecotone, the world's largest, stretches for over 13,400 km and marks the transition between the northern limits of forests and the southern margin of the tundra. Because of the inaccessibility and large extent of this zone, remote sensing data can play an important role for mapping the characteristics and monitoring the dynamics. Basic understanding of the capabilities of existing space borne instruments for these purposes is required. In this study we examined the use of several remote sensing techniques for identifying the existing

tundra- taiga ecotone. These include Landsat-7, MISR, MODIS and RADARSAT data. Historical cover maps, recent forest stand measurements and high-resolution IKONOS images were used for local ground truth. It was found that a tundra-taiga transitional area can be characterized using multi- spectral Landsat ETM+ summer images, multi-angle MISR red band reflectance images, RADARSAT images with larger incidence angle, or multi-temporal and multi-spectral MODIS data. Because of different resolutions and spectral regions covered, the transition zone maps derived from different data types were not identical, but the general patterns were consistent.
Author
Tundra; Forests; Spectral Bands; Remote Sensing; Imaging Spectrometers

20040027502 NASA Marshall Space Flight Center, Huntsville, AL, USA
Long Focal Length Large Mirror Fabrication System
Bennett, H. E.; [2003]; 2 pp.; In English; Technology Days 2003, 11-12 Feb. 2003, Augusta, GA, USA; No Copyright; Avail: Other Sources; Abstract Only

The goals of this ambitious program are (1) to develop systems to make large superpolished optical mirrors, (2) to develop low scatter polishing techniques using centrifugal elutriation, (3) to develop a means of measuring scatter at any point on the mirror, (4) to polish a Hindle sphere to measure the optical figure of a one meter diameter convex mandrel, and (5) to fabricate low scatter, large adaptive optic graphite filled, cyanate ester replica transfer mirrors using these mandrels. Deliverables are a 30 cm diameter superpolished composite AO mirror. We fabricated a 1/3rd meter superpolished zerodur flat mandrel and with the support of our major subcontractor, Composite Mirror Applications Inc (CMA) we have demonstrated a 30 cm lightweight cyanate ester mirror with an rms microroughness between 0.6 and 0.8 nm and 8 faceplate influence function of 5 cm. The influence function was chosen to be comparable to the atmospheric correlation coefficient r(sub 0) which is about 5 cm at sea level. There was no print-thru of the graphite fibers in the cyanate ester surface (the bane of many previous efforts to use cyanate ester mirrors). Our subcontractor has devised a means for developing a 30-50 nm thick layer of graphite free pure ester resin on the surface of the mirrors. This graphite fiber filled material has a thermal expansion coefficient in the 10(exp -8) centimeter per Kelvin range (the same range of expansion coefficient as Zerodur and ULE glasses) and does not take up water and swell, so it is a nearly ideal mirror material in these areas. Unfortunately for these 0.8mm thick faceplates, the number of plies is not enough to result in isometric coverage. Isolated figure irregularities can appear, making it necessary to go to thicker faceplates. The influence function will then only approximate the length of r(sub 0), at higher altitudes or longer wavelengths. The influence function goes as the cube of the thickness, so we are now making a faceplate optimized for an infrared wavelength, possibly that used for the AO system of the Keck telescope, instead of 0.63 microns. We have polished a 55 cm diameter mandrel to better than 1/20th wave optical figure in the visible using centrifugal elutriation. CMA has just told us that it needs to retool to get optimum mirror faceplate quality in this size, so implementing the 55 cm AO mirror may be delayed somewhat. We expect to complete our 1/3 rd meter AO mirror on time using novel piezoelectric actuators with a throw of one micrometer per volt, as compared to 0.005 micrometers per volt for conventional piezoelectric actuators. We will then demonstrate its AO performance interferometrically.
Author
Fabrication; Mirrors; Adaptive Optics; Polishing

20040027538 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Package for Interactive Analysis of Line Emission (Analysis of UV-X-Ray High-Resolution Emission Spectra)
Hunter, Paul, Technical Monitor; Kashyap, Vinay; January 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9322; No Copyright; Avail: CASI; A01, Hardcopy

The Package for Interactive Analysis of Line Emission (PINTofALE) is a suite of IDL routines designed to carry out spectroscopic analysis of high-resolution X-ray spectra. The current version is 1.5, and will shortly be upgraded to v2. A detailed description of the package, together with detailed documentation, example walk-throughs, science threads, and downloadable tar files, are available on-line.
Author
Emission Spectra; X Ray Spectra; Spectroscopic Analysis

20040027787 Nippon Telegraph and Telephone Public Corp., Japan
NTT Technical Review, Volume 1, No. 7
October 2003; 101 pp.; In English; See also 20040027788 - 20040027803; Copyright; Avail: Other Sources

The following reports pertaining to optical switching and broadband broadcasting are presented:For Further Innovation;

R&D that can Capture Value; Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks; Recent Progress in Optical Switching Device Technologies in NTT; Recent Advances in Optical Switches Using Silica-based PLC Technology; High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks; Development of a Large-scale 3D MEMS Optical Switch Module; Monolithically Integrated 64-channel WDM Channel Selector; A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator; Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting; Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications; Scalable Content Delivery Technology; Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions; Image Systems Using WID Tag Positioning Information; Spot Information Navigator; and Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T.
CASI
Microelectromechanical Systems; Optical Switching

20040027788 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator
Matsuo, Shinji; Ohiso, Yoshitaka; Segawa, Toru; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 50-57; In English; See also 20040027787; Copyright; Avail: Other Sources

A high-speed tunable optical filter incorporating a semiconductor ring resonator is a key device in photonic packet switching. To achieve a wide tuning range we designed a double-ring structure, in which two ring resonators are connected in series, and fabricated it using the InGaAsP-InP material system. This device exhibits a total free spectral range (FSR) of I .7 THz and contrast ratio of 9.5 dB. The ring radii are 25.2 and 17.8 pm, which correspond to FSRs of 340 and 425 GHz, respectively. The switching time of the device is 2.5 ns.
Author
Optical Filters; Optical Switching

20040027798 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Recent Progress in Optical Switching Device Technologies in NTT
Maruno, Tohru; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 12-19; In English; See also 20040027787; Copyright; Avail: Other Sources

There have been several important developments in photonic networks based on wavelength division multiplexing in response to the explosive growth of Internet and broadband network services. Since optical processing systems such as optical cross-connects and optical add-drop multiplexers are essential for photonic networks, there is a strong need for optical switching devices, which will be key components of these systems. This paper gives an overview of NTT's recent progress in low-loss and highly reliable optical switches fabricated by technologies based on planar-lightwave circuits, the oil-latching interfacial-tension variation effect switch, and three-dimensional micro-electro-mechanical systems mirrors.
Author
Optical Switching; Technology Assessment; Microelectromechanical Systems; Interfacial Tension

20040027799 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Recent Advances in Optical Switches Using Silica-based PLC Technology
Okuno, Masayuki; Goh, Takashi; Sohma, Shunichi; Shibata, Tomohiro; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 20-30; In English; See also 20040027787; Copyright; Avail: Other Sources

We review recent progress in optical switches based on planar lightwave circuit (PLC) technology. First, we describe the basic configuration and fabrication of silica-based PLC switches. Then, we describe the configuration and characteristics of N x N strictly nonblocking matrix switches (mainly a 16 x 16 switch), 1xN switches (mainly a 1 x 128 switch), a 128x128 switching sub-system consisting of 256 1 x 128 switch modules, and an optical add/drop multiplexing circuit consisting of arrayed waveguide gratings and 2 x 2 switches. We also report a low power consumption trial for large-scale PLC switches and the results of reliability tests.
Author
Optical Switching; Silicon Dioxide; Fabrication; Matrices (Mathematics)

20040027800 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks
Shimokawa, Fusao; Sakata, Tomomi; Makihara, Mitsuhiro; Katagiri, Yoshitada; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 31-36; In English; See also 20040027787; Copyright; Avail: Other Sources

We have improved our previously developed waveguide optical switch called Olive (oil-latching inter- facial-tension variation effect switch) by developing basic technologies for lowering the viscosity of the refractive-index-matching liquid and shortening the distance the liquid must travel. In combination with our previously developed highly accurate deep-groove fabrication with a high aspect ratio, batch injec- tion of a very small amount of liquid, and high-performance sealing, these improvements enabled us to achieve a switching time of less than 10 ms while maintaining excellent optical characteristics. This switching time, which is about one-tenth that of our previous Olive, breaks through an important threshold, allowing Olives to be used for optical crossconnects and add/drop multiplexers.
Author
Optical Switching; Thermocapillary Migration

20040027801 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Development of a Large-scale 3D MEMS Optical Switch Module
Yamamoto, Tsuyoshi; Yamaguchi, Johji; Sawada, Renshi; Uenishi, Yuji; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 37-42; In English; See also 20040027787; Copyright; Avail: Other Sources

A three-dimensional (3D) micro-electro-mechanical system (MEMS) optical switch, consisting of two- axis tilt mirror arrays and free-space optics, is a practical solution for constructing large-scale switching fabrics due to its high component density and low cost. The MEMS-mirror arrays developed by NTT are single-crystal silicon mirrors integrated with high-aspect ratio torsion springs and actuated by electrostatic forces. The free-space optics consist of low-cost high-precision polymer components assembled passively. A prototype module with 100-channel optical fiber input/output exhibited a low coupling loss of 4.0 dB and a switching time of 3 ms.
Author
Microelectromechanical Systems; Optical Switching

20040028040 NASA Glenn Research Center, Cleveland, OH, USA
Optical Levitation of Micro-Scale Particles in Air
Wrbanek, Susan Y.; Weiland, Kenneth E.; January 2004; 19 pp.; In English
Contract(s)/Grant(s): WBS 22-708-90-41
Report No.(s): NASA/TM-2004-212889; E-14306; No Copyright; Avail: CASI; A03, Hardcopy

Success has been achieved using a radiation pressure gradient to levitate microscale particles in air for as long as four hours. This work is performed as a precursor to the development of a vacuum based optical tweezers interrogation tool for nanotechnology research. It was decided to first proceed with solving the problem of achieving optical levitation of a micro-scale particle in air before trying the same in a vacuum environment. This successful optical levitation in air confirms the work of Ashkin and Dziedzic. Levitation of 10 and 13.8 microns diameter polystyrene spheres was achieved, as well as the levitation of 10 and 100 microns diameter glass spheres. Particles were raised and lowered. A modicum of success was achieved translating particles horizontally. Trapping of multiple particles in one laser beam has been photographed. Also, it has been observed that particles, that may be conglomerates or irregular in shape, can also be trapped by a focused laser beam. Levitated glass beads were photographed using laser light scattered from the beads. The fact that there is evidence of optical traps in air containing irregular and conglomerate particles provides hope that future tool particles need not be perfect spheres.
Author
Nanotechnology; Optics; Levitation; Microparticles; Air

20040028103 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Highlights of the ASPE 2004 Winter Topical Meeting on Free-Form Optics: Design, Fabrication, Metrology, Assembly
Ohl, Raymond G.; Dow, Thomas A.; Sohn, alex; [2004]; 2 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 21-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

We present highlights from the American Society for Precision Engineering's 2004 winter topical meeting entitled Free-Form Optics: Design, Fabrication, Metrology, Assembly. We emphasize those papers that are most relevant to astronomical optics. Optical surfaces that transcend the bounds of rotational symmetry have been implemented in novel optical systems with fantastic results since the release of Polaroid's first instant camera. Despite these successes, free-form optics have found only a few niche applications and have yet to enter the mainstream. The purpose of this meeting is to identify the state of the art of free-form optics design, fabrication, metrology and assembly and to identify the technical and logistical challenges that inhibit their widespread use. Issues that will be addressed include: What are free-form optics? How can optical systems be made better with free-form optics? How can designers use free-form optics? How can free-form optics be fabricated? How

can they be measured? How are free-form optical systems assembled? Control of multi-axis systems.
Author
Fabrication; Metrology; Winter; Optics; Astronomy

20040030477 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer
Liu, Kuo-Chia; Hyde, Tristram; Blaurock, Carl; Bolognese, Jeff; Howard, Joseph; Danchi, William; [2004]; 1 pp.; In English; Astronomical Telescopes and Instrumentation 2004, 21-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

The Fourier-Kelvin Stellar Interferometer (FKSI) has been proposed to detect and characterize extra solar giant planets. The baseline configuration for FKSI is a two- aperture, structurally connected nulling interferometer, capable of providing null depth less than lo4 in the infrared. The objective of this paper is to summarize the process for setting the top level requirements and the jitter analysis performed on FKSI to date. The first part of the paper discusses the derivation of dynamic stability requirements, necessary for meeting the FKSI nulling demands. An integrated model including structures, optics, and control systems has been developed to support dynamic jitter analysis and requirements verification. The second part of the paper describes how the integrated model is used to investigate the effects of reaction wheel disturbances on pointing and optical path difference stabilities.
Author
Interferometers; Infrared Radiation; Gas Giant Planets

20040030516 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Development of High Resolution Hard X-Ray Telescope with Multilayer Coatings
Brinton, John C., Technical Monitor; Gorenstein, Paul; February 2004; 6 pp.; In English
Contract(s)/Grant(s): NAG5-5354; No Copyright; Avail: CASI; A02, Hardcopy

The major objective of this program is the development of a focusing hard X-ray telescope with moderately high angular resolution, i .e. comparable to the telescopes of XMM-Newton. The key ingredients of the telescope are a depth graded multilayer coatings and electroformed nickel substrates that are considerably lighter weight than those of previous missions such as XMM-Newton, which have had conventional single metal layer reflective coatings and have operated at much lower energy X-rays. The ultimate target mission for this technology is the Hard X-Ray Telescope (HXT) of the Constellation X-Ray Mission. However, it is applicable to potential SMEX and MIDEX programs as well.
Derived from text
X Ray Telescopes; Manufacturing; Focusing; Angular Resolution; High Resolution

20040030521 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Construction of a Virtual Scanning Electron Microscope (VSEM)
Fried, Glenn; Grosser, Benjamin; January 07, 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG10-338; No Copyright; Avail: CASI; A01, Hardcopy

The Imaging Technology Group (ITG) proposed to develop a Virtual SEM (VSEM) application and supporting materials as the first installed instrument in NASA s Virtual Laboratory Project. The instrument was to be a simulator modeled after an existing SEM, and was to mimic that real instrument as closely as possible. Virtual samples would be developed and provided along with the instrument, which would be written in Java.
Author
Scanning Electron Microscopy; Construction

20040031494 NASA Goddard Space Flight Center, Greenbelt, MD, USA
NASA's Far-IR/Submillimeter Roadmap Missions SAFIR and SPECS
Leisawitz, David; [2003]; 1 pp.; In English; IAU XXV Meeting, 13-26 Jul. 2003, Sydney, Australia; No Copyright; Avail: Other Sources; Abstract Only

The far-IR is rich with information about star, disk and planet formation because protostars emit predominantly in this spectral range, and the radiation can escape from the inherently dusty stellar birth sites. Spectral lines contain particularly valuable information about the cooling, collapse, and chemistry of molecular cloud cores and protostars. However, the interpretation of line intensities and profiles is model-dependent; ultimately, high angular resolution is needed to break model degeneracy and definitively characterize the source. Processes occurring on scales smaller than 10,000 AU (72 arcsec at 140

pc, where the nearest protostellar objects are found) likely affect the stellar initial mass function and determine the product of cloud collapse (Binary star or planetary system? How many planets, and what kind will they be?) The next-generation far-IR observatories SIRTF, SOFIA, and Herschel will revolutionize star formation studies and leave the community yearning for telescopes that operate in this spectral region but provide many orders of magnitude better angular resolution. NASA's space science roadmap includes the JWST-scale Single Aperture Far-IR (SAFIR) telescope and the 1 km maximum baseline far-IR interferometer, SPECS (the Submillimeter Probe of the Evolution of Cosmic Structure). I will give the scientific motivation for these missions, describe mission concepts and telescope measurement capabilities, and compare these capabilities with those of the next-generation IR telescopes and with the complementary JWST and ALMA. I will also describe the Space Infrared Interferometric Telescope (SPIRIT), a science and technology pathfinder for SPECS, which could be ready to launch in about a decade. At 100 microns, SAFIR will provide 2.5 arcsec resolution (10 times better than SIRTF), SPIRIT will provide 0.25 arcsec resolution, and SPECS will provide 10 milli-arcsec resolution, which is comparable to that of the Hubble Space Telescope.
Author
Far Infrared Radiation; Star Formation; Disk Galaxies; Molecular Clouds; Protostars; Spaceborne Telescopes

20040031504 Massachusetts Inst. of Tech., Cambridge, MA, USA
[Calibration, Analysis, and Interpretation of SERTS and EUNIS Observation]
[2004]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-13221; No Copyright; Avail: CASI; A01, Hardcopy

We have made satisfactory and expected progress in the first year of this project. The spectrophotometric data for the S asteroids of interest have been reduced, and lightcurve effects accounted for. We have begun mixing models for spectra of 6 Hebe, and expect to have a publication late in 2004 or early in 2005 on that part of the project. Preliminary models suggest that Hebe requires hydrated minerals to explain its spectrum in the 3-pm region. We will also perform mixing models with additional data which has been recently obtained. We have been able to constrain thermal properties on near-Earth asteroids (NEAs) as a result of thermal modeling done as part of this project. This work provides a means of obtaining albedo data from common visible-near IR data. This portion of the project has been presented at the DPS meeting in Monterey, and is being presented in expanded form at the Yarkovsky workshop at Arecibo Observatory in February. A manuscript is in preparation. In the coming year we expect to finish the thermal corrections for the spectrophotometric data, and complete the mixing models. The results will be prepared for publication, and the data offered to the PDS. It will also be available on the SMASS website (smass.mit.edu), for which the PI is webmaster.
Author
Spectrophotometry; Data Acquisition; Asteroids; Near Infrared Radiation

20040031516 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical Properties of Zitex in the Infrared Submillimeter
Benford, Dominic J.; Gaidis, Michael C.; Koou, Jacob W.; [2003]; 6 pp.; In English; Copyright; Avail: CASI; A02, Hardcopy

The results of measurements of the refractive index and power attenuation coefficient of Zitex at 290K, 77K, and 4K in the spectral region from 1 to 1000 microns are presented. Zitex is a porous Teflon sheet with a filling factor of approx. 50%, and is manufactured in several varieties as a filter paper. Zitex is found to be an effective IR block, with thin (200 microns) sheets transmitting less than 1% in the 1 - 50 microns range while attenuating less than or approx. 10% at wavelengths longer than 200 microns. Some variation in the cutoff wavelength is seen, tending to be a shorter wavelength cutoff for a smaller pore size. Additionally, the thermal conductivity of Zitex at cryogenic temperatures has been measured, and is found to be roughly one-half that of bulk Teflon. Finally, its dielectric constant has been measured in the submillimeter as n = 1.20, resulting in extremely low dielectric reflection losses. As a result, Zitex is particularly useful as an IR blocking filter in low-noise heterodyne receivers; in the millimeter-wave range (lambda greater than approx. 850 microns or nu less than or = 350 GHz) the attenuation of alpha less than or = 0.01/cm for a 3.5 mm thickness filter of Zitex G125 would raise receiver noise temperatures by less than 1K.
Author
Optical Properties; Infrared Radiation; Submillimeter Waves

20040031538 Lawrence Livermore National Lab., Livermore, CA
X-Ray Optics and Diagnostics for the First Experiments on the Linac Coherent Light Source
Wootton, A.; Arthur, J.; Barbee, T.; Bionta, R.; London, R.; Jun. 13, 2001; 16 pp.; In English
Report No.(s): DE2003-15005027; UCRL-JC-144183; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
X Ray Optics; Coherent Light; Free Electron Lasers

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20040016362 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Nonlinear Coupling of Alfven and Lower Hybrid Waves in Space Plasma
Khazanov, George V.; January 2004; 1 pp.; In English; 2004 National Radio Science Meeting, 4-8 Jan. 2004, Boulder, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

Space plasmas support a wide variety of waves, and wave-particle interactions as well as wave-wave interactions which are of crucial importance to magnetospheric and ionospheric plasma behavior. The excitation of lower hybrid waves (LHWs) in particular is a widely discussed mechanism of interaction between plasma species in space and is one of the unresolved questions of magnetospheric multi-ion plasmas. It is demonstrated that large-amplitude Alfven waves may generate LHWs in the auroral zone and ring current region and in some cases (particularly in the inner magnetosphere) this serves as the Alfven wave saturation mechanism. We present several examples of observational data which illustrate that the proposed mechanism is a plausible candidate to explain certain classes of LHW generation events in the ionosphere and magnetosphere and demonstrate electron and ion energization involving these processes. We discuss the morphology dynamics and level of LHW activity generated by electromagnetic ion cyclotron (EMIC) waves during the May 2-7 1998 storm period on the global scale. The LHWs were calculated based on a newly developed self-consistent model (Khazanov et. al. 2002) that couples the system of two kinetic equations: one equation describes the ring current (RC) ion dynamic and another equation describes the evolution of EMIC waves. It is found that the LHWs are excited by helium ions due to their mass dependent drift in the electric field of EMIC waves. The level of LHW activity is calculated assuming that the induced scattering process is the main saturation mechanism for these waves. The calculated LHWs electric fields are consistent with the observational data.
Author
Nonlinearity; Space Plasmas; Coupling; Magnetohydrodynamic Waves; Ion Cyclotron Radiation

20040016385 Lawrence Livermore National Lab., Livermore, CA
Target Designs for an Inertial Fusion Energy Power Plant Driven by Heavy Ions
Callahan, D. A.; Tabak, M.; Aug. 24, 2001; 16 pp.; In English
Report No.(s): DE2003-15004696; UCRL-JC-145196; No Copyright; Avail: Department of Energy Information Bridge

We present two indirect drive inertial fusion targets driven by heavy ions beams for fusion energy production. Because there are uncertainties in the ion beam focal spot size and uncertainties in the accelerator cost, we have tried to design targets that cover a large parameter space. One of the designs requires small ion beam focal spots but produces more than adequate gain at low driver energy (gain 130 from 3.3 MJ of beam energy). The other design allows a large beam spot, but requires more driver energy (gain 55 from 6.7 MJ of beam energy). Target physics issues as well as the implications for the accelerator from each design are discussed.
NTIS
Ion Beams; Lasers; Inertial Confinement Fusion

20040016438 Lawrence Livermore National Lab., Livermore, CA
Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target
Sanchez, J. J.; Giedt, W. H.; Kozioziemski, B. J.; London, R. L.; Moody, J. D.; Aug. 22, 2003; 18 pp.; In English
Report No.(s): DE2003-15005067; UCRL-JC-152490; No Copyright; Avail: Department of Energy Information Bridge

We use thermal conduction models to investigate the effects of tailored IR heating on the fuel layer symmetry within a target capsule supported inside of a National Ignition Facility (NIF) hohlraum. We calculate the layer thickness profile that would result from the IR heat distribution alone and in combination with additional temperature shimming of the cylindrical

hohlraum wall. We use the same model to study the effect of convection within the high density tamping gas in the hohlraum. A seven-region model was developed to evaluate how effective additional thin film convection barriers may be in damping convection with the higher power dissipation introduced by IR heating.
NTIS
Conductive Heat Transfer; Cryogenics; Thin Films; Ignition; Symmetry; Cylindrical Bodies

20040016455 Lawrence Livermore National Lab., Livermore, CA
3D Computations and Experiments
Couch, R.; Faux, D.; Goto, D.; Nikkel, D.; May 12, 2003; 22 pp.; In English
Report No.(s): DE2003-15004908; UCRL-JC-153345; No Copyright; Avail: Department of Energy Information Bridge
This project is in its first full year after the combining of two previously funded projects: 3D Code Development and Dynamic Material Properties. The motivation behind this move was to emphasize and strengthen the ties between the experimental work and the computational model development in the materials area. The next year's activities will indicate the merging of the two efforts. The current activity is structured in two tasks. Task A, Simulations and Measurements, combines all the material model development and associated numerical work with the materials-oriented experimental activities. Task B, ALE3D Development, is a continuation of the non-materials related activities from the previous project.
NTIS
Mechanical Properties; Three Dimensional Models; Dynamic Characteristics

20040020037 Lawrence Livermore National Lab., Livermore, CA
Stimulated Brillouin Scattering from Helium-Hydrogen Plasmas
Froula, D. H.; Divol, L.; Price, D.; Gregori, G.; Williams, E. A.; Aug. 22, 2003; 10 pp.; In English
Report No.(s): DE2003-15005036; UCRL-JC-151256; No Copyright; Avail: Department of Energy Information Bridge
An extensive study of the stimulated Brillouin scattering (SBS) in helium-hydrogen plasmas has been performed using a gas jet at the Janus Laser Facility. We observe three regions of reflectivity by varying the probe intensity from 1014 to saturated region, linear region, and near SBS threshold region. In the linear regime, adding small amounts of H to a He plasma reduces the SBS reflectivity by a factor of 4.
NTIS
Hydrogen Plasma; Helium Plasma; Brillouin Effect

20040020040 Lawrence Livermore National Lab., Livermore, CA
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering
Gregori, G.; Glenzer, S. H.; Rogers, F. J.; Landen, O. L.; Blancard, C.; Aug. 23, 2003; 12 pp.; In English
Report No.(s): DE2003-15005061; UCRL-JC-152388; No Copyright; Avail: Department of Energy Information Bridge
We present an improved analytical expression for the x-ray dynamic structure factor from a dense plasma which includes the effects of weakly bound electrons. This result can be applied to describe scattering from low to moderate Z plasmas, and it covers the entire range of plasma conditions that can be found in inertial confinement fusion experiments, from ideal to degenerate up to moderately coupled systems. We use our theory to interpret x-ray scattering experiments from solid density carbon plasma and to extract accurate measurements of electron temperature, electron density and charge state. We use our experimental results to validate various equation-of-state models for carbon plasmas.
NTIS
Electronic Structure; X Ray Scattering; Plasmas (Physics); Electron Density (Concentration); Carbon

20040020064 Lawrence Livermore National Lab., Livermore, CA
Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada
Erlandson, A. C.; Astanovitskiy, A.; Batie, S.; Bauer, B.; Bayramian, A.; Sep. 07, 2003; 10 pp.; In English
Report No.(s): DE2003-15005146; UCRL-JC-155356; No Copyright; Avail: Department of Energy Information Bridge
The authors have developed a conceptual design for a 50 TW / 20 J short-pulse laser for performing high- energy-density plasma physics experiments at the Nevada Terawatt Facility of the University of Nevada, Reno. The purpose of the laser is to develop proton and x-ray radiography techniques, to use these techniques to study z-pinch plasmas, and to study deposition of intense laser energy into both magnetized and unmagnetized plasmas. This paper describes planned plasma experiments,

system performance requirements, the laser design, and the target area design.
NTIS
Plasma Physics; Laser Applications; Nevada; Laser Plasmas; Chirp Signals; Amplification

20040027858 NASA Glenn Research Center, Cleveland, OH, USA
Solar Array in Simulated LEO Plasma Environment
Vayner, Boris; Galofaro, Joel; Ferguson, Dale; [2003]; 15 pp.; In English; 8th Spacecraft Charging Technology Conference, 20-24 Oct. 2003, Huntsville, AL, USA; Original contains black and white illustrations
Contract(s)/Grant(s): 755-60-04; No Copyright; Avail: CASI; A03, Hardcopy

Six different types of solar arrays have been tested in large vacuum chambers. The low earth orbit plasma environment was simulated in plasma vacuum chambers, where the parameters could be controlled precisely. Diagnostic equipment included spherical Langmuir probes, mass spectrometer, low-noise CCD camera with optical spectrometer, video camera, very sensitive current probe to measure arc current, and a voltage probe to register variations in a conductor potential. All data (except video) were obtained in digital form that allowed us to study the correlation between external parameters (plasma density, additional capacitance, bias voltage, etc) and arc characteristics (arc rate, arc current pulse width and amplitude, gas species partial pressures, and intensities of spectral lines). Arc inception voltages, arc rates, and current selections are measured for samples with different coverglass materials and thickness, interconnect designs, and cell sizes. It is shown that the array with wrapthrough interconnects have the highest arc threshold and the lowest current collection. Coverglass design with overhang results in decrease of current collection and increase of arc threshold. Doubling coverglass thickness cases the increase in arc inception voltage. Both arc inception voltage and current collection increase significantly with increasing a sample temperature to 80 C. Sustained discharges are initiated between adjacent cells with potential differences of 40 V for the sample with 300 micron coverglass thickness and 60 V for the sample with 150 micron coverglass thickness. Installation of cryogenic pump in large vacuum chamber provided the possibility of considerable outgassing of array surfaces which resulted in significant decrease of arc rate. Arc sites were determined by employing a video-camera, and it is shown that the most probable sites for arc inception are triple-junctions, even though some arcs were initiated in gaps between cells. It is also shown that the arc rate increases with increasing of ion collection current. The analysis of optical spectra (240-800 nm) reveals intensive narrow atomic lines (Ag, H) and wide molecular bands (OH, CH, SiH, SiN) that confirms a complicated mechanism of arc plasma generation. The results obtained seem to be important for the understanding of the arc inception mechanism, which is absolutely essential for progress toward the design of high-voltage solar array for space application.
Author
Low Earth Orbits; Solar Arrays; Computerized Simulation; Earth Orbital Environments; Plasma Jets

20040031585 Lawrence Livermore National Lab., Livermore, CA
Investigations on 10-Hz sub-Joule fs-Laser Pumped Neon- and Nickel-like X-ray Lasers
Tommasini, R.; Nilsen, J.; Fill, E. E.; Aug. 13, 2001; 16 pp.; In English
Report No.(s): DE2003-15004693; UCRL-JC-144893; No Copyright; Avail: Department of Energy Information Bridge

Experimental investigations on the conditions to achieve transient gain in neon-like Ti and nickel-like molybdenum XUV laser pumped by a 10-HZ sub-Joule femtosecond laser are presented. The 4d-4p (J= 0-1)(lambda)= 18.9 nm and 4f-4d (J= 1-11)(lambda)= 22.6 nm lines in Ni-like Mo as well as the 3p-3s (J= 0-1)(lambda)= 32.6 nm line in neon-like titanium have been observed. The Ni-like laser lines show a threshold behavior with respect to the pump irradiance as they appear only above 10(sup 15) W/cm(sup 2). Simulation for the fs-laser pumped Ni-like Mo XUV laser are also presented.
NTIS
X Ray Lasers; Neon; Extreme Ultraviolet Radiation; Molybdenum

76
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*.

20040016311 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Astro-E2 Magnesium Diboride High Current Leads
Panek, J. S.; Tuttle, J. G.; Riall, S.; Mustafi, S.; Gray, A.; Edmonds, R.; Marrero, V.; September 04, 2003; 1 pp.; In English; Cryogenic Engineering Conference, 23 Sep. 2003, Anchorage, AL, USA; No Copyright; Avail: Other Sources; Abstract Only

The recent discovery of superconducting properties in MgB_2 and rapid development of small diameter steel-clad wires has opened up the possibility of enhancing the design of the baseline Astro-E2 high current lead assembly. Replacing YBCO filaments with MgB_2 wires and modifying the heat sink location can give much higher margins against quench from temperature oscillations of the 4 K heat sink, although wih some overall thermal penalty. The design and performance of a new lead assembly during flight qualification is discussed, with emphasis on thermal, structural, and electrical test results.
Author
Magnesium Compounds; Borides; Superconductors (Materials); Electric Wire

20040027763 North Carolina State Univ., Raleigh, NC
Wide Band Gap Semiconductor Technology Initiative
Davis, Robert F.; Jan. 7, 2004; 14 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0580
Report No.(s): AD-A419730; No Copyright; Avail: CASI; A03, Hardcopy

Investigations have been concerned with substrate etching, thin film growth and doping and the growth of pin structures coupled with structural, microstructural, thickness, optical and electrical characterizations. Maps of the FWHM of the x-ray rocking curves reveal that both the number and the degrees of tilt of the domains in the (112-0) wafers were significantly smaller than those observed for the 80 off-axis (0001) as-received wafers. The average FWHM values for the former and latter were determined to be 22.93 and 50.96 arcsec, respectively. Growth results obtained on 4H-SiC(112-0) have shown differences with those obtained on 80 off-axis 4H- SiC(0001).
DTIC
Thin Films; Doping (Materials); Substrates

20040030442 Maine Univ., Orono, ME
Measurement of Anisotropic Elastic Constitutive Properties at High Temperatures
Peterson, Michael L.; Dec. 30, 2003; 116 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0519
Report No.(s): AD-A419939; MLP-12/31/03; No Copyright; Avail: CASI; A06, Hardcopy

The ability of a single acoustic element to produce a compact time domain signal from a multi-mode solid cylindrical waveguide using a time-reversal mirror (TRM) is considered. Two single element longitudinal contact transducers were used to excite and receive multiple longitudinal modes in a fused quartz waveguide in a TRM experiment. The TRM is demonstrated to be effective with the limited information from a single longitudinal transducer. Experimental results are presented along with a simple interpretation that shows how a TRM with only a single element can be used as a practical sensor.
DTIC
Anisotropy; Transducers; Quartz; Waveguides

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

20040030465 Army Aviation and Missile Command, Redstone Arsenal, AL
Analytic Modeling and Experimental Validation of Intumescent Behavior of Charring Heatshield Materials
Russell, Gerald W.; Jan. 2004; 142 pp.; In English; Original contains color illustrations
Report No.(s): AD-A420017; AMSAM-TR-AMR-PS-04-05; No Copyright; Avail: CASI; A07, Hardcopy

Intumescing heatshield materials have been shown to provide significant thermal protection for missile system environments. The design and use of these materials requires the analytic understanding of a considerable level of thermodynamic phenomena occurring on the surface, as well as in-depth. These phenomena can include in-depth thermochemical decomposition, pyrolysis gas generation and mass transfer, thermophysical property change, thermochemical and mechanical ablation, intumescence or conduction path growth, and boundary layer modification due to pyrolysis gas

injection or surface reactions. Existing numerical design codes do not specifically address the thermodynamic effects of intumescent behavior.
DTIC
Thermodynamics; Thermochemistry; Heat Shielding

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*.

20040016347 Morgan Research Corp., Huntsville, AL, USA
A NASA SHARP Mentoring Experience Utilizing GP-B
Estes, Howard; [2004]; 12 pp.; In English; American Association of Physics Teachers 128th National Meeting, 24-28 Jan. 2004, Miami Beach, FL, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this program is to increase the participation and success rates of students who are traditionally underrepresented in science, mathematics, technology , and geography. Students are selected based on aptitude and oi nterests. It is a NASA sponsored, 8 week program.
Derived from text
NASA Programs; Gravity Probe B; Education

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20040016349 NASA Marshall Space Flight Center, Huntsville, AL, USA
Hyperspectral Imaging on the International Space Station: An Innovative Approach to Commercial Development of Space
[2003]; 1 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA; No Copyright; Avail: Other Sources; Abstract Only

NASA s Space Partnership Division (SPD) was established to promote the commercial development of space by providing access to space ai opportunity to perform commercial research in the microgravity environment. NASA, through SPD, has established Research Partnership Centers (RPC s) that bring the government, universities at private industry together to perform research in space for commercial applica!.!lons. The SPD Office has fostered a re!ationship between an RPC and an aerospace company to perform hyperspectral imaging on the Window Observational Research Facility (WORF) on board the International Space Station (ISS). As a result of this relationship and M the capabilities of the WORF, the ISS will serve the private sector with platform to conduct hyperspectral imaging for commercial research.
Author
Imaging Techniques; Research Facilities; Space Commercialization

20040021400 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Report from the School of Experience: Lessons-Learned on NASA's EOS/ICESat Mission
Anselm, William; November 06, 2003; 7 pp.; In English; 2004 IEEE Aerospace Conference, 6-13 Mar. 2004, Big Sky, MT, USA; No Copyright; Avail: CASI; A02, Hardcopy

Abstract-NASA s Earth Observing System EOS) Ice, Cloud, and Land Elevation Satellite (ICESat) mission was one of the first missions under Goddard Space Flight Center s (then-) new Rapid Spacecraft Development Office. This paper explores the lessons-learned under the ICESat successful implementation and launch, focusing on four areas: Procurement., Management, Technical, and Launch and Early Operations. Each of these areas is explored in a practical perspective of communication, the viewpoint of the players, and the interactions among the organizations. Conclusions and lessons-learned are summarized in the final section.
Author
Ice, Cloud and Land Elevation Satellite; Procurement; Organizations; Launching; Management Analysis

20040021412 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
Highlights: US Commercial Remote Sensing Industry Analysis
Rabin, Ron; September 16, 2002; 96 pp.; In English; Geomatics Atlantic 2002 Conference, 25-27 Sep. 2002, Saint John's, New Foundland, Canada
Contract(s)/Grant(s): NAS13-650
Report No.(s): NASA/SE-2002-09-00067-SSC; No Copyright; Avail: CASI; A05, Hardcopy

This viewgraph presentation profiles the US remote sensing industry based on responses to a survey by 1450 industry professionals. The presentation divides the industry into three sectors: academic, commercial, and government; the survey results from each are covered in a section of the presentation. The presentation also divides survey results on user needs into the following sectors: spatial resolution, geolocation accuracy; elevation accuracy, area coverage, imagery types, and timeliness. Data, information, and software characteristics are also covered in the presentation.
CASI
Space Commercialization; Industries; Remote Sensing; Surveys

20040027796 Nippon Telegraph and Telephone Public Corp., Japan
R and D that can Capture Value
Ichikawa, Haruhisa; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 3; In English; See also 20040027787; Copyright; Avail: Other Sources

NTT Network Innovation Laboratories, with a five- to ten-year outlook, is focusing on 1) creating innovative services and the network concepts that will sup- port them, 2) providing the new network foundation technologies required to win the business competition, and 3) being a leading force in the field of innovative, foundation technologies. In the Japanese name for NTT Network Innovation Laboratories, we deliberately chose to write net (for network) in cursive Japanese characters (hiragana rather than kanji). This expresses our determination to break into new fields with a free and unrestricted approach and to create a supple network that can cope with variations in traffic and services with flexibility and adaptability in the future network. This should be carried out by bringing together a wide range of researchers-working in the fields of optics, wireless systems, and software and tackling the network architecture from the physical layer to the application layer.
Derived from text
Competition; Computer Systems Programs; Field Theory (Physics)

20040031443 North Atlantic Treaty Organization, The Hague, Netherlands
The Increasing Need for the Representation of Decision Making and Human Behaviour in Simulations Used for Computer Assisted Exercises in NATO
Coppieters, D.; Simulation of and for Military Decision Making; June 2003, pp. 13-1 - 13-5; In English; See also 20040031429; Copyright; Avail: CASI; A01, Hardcopy

In computer assisted exercises aimed at staffs and commanders operating in NATO headquarters, simulation models are used by response cell personnel to represent the behaviour of the forces that they are commanding. Exercise directing staff and personnel managing other forces involved in the exercise interact with the simulations to complete the representation of the behaviour of the world that is relevant for the achievement of the exercise objectives. Hence the quality of the exercise depends heavily on the quality of the personnel that interact with the simulation environment. Their ability to understand and interpret the intentions of the exercising staff and to provide them with relevant information through their regular command and control information systems is critical to the success of an exercise. Due to the increasing number of different aspects of the real world and associated scenarios that need to be exercised, the range of activities represented in the simulation models and the breadth and depth of knowledge of the personnel who operate them must grow and adapt rapidly. However the time to develop new simulation models and to adapt existing ones to new requirements has not been reduced considerably in the last decade. The availability of highly qualified personnel to interact with simulations, represent subordinate commanders and staffs, intelligent opponents and interested third parties is limited in both numbers and time. So although considerable improvements have been made in the preparation of the simulation environments to meet exercise objectives, most computer assisted exercises suffer from poorly trained response cell and other forces personnel. Also the reduction in the size of forces, the greater effect and effectiveness of weapons and the importance of inflicted damage causes individual tactical decisions and actions to have a major impact on the battlefield and the exercise. Therefore, the ability to incorporate automated representations of autonomous planning and decision making and real time conduct of operations will be critical in overcoming these problems. Equally important will be the development of intelligent information presentation entities capable of interfacing with small numbers of simulation operators and with real world command and control information systems. It appears that progress in the representation of computer generated forces and human behaviour modelling may allow these

capabilities to be developed. The ability to enable them to go beyond reproducing known behaviour according to established patterns and display some form of creative thinking and unanticipated behaviour will be essential in making them effective for any length of time.
Author
Command and Control; Decision Making; Military Operations

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*.

20040016317 NASA Goddard Space Flight Center, Greenbelt, MD, USA
NASA's Management and Utilization of the Small Business Innovative Research (SBIR) Program
Mexcur, Winfield Paul; [2003]; 1 pp.; In English; Symposium on Collaboration in Space among Industries, Academia and Government, 17 Sep. 2003, Tokyo, Japan; No Copyright; Avail: Other Sources; Abstract Only

The United Space Congress established the SBIR program in 1982 for the following purposes: (1) Stimulate technological innovation (2) Increase private-sector commercialization derived from federal R&D (3) Use small business to meet federal R&D needs (4) Foster and encourage participation by disadvantaged persons and women in technological innovation The STTR program was established in 1992 with the additional requirement of having a small business partner with a research institution (usually a university) for the purpose of transferring intellectual property from the research institution to the small business concern for enabling a government technical need and furthering the technological development for the purpose of developing commercial products. The government of Japan has established a program that models portions of the U.S. SBIR and STTR programs. They are very interested in how NASA has been so successful in fulfilling the Congressional objectives of these programs. In particular, they want to understand the management practices and incentives that are provided to enable partnerships between business enterprises, academia and government. The speech will also focus on some of the many successful technologies (on a conceptual level) that have been developed through NASA s SBIR and STTR programs and mechanisms used to promote cooperation between small businesses, large businesses, academia and government agencies within the USA. The speech is on a conceptual level, focusing on U.S. and NASA policies and management implementation practices. No enabling technical discussion will be held.
Author
Intellectual Property; Technology Utilization; Policies; Procedures

20040016427 NASA Ames Research Center, Moffett Field, CA, USA
The MER/CIP Portal for Ground Operations
Chan, Louise; Desai, Sanjay; DOrtenzio, Matthew; Filman, Robtert E.; Heher, Dennis M.; Hubbard, Kim; Johan, Sandra; Keely, Leslie; Magapu, Vish; Mak, Ronald, et al.; December 2003; 4 pp.; In English; Ground Systems Architecture Workshop 2004, March 2004, Manhattan Beach, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy

We developed the Mars Exploration Rover/Collaborative Information Portal (MER/CIP) to facilitate MER operations. MER/CIP provides a centralized, one-stop delivery platform integrating science and engineering data from several distributed heterogeneous data sources. Key issues for MER/CIP include: 1) Scheduling and schedule reminders; 2) Tracking the status of daily predicted outputs; 3) Finding and analyzing data products; 4) Collaboration; 5) Announcements; 6) Personalization. Derived from text
Mars Roving Vehicles; Information Systems

20040020061 Lawrence Livermore National Lab., Livermore, CA
Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset
Walter, W. R.; Smith, K. D.; O'Boyle, J. L.; Hauk, T. F.; Ryall, F.; Jul. 18, 2003; 16 pp.; In English
Report No.(s): DE2003-15005131; UCRL-JC-148365-R1; No Copyright; Avail: Department of Energy Information Bridge

This project has built a unique historic database of regional distance nuclear explosion, earthquake, and mine-related digital broadband seismograms for the western USA (US). The emphasis is on data from Lawrence Livermore National Laboratory (LLNL)-managed stations MNA, ELK, KNB and LAC that recorded many nuclear tests and nearby earthquakes in broadband digital form since 1980, along with a small number of earlier events that were digitized from tapes. Through the generous cooperation of Sandia National Laboratory (SNL) we have also included waveforms from their Leo Brady network

(BMN, DWN, LDS, NEL, TON). In addition we include data from other open broadband stations in the western US with long operating histories andor ties to the International Monitoring System (IMS) (e.g. PFO, YKA, CMB, NEW, DUG, ANMO, TUC). These waveforms are associated with a reconciled catalog of events and station response information to facilitate analysis. The goal is to create a high-quality database that can be used in the fUture to analyze fundamental regional monitoring issues such as detection, location, magnitude, and discrimination.
NTIS
Seismograms; Signal Processing; Information Analysis; Data Bases

20040020127 Space Education Initiative, Inc., Green Bay, WI, USA
Wisconsin Earth and Space Science Education
Bilbrough, Larry, Technical Monitor; French, George; [2003]; 9 pp.; In English
Contract(s)/Grant(s): NAG5-12532; No Copyright; Avail: CASI; A02, Hardcopy

The Wisconsin Earth and Space Science Education project successfilly met its objectives of creating a comprehensive online portfolio of science education curricular resources and providing a professional development program to increase educator competency with Earth and Space science content and teaching pedagogy. Overall, 97% of participants stated that their experience was either good or excellent. The favorable response of participant reactions to the professional development opportunities highlights the high quality of the professional development opportunity. The enthusiasm generated for using the curricular material in classroom settings was overwhelmingly positive at 92%. This enthusiasm carried over into actual classroom implementation of resources from the curricular portfolio, with 90% using the resources between 1-6 times during the school year. The project has had a positive impact on student learning in Wisconsin. Although direct measurement of student performance is not possible in a project of this kind, nearly 75% of participating teachers stated that they saw an increase in student performance in math and science as a result of using project resources. Additionally, nearly 75% of participants saw an increase in the enthusiasm of students towards math and science. Finally, some evidence exists that the professional development academies and curricular portfolio have been effective in changing educator behavior. More than half of all participants indicated that they have used more hands-on activities as a result of the Wisconsin Earth and Space Science Education project.
Author
Earth Sciences; Education

20040021335 NASA Goddard Space Flight Center, Greenbelt, MD, USA
CESDIS
[1994]; 221 pp.; In English
Contract(s)/Grant(s): NAS5-32337; No Copyright; Avail: CASI; A10, Hardcopy

CESDIS, the Center of Excellence in Space Data and Information Sciences was developed jointly by NASA, Universities Space Research Association (USRA), and the University of Maryland in 1988 to focus on the design of advanced computing techniques and data systems to support NASA Earth and space science research programs. CESDIS is operated by USRA under contract to NASA. The Director, Associate Director, Staff Scientists, and administrative staff are located on-site at NASA's Goddard Space Flight Center in Greenbelt, Maryland. The primary CESDIS mission is to increase the connection between computer science and engineering research programs at colleges and universities and NASA groups working with computer applications in Earth and space science. The 1993-94 CESDIS year included a broad range of computer science research applied to NASA problems. This report provides an overview of these research projects and programs as well as a summary of the various other activities of CESDIS in support of NASA and the university research community, We have had an exciting and challenging year.
Derived from text
Information Management; Data Bases; Parallel Computers

20040027590 Naval Health Research Center, San Diego, CA
An Overview of the Medical Data Surveillance System (MDSS)
Pugh, Jamie K.; Pugh, William M.; Murphy, Brian; Deniston, William; Jul. 2002; 11 pp.; In English
Report No.(s): AD-A419666; NHRC-02-14; No Copyright; Avail: CASI; A03, Hardcopy

The Medical Data Surveillance System (MDSS) is a Web-enabled system for medical surveillance of deployed Navy and Marine Corps forces. The primary objective of MDSS is to rapidly detect medical threats through the analysis of routinely collected patient data. This system represents the culmination of years of naval research and a productive collaboration

between Naval Health Research Center (NHRC) and Space and Naval Warfare Systems Center, San Diego (SSC-SD). The personnel at NHRC have extensive expertise in medical and epidemiological research, while the personnel at SSC-SD provide knowledge and expertise in signal detection and system engineering.
DTIC
Information Systems; Data Systems; Health

20040027724 Northrop Grumman Information Technology, Inc., Reston, VA, USA
Joint Battlespace Infosphere Repository Prototype
McCabe, Patrick K.; Barnum, Douglas J.; Gann, Robert; Nov. 2003; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-D-0159; Proj-JBIT
Report No.(s): AD-A419757; AFRL-IF-RS-TR-2003-269; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this task was to design and develop a prototype capability that provides repository services for a Joint Battlespace Infosphere (JBI) repository Prototype. Repository services include storage and retrieval of Information Objects as well as all data required for JBI operation, maintenance, and management. The objective in building the prototype was to obtain an understanding of the requirements for a robust JBI repository, and to examine in a laboratory setting, how those requirements could be satisfied. The approach was to leverage in-house research and development for repository design and core service definition as points of departure for a far term design. Several repository software packages were evaluated to aid in the definition of the design space for the JBI repository prototype.
DTIC
Software Engineering; Information Retrieval; Applications Programs (Computers)

20040027726 Utah State Univ., Logan, UT
Analytic Prediction of Emergent Dynamics for Autonomous Negotiating Team (ANT) Systems
Watson, Daniel; Moon, Todd; Powell, James; Nov. 2003; 140 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0532; Proj-ANTS
Report No.(s): AD-A419765; AFRL-IF-RS-TR-2003-260; No Copyright; Avail: CASI; A07, Hardcopy

In the work on analytic prediction and dynamics at USU, three distinct perspectives have been brought to bear. The computer science perspective was closely tied to real-time scheduling and planning questions, leading to case-based negotiation. In this work, autonomous negotiating systems are composed of logically separated software agents that control resources that altruistically seek to perform useful work in a cooperative manner. This study examines the negotiation strategy that improves over time by gained experience. A case- based negotiation strategy is presented that allows self- organized scheduling of the tasks. The mathematics perspective examines task completion under a general resource allocation model, where the allocation problem as a nonlinear differential equation, which was used to predict completion ability. This predictive model was then compared with simulation models. The electrical engineering perspective examined the praxes decision theory approach to multiple agent coordination. Inference, the problem of estimating the goals of other agents in the arena, is discussed in the praxis context. Another viewpoint toward multiple agents systems is also presented using catastrophe theory. In this analysis it is determined that a phase transition' behavior is to be expected.
DTIC
Decision Theory; Management; Autonomy; Applications of Mathematics

20040027782 Defense Technical Information Center, Fort Belvoir, VA
FY 2003 Top 200 Users Survey Report
Aug. 2003; 49 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419889; No Copyright; Avail: CASI; A03, Hardcopy

The Defense Technical Information Center (DTIC) has surveyed its registered customers since 1999. There are two surveys conducted yearly: Top 200 Users. Roughly 200 users defined in terms of dollar value of billing, number of documents ordered, and downloads from Secure STINET. All 200+ users were surveyed. Surveys were conducted from FY 2000 through FY 2003. Customer Satisfaction Survey. A random sample of all users not included in the Top 200 Survey. Surveys were conducted in FY 1999, FY 2001, and FY 2002 and will be conducted in FY 2003. A combined Annual Survey Composite Data Report was developed in FY 2001 and FY 2002. A similar report is planned for FY 2003. The DTIC Performance Report, sent to the Defense Information Systems Agency (DISA), contains a report on overall customer satisfaction. This is derived from

the Annual Survey Composite Data Report and reflects data from both the Top 200 Users Survey and the Customer Satisfaction Survey.
DTIC
Surveys; Information Systems; Random Sampling

20040027786 Defense Technical Information Center, Fort Belvoir, VA
2003 DTIC Customer Satisfaction Survey Report
Oct. 2003; 49 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419890; No Copyright; Avail: CASI; A03, Hardcopy

The Defense Technical Information Center (DTIC) has surveyed its registered customers since FY 1999. There are two surveys conducted yearly: Customer Satisfaction Survey. A complete sampling (census) method of all users was used excluding the following: DTIC employees, Air Force Materiel Command (AFMC) personnel, Small Business Innovative Research (SBIR), foreign or overseas users and users identified as Top 200. Surveys were conducted in FY 1999 through FY 2003. Top 200 Users. Roughly 200 users defined in terms of dollar value of billing, number of documents ordered, and downloads from Secure STINET. All 200+ users were surveyed. Surveys were conducted in FY 2000 through FY 2003. A combined Annual Survey Composite Data Report was developed in FY 2001 and FY 2002. An analysis highlighting differences between the two surveys is planned for FY 2003. The DTIC Performance Report, sent to the Defense Information Systems Agency (DISA), contains a report on overall customer satisfaction. This is derived from the Annual Survey Composite Data Report and reflects data from both the Top 200 Users Survey and the Customer Satisfaction (CS) survey.
DTIC
Surveys; Information Systems; Sampling; Census

20040027842 Advanced Technology Inst., North Charleston, SC, USA
Defense Healthcare Information Assurance Program (DHIAP) Phase III
Andrews, Archie; Oct. 2003; 173 pp.; In English
Contract(s)/Grant(s): DAMD17-01-C-0048
Report No.(s): AD-A419898; No Copyright; Avail: CASI; A08, Hardcopy

This report covers activities and accomplishments of Phase III of the Defense Healthcare Information Assurance Program% (DHIAP) for the period 30 July 2001 to 30 July 2003. Phase Ill tasks include: Technical Management, Deploy OCTAVE, OCTAVE Tools, OCTAVE Comparative Analysis, and Biometric Authentication Prototype. The Deploy OCTAVE effort developed and delivered DoD-specific training in use of the OCTAVE Methodology for conducting risk assessments. OCTAVE Tools developed two forms of automated support for the DoD's use of OCTAVE-a PC-based OCTAVE Automated Tool (OAT) to guide site Medical Information Security Response Teams (MlSRTs) through execution of OCTAVE while capturing data and generating interim and final reports, and a Risk Database (RDB) for centralized capture and analysis of site-level OAT data. OCTAVE Comparative Analysis produced reports comparing the OCTAVE process and outputs to other MHS requirements, specifically to execution and results of DlTSCAP, requirements of the HlPAA Security/Privacy Standards, JCAHO requirements, and requirements of the NIST Best Practices for Information Security (NIST SP 800-30). The Biometric Authentication Prototype effort developed and piloted a server and workstation outfitted with biometric authentication technologies (fingerprint, face, iris, and voice) and reported on utility/desirability of various biometric authentication approaches in medical environments with diverse characteristics.
DTIC
Computer Information Security; Medical Personnel; Biometrics

20040028023 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA
List of US Army Research Institute Research and Technical Publications
Moses, Franklin L.; Simutis, Zita M.; Aug. 2003; 53 pp.; In English
Report No.(s): AD-A419849; ARI-RN-2003-08; No Copyright; Avail: CASI; A04, Hardcopy

The primary responsibility of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is to maximize soldier effectiveness. ARI accomplishes its mission through research and development in the acquisition, training, utilization, and retention of Army personnel. AR research and products affect every Army mission with a human performance component. As convenient references for qualified agencies and individuals and sponsors, ARI publishes lists of its technical and research publications. This issue of the publication list describes reports published during the period October 1. 2001, to September 30, 2002. It contains the abstract of each publication and the bibliographic information needed to identify a

publication. The abstracts have been written. as far as possible, to describe the principal research findings in non-technical terms; however. technical language is used to communicate efficiently the details of research analysis. Author and subject indexing provide access to individual reports and topics.
DTIC
Bibliographies; Indexes (Documentation)

20040028033 Naval Postgraduate School, Monterey, CA
Compilation of Theses Abstracts
Sep. 2003; 110 pp.; In English
Report No.(s): AD-A419966; NPS-09-03-009; No Copyright; Avail: CASI; A06, Hardcopy

This publication contains restricted abstracts (classified or restricted distribution) of theses submitted for the degrees Doctor of Philosophy, Master of Business Administration, Master of Science, and Master of Arts for the September 2003 graduation. Classified and restricted distribution abstracts are listed on the NPS SIPRnet. This compilation of abstracts of theses is published in order that those interested in the fields represented may have an opportunity to become acquainted with the nature and substance of the student research that has been undertaken. Programs of graduate studies at NPS are grouped as follows: Graduate School of Operational and Information Science, Graduate School of Engineering and Applied Science, Graduate School of Business and Public Policy, School of International Graduate Studies, Interdisciplinary Curricula.
DTIC
Theses; Abstracts; Research; Policies

20040028045 New Mexico Univ., Albuquerque, NM
Tradeoffs in Polarimeter Design
Tyo, J. S.; Mar. 2003; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419974; No Copyright; Avail: CASI; A03, Hardcopy

This presentation concerns system dimensionality, which includes applications and methods, data collection strategies, which includes serial vs. parallel, rotating vs. non-rotating optics, active vs. passive, and system optimization.
DTIC
Optimization; Data Acquisition; Tradeoffs

20040028061 Army Armament Research, Development and Engineering Center, Watervliet, NY
Chemistry Laboratory Operations Manual
Sopok, Samuel; Aug. 1992; 66 pp.; In English
Report No.(s): AD-A420000; BITR-92-4; No Copyright; Avail: CASI; A04, Hardcopy

In 1987, using quality as a focal point, an extensive effort was undertaken to research, develop, implement, document, and periodically revise all methods used in SMCAR- CCB-RT's Chemistry Laboratory operations. The resulting information is compiled in this manual and should provide a useful starting point for responsible and efficient operations in the future.
DTIC
Chemistry; Education; Laboratories

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20040027210 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A National MagLev Transportation System
Wright, Michael R.; August 2003; 1 pp.; In English; Transportation Research Board National Academy of Science Meeting, Washington, DC, USA; No Copyright; Avail: Other Sources; Abstract Only

The case for a national high-speed magnetic-levitation (MagLev) transportation system is presented. Focus is on current issues facing the country, such as national security, the economy, transportation, technology, and the environment. NASA s research into MagLev technology for launch assist is also highlighted. Further, current socio-cultural norms regarding motor-vehicle-based transportation systems are questioned in light of the problems currently facing the U.S. The

multidisciplinary benefits of a long-distance MagLev system support the idea that such a system would be an important element of a truly multimodal U.S. transportation infrastructure.
Author
Magnetic Levitation Vehicles; Transportation; Magnetic Suspension; Security

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*.

20040030481 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Space Weather Effects on Spacecraft Systems
Barth, Janet L.; [2003]; 9 pp.; In English; American Meteorological Society Annual Meeting Space Weather Symposium, January 2004, Seattle, WA, USA; No Copyright; Avail: CASI; A02, Hardcopy

Space-based systems are developing into critical infrastructure required to support the quality of life on Earth. Hence, spacecraft reliability is a serious issue that is complicated by exposure to the space environment. Complex mission designs along with rapidly evolving technologies have outpaced efforts to accommodate detrimental space environment impacts on systems. Hazardous space environments, the effects on systems, and the accommodation of the effects are described with a focus on the need to predict space environments.
Author
Aerospace Environments; Space Weather; Aerospace Systems; Spacecraft Structures

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20040016254 Tromsoe Univ., Norway
Absolute Optical Calibrations Using a Simple Tungsten Bulb: Theory
Harang, O.; Kosch, M. J.; Proceedings of the 28th Annual European Meeting on Atmospheric Studies by Optical Methods; 2003, pp. 121-123; In English; See also 20040016242; Copyright; Avail: Other Sources

The absolute spectral intensity calibration of optical detectors has always been difficult. In the past, this was only possible using expensive sources, which had been cross-calibrated against national standards. We describe a simple theoretical approach to absolute optical calibrations using any ordinary Tungsten light bulb. A key element of the theory is transforming Tungsten into an equivalent black body radiator. This permits direct application of Stefan-Boltzmann's and Planck's formulas of radiation.
Author
Calibrating; Luminaires; Optical Equipment

20040016355 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Soft Excess Emission in the Hercules Supercluster Observed with the ROSAT Position Sensitive Proportional Counter
Bonamente, Massimiliana; Lieu, Richard; Kaastra, Jelle; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Recent observations with the XMM-Newton satellite confirmed the existence of the soft excess phenomenon in galaxy clusters, earlier discovered in several EUVE, ROSAT and BeppoSAX observations. Excess of soft X-ray radiation in the spectra of several clusters -- above the contribution from the well-known hot intra-cluster gas -- is normally interpreted as emission from cooler gas (T~10^6 K) in the vicinity of galaxy clusters. In this paper we investigate the emission from three clusters in the Hercules concentration, MKW~S, A2052 and A2063. Available XMM observations for two of them (MKW~3s and A2052) indicate the presence of the excess emission, also associated with O VII emission lines. The clusters lie close to the North Polar Spur region, a portion of the sky which features strong soft X-ray emission. We analyze the ROSAT PSPC data of the three clusters and of eight other neighboring locations, in order to study the level of the local soft X-ray background

and its influence on the determination of soft excess fluxes. Our analysis reveals that the North Polar Spur region has strong gradients in the soft X-ray emission, which render the background subtraction process quite cumbersome. Despite these complications, we are able to provide evidence for the presence of soft excess emission in the PSPC data of MKW~S, A2052 and A2063.
Author
Emission Spectra; Galactic Clusters; Proportional Counters; Rosat Mission; Sensitivity

20040016370 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Formation Control of the MAXIM L2 Libration Orbit Mission
Folta, David; Hartman, Kate; Howell, Kathleen; Marchand, Belinda; [2004]; 4 pp.; In English; AIAA/AAS Aerodynamics Specialist Conference and Exhibit, 16-19 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy

The Micro-Arcsecond Imaging Mission (MAXIM), a proposed concept for the Structure and Evolution of the Universe (SEU) Black Hole Imaging mission, is designed to make a ten million-fold improvement in X-ray image clarity of celestial objects by providing better than 0.1 microarcsecond imaging. To achieve mission requirements, MAXIM will have to improve on pointing by orders of magnitude. This pointing requirement impacts the control and design of the formation. Currently the architecture is comprised of 25 spacecraft, which will form the sparse apertures of a grazing incidence X-ray interferometer covering the 0.3-10 keV bandpass. This configuration will deploy 24 spacecraft as optics modules and one as the detector. The formation must allow for long duration continuous science observations and also for reconfiguration that permits re-pointing of the formation. In this paper, we provide analysis and trades of several control efforts that are dependent upon the pointing requirements and the configuration and dimensions of the MAXIM formation. We emphasize the utilization of natural motions in the Lagrangian regions that minimize the control efforts and we address both continuous and discrete control via LQR and feedback linearization. Results provide control cost, configuration options, and capabilities as guidelines for the development of this complex mission.
Author
Imaging Techniques; Black Holes (Astronomy); Space Missions; Earth-Moon System; Formation Flying; Libration; Spacecraft Orbits

20040016378 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Control of the Laser Interferometer Space Antenna
Maghami, Peiman; Hyde, T. Tupper; [2003]; 3 pp.; In English; American Control Conference, 30 Jun. - 2 Jul. 2004, Boston, MA, USA; No Copyright; Avail: CASI; A01, Hardcopy

The detection of gravity waves will open a new window of observation on the universe. Unlike typical observatories, which detect electromagnetic waves traveling through space-time, the Laser Interferometer Space Antenna (LISA) will detect ripples in space-time itself. Science targets include galactic binaries, merging supermassive black holes, intermediate-mass/seed black holes, and cosmological backgrounds. Gravity waves are detected by measuring the strain in space, i.e. the change in distance between a set of masses (test masses or proof masses) separated by a great distance. Ground based detection of gravity waves by Laser Interferometer Gravitational Wave Observatory (LIGO) and other observatories are possible with laser interferometry; hut the relatively short arm length (4 km) and seismic noise limit the measurement band to above 10 Hz on Earth. LISA also uses laser interferometric measurement of the change in distance between test masses, but does it in space. Each LISA spacecraft embodies two test masses. Space allows very long arm lengths (5 million km for LISA) and a very quiet acceleration environment (3.5x10(exp -15) meters per second squared/Hertz (sup 0.5) for LISA), which allows for the detection of gravity wave strains to a best sensitivity of 3x10(exp -24) strain/Hertz (sup 0.5) over the measurement band of 10(exp -4) to 10(exp -1) Hertz for a one-year observation. The LISA mission consists of three spacecraft in heliocentric orbit. The orbits are chosen so that the three spacecraft form a roughly equilateral triangle with its center located at a radius of 1 AU and 20 degrees behind the Earth, as shown. Requirements are placed on the rotational and translational dynamics of each spacecraft to ensure that the proper sensitivity for science measurements can be achieved.
Derived from text
Lisa (Observatory); Detection; Satellite Attitude Control; Telescopes

20040016419 Lawrence Livermore National Lab., Livermore, CA
Twenty Meter Space Telescope Based on Diffractive Fresnel Lens
Early, J.; Hyde, R.; Baron, R.; Jun. 26, 2003; 16 pp.; In English
Report No.(s): DE2003-15004856; UCRL-JC-154093; No Copyright; Avail: Department of Energy Information Bridge

Diffractive lenses offer two potential advantages for very large aperture space telescopes; very loose surface-figure tolerances and physical implementation as thin, flat optical elements. In order to actually realize these advantages one must be able to build large diffractive lenses with adequate optical precision and also to compactly stow the lens for launch and then fully deploy it in space. We will discuss the recent fabrication and assembly demonstration of a 5m glass diffractive Fresnel lens at LLNL. Optical performance data from smaller full telescopes with diffractive lens and corrective optics show diffraction limited performance with broad bandwidths. A systems design for a 20m space telescope will be presented.
NTIS
Diffractive Optics; Spaceborne Telescopes; Fresnel Lenses

20040021338 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical Spectra of Extrasolar Giant Planets
Heap, Sara R.; Hubeny, Ivan; Sudarsky, David; Burrows, Adam; January 2004; 1 pp.; In English; XIXth IAP Colloquium, 30 Jun. - 4 Jul. 2003, Paris, France; Copyright; Avail: Other Sources; Abstract Only

The flux distribution of a planet relative to its host star is a critical quantity for planning space observatories to detect and characterize extrasolar giant planets (EGP's). In this paper, we present optical planet-star contrasts of Jupiter-mass planets as a function of stellar type, orbital distance, and planetary cloud characteristics. As originally shown by Sudarsky et al. (2000, 2003), the phaseaveraged brightness of an EGP does not necessarily decrease monotonically with greater orbital distance because of changes in its albedo and absorption spectrum at lower temperatures. We apply our results to Eclipse, a 1.8-m optical telescope + coronograph to be proposed as a NASA Discovery mission later this year.
Author
Extrasolar Planets; Gas Giant Planets; Light (Visible Radiation); Telescopes

20040021361 Science Applications International Corp., Chantilly, VA, USA
Asteroid Search with Advanced Detection Algorithms
Gural, Peter S.; Larsen, Jeffrey; [2003]; 18 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS5-01121; No Copyright; Avail: CASI; A03, Hardcopy

This report is the final stage of the two-year software development effort by SAIC to enhance asteroid detection capability through the use of advanced image processing techniques. It has been broken into three parts with the first being a programmatic section summarizing results achieved and major accomplishments on the program. The second part involves a performance evaluation for the baseline data set, a summary of the Spacewatch analysis report, and a short analysis on a recently provided NEAT (Near Earth Asteroid Tracking) program data set. A final section addresses software transition efforts and potential capability enhancements not covered under this effort. The work that was originally proposed was to give NASA an ability to improve the detection capabilities of existing Near Earth Asteroid (NEA) survey programs through software and algorithmic enhancements rather than through hardware modifications. This was to help meet the ultimate NASA Office of Space Science goal of providing tools for the 90% completion of the survey of NEAs of size greater than one kilometer by 2008. To that end a significant level of success has been achieved during the course of this project with respect to detection algorithm improvements. Reports by Tedesco (2000) and Stokes (2003) have indicated that current survey techniques will not be able to achieve the original survey goal by 2008. Greater sky coverage and deeper limiting magnitude were areas that would help to shorten the length of the surveys with a combination of space-based and ground-based systems needed and complementing each other effectively. Clearly one approach to enhance limiting magnitude has been demonstrated with this project, that is, through the use of matched filter processing. That advantage alone however will not be adequate to meet the near term goal and either more systems for the detection and recovery (tracking) of new discoveries are needed or a space-based NEA search capability be put into place. This program's objectives were to provide the NEA community with advanced image processing software modules for moving target detection that would aid in both the detection and tracking of asteroids.
Derived from text
Algorithms; Asteroid Detection; Target Acquisition; Near Earth Objects

20040027504 NASA Marshall Space Flight Center, Huntsville, AL, USA
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425
Kouveliotou, C.; Woosley, S. E.; Patel, S. K.; Levan, A.; Blandford, R.; Ramirez-Ruiz, E.; Wijers, R. A. M. J.; Weisskopf, M. C.; Tennant, A.; Pian, E., et al.; January 11, 2004; 2 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We report X-ray studies of the environs of SN 1998bw and GRB 980425 using the Chandra X-Ray Observatory 1281 days

after the GRB. Eight X-ray point sources were localized, three and five each in the original error boxes - S1 and S2 - assigned for variable X-ray counterparts to the GRB by BeppoSAX. The sum of the discrete X-ray sources plus continuous emission in S2 observed by CXO on day 1281 is within a factor of 1.5 of the maximum and the upper limits seen by BeppoSAX. We conclude that S2 is the sum of several variable sources that have not disappeared, and therefore is not associated with the GRB. Within S1, clear evidence is seen for a decline of approximately a factor of 12 between day 200 and day 1281. One of the sources in S1, Sla, is coincident with the well-determined radio location of SN 1998bw, and is certainly the remnant of that explosion. The nature of the other sources is also discussed. Combining our observation of the supernova with others of the GRB afterglow, a smooth X-ray light curve, spanning approximately 1300 days, is obtained by assuming the burst and supernova were coincident at 35.6 Mpc. When this X-ray iight curve is compared with those of the X-ray afterglows of ordinary GRBs, X-ray Flashes, and ordinary supernovae, evidence emerges for at least two classes of lightcurves, perhaps bounding a continuum. By three to ten years, all these phenomena seem to converge on a common X-ray luminosity, possibly indicative of the supernova underlying them all. This convergence strengthens the conclusion that SN 1998bw and GRB 980425 took place in the same object. One possible explanation for the two classes is a (nearly) standard GRB observed at different angles, in which case X-ray afterglows with intermediate luminosities should eventually be discovered. Finally, we comment on the contribution of GRBs to the ULX source population.
Author
X Ray Astrophysics Facility; Gamma Ray Bursts; Supernovae; Astrophysics

20040027547 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Nanotechnology Infrared Optics for Astronomy Missions
Frogel, Jay, Technical Monitor; Smith, Howard A.; January 2004; 16 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-9363; No Copyright; Avail: CASI; A03, Hardcopy

We have used the 'MicroStripes' code (Flomerics, Inc.) to perform full-, near- and far-field diffraction modeling of metal mesh performance on substrates. Our Miles Code software, which approximates the full calculation in a quick, gui-based window, is useful as an iterative device by adjusting the input parameters (index of refraction, thickness, etc.) to provide agreement with the full calculation. However, despite the somewhat extravagant claims by the MicroStripes manufacturer, this code is also not perfect because numerous free parameters must be set. Key among these, as identified in our earlier papers and proposal documents, is the high frequency (i.e., far IR) character of the real and imaginary parts of the index of refraction of the metal mesh, the high frequency character of the real and imaginary parts of the index of refraction of the substrate, and the character of the interface between the mesh and the substrate material, and in particular the suppression (or possible enhancement) of surface effects at the interface.
Derived from text
Infrared Astronomy; Graphical User Interface; Refractivity; Augmentation; Diffraction; Nanotechnology; Mesh

20040027553 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Coronal Activity in Low-Mass Pre-Main Sequence Stars: NGC 2264
Tebbe, Heidi J.; Tebbe, Heidi J.; [1999]; 17 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Located at a distance of approx. 800 parsecs, the open cluster NGC 2264 is an ideal region to study stellar evolution. In this paper I present the preliminary results of an analysis of ROSAT archival data in the region of the young cluster NGC 2264. Two sets of pointings, one centered on the central region of the cluster and the other centered on the southern part of the cluster, along with data from ground-based optical surveys, were obtained and used for this analysis. I use these data to identify member stars showing X-ray emission and to determine X-ray luminosities for these stars. I also examine the relationship between X-ray activity and age for solar-mass stars in NGC 2264 and those in other older clusters. In total 113 sources were identified in the ROSAT images with signal-to-noise greater than or equal to 3, 39 more than in a previous analysis. Another 15 positions were identified with net counts above the background with 1 less than or equal to signal-to-noise < 3. Limiting luminosities for 3sigma detections are estimated to be log L(sub x)(erg/sec) = 30.18, 30.23, 30.08 for the north, south, and overlap fields respectively. We find that this ROSAT HRI X-ray survey detected only the brightest X-ray members of the cluster.
Author
Pre-Main Sequence Stars; Star Clusters; Stellar Evolution; Stellar Mass; Coronas

20040027560 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Beauty and Limitations of 10 Micron Heterodyne Interferometry (ISI)

Danchi, William C.; [2003]; 1 pp.; In English; Ringberg Workshop, 1-5 Sep. 2003, Munich, Germany; No Copyright; Avail: Other Sources; Abstract Only

Until recently, heterodyne interferometry at 10 microns has been the only successful technique for stellar interferometry in the very difficult atmospheric window from 9-12 microns. For most of its operational lifetime the U.C. Berkeley Infrared Spatial Interferometer was a single-baseline two telescope (1.65 m aperture) system using CO2 lasers as local oscillators. This instrument was designed and constructed from 1983-1988, and first fringes were obtained at Mt. Wilson in June 1988. During the past few years, a third telescope was constructed and just recently the first closure phases were obtained at 11.15 microns. We discuss the history, physics and technology of heterodyne interferometry in the mid-infrared, and some key astronomical results that have come from this unique instrument.

Author

Infrared Interferometers; Telescopes; Astronomy

20040027567 Massachusetts Inst. of Tech., Cambridge, MA, USA

Spectroscopy and Photometry of Mars Trojans

Rivkin, A. S.; Binzel, R. P.; Howell, E. S.; Bus, S. J.; Grier, J. A.; Icarus; 2003; ISSN 0019-1035; Volume 165, pp. 349-354; In English

Contract(s)/Grant(s): NAG5-13221; Copyright; Avail: Other Sources

Mars is the only terrestrial planet known to have co-orbiting 'Trojan' asteroids. We have obtained visible and near-IR reflectance spectra of three of these objects: 5261 Eureka and 1998 VF31 in the L5 region and 1999 UJ7 in the L4 region. We also obtained JHK spectrophotometry and a visible lightcurve for 5261 Eureka. The asteroid 5261 Eureka has a visible spectrum that is classified as Sr in the Bus taxonomy, and has infrared colors consistent with the A-class asteroids. The data for 1998 VF31 have a restricted wavelength range, but are most consistent with the Sr or Sa class, though we note a marginal consistency with the D class. We can rule out a C-class classification. 1999 UJ7 has an X-class or T-class spectrum, which is unlike that of the other two Mars Trojans. The photometric data for Eureka are limited, but we can constrain the period to longer than 5 hours (likely 5.556 hours) and lightcurve amplitude of at least 0.15 magnitude at this viewing geometry. The spectral differences among the Mars Trojans suggests that either they did not all form at their present solar distances or that they have not always been at their present sizes. 0 2003 Elsevier Inc. All rights reserved. Keywords: Asteroids; Asteroids, composition; Spectroscopy; Satellites of Mars

Author

Spectroscopy; Spectrophotometry; Mars (Planet); Trojan Asteroids; Near Infrared Radiation; Terrestrial Planets

20040027568 Space Telescope Science Inst., Baltimore, MD, USA

Observations of Distant Clusters

Donahue, Megan; January 26, 2004; 3 pp.; In English

Contract(s)/Grant(s): NAG5-3257; STScI Proj. J0478; No Copyright; Avail: CASI; A01, Hardcopy

The is the proceedings and papers supported by the LTSA grant: Homer, D. J.\& Donahue, M. 2003, in 'The Emergence of Cosmic Structure': 13'h Astrophysics Conference Proceedings, Vol. 666,3 1 1-3 14, (AIP). Baumgartner, W. H., Loewenstein, M., Horner, D. J., Mushotzky, R. F. 2003, HEAD- AAS, 35.3503. Homer, D. J. , Donahue, M., Voit G. M. 2003, HEAD-AAS, 35.1309. Nowak, M. A., Smith, B., Donahue, M., Stocke, J. 2003, HEAD-AAS, 35.1316. Scott, D., Borys, C., Chapman, S. C., Donahue, M., Fahlman, G. G., Halpem, M. Newbury, P. 2002, AAS, 128.01. Jones, L. R. et al. 2002, A new era in cosmology, ASP Conference Proceedings, Vol. 283, p. 223 Donahue, M., Daly, R. A., Homer, D. J. 2003, ApJ, 584, 643, Constraints on the Cluster Environments and Hotspot magnetic field strengths for radio sources 3~280 and 3~254. Donahue, M., et al. 2003, ApJ, 598, 190. The mass, baryonic fraction, and x-ray temperature of the luminous, high-redshift cluster of galaxies MS045 1.6-0305 Perlman, E. S. et al. 2002, ApJS, 140, 256. Smith, B. J., Nowak, M., Donahue, M., Stocke, J. 2003, AJ, 126, 1763. Chandra Observations of the Interacting NGC44 10 Group of Galaxies. Postman, M., Lauer, T. R., Oegerle, W., Donahue, M. 2002, ApJ, 579, 93. The KPNO/deep-range cluster survey I. The catalog and space density of intermediate-redshift clusters. Molnar, S. M., Hughes, J. P., Donahue, M., Joy, M. 2002, ApJ, 573, L91, Chandra Observations of Unresolved X-Ray Sources around Two Clusters of Galaxies. Donahue, M., Mack, J., 2002 NewAR, 46, 155, HST NIcmos and WFPC2 observations of molecular hydrogen and dust around cooling flows. Koekemoer, A. M. et al. 2002 NewAR, 46, 149, Interactions between the A2597 central radio source and dense gas host galaxy. Donahue, M. et al. 2002 ApJ, 569,689, Distant cluster hunting II.

CASI

Astrophysics; Galactic Clusters; Gas Density; Magnetic Flux; Molecular Gases

20040027574 NASA Marshall Space Flight Center, Huntsville, AL, USA

Prediction of Active-Region CME Productivity from Magnetograms

Falconer, D. A.; Moore, R. L.; Gary, G. A.; [2004]; 2 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We report results of an expanded evaluation of whole-active-region magnetic measures as predictors of active-region coronal mass ejection (CME) productivity. Previously, in a sample of 17 vector magnetograms of 12 bipolar active regions observed by the Marshall Space Flight Center (MSFC) vector magnetograph, from each magnetogram we extracted a measure of the size of the active region (the active region s total magnetic flux a) and four measures of the nonpotentiality of the active region: the strong-shear length L(sub SS), the strong-gradient length L(sub SG), the net vertical electric current I(sub N), and the net-current magnetic twist parameter alpha (sub IN). This sample size allowed us to show that each of the four nonpotentiality measures was statistically significantly correlated with active-region CME productivity in time windows of a few days centered on the day of the magnetogram. We have now added a fifth measure of active-region nonpotentiality (the best-constant-alpha magnetic twist parameter (alpha sub BC)), and have expanded the sample to 36 MSFC vector magnetograms of 31 bipolar active regions. This larger sample allows us to demonstrate statistically significant correlations of each of the five nonpotentiality measures with future CME productivity, in time windows of a few days starting from the day of the magnetogram. The two magnetic twist parameters (alpha (sub 1N) and alpha (sub BC)) are normalized measures of an active region s nonpotentially in that they do not depend directly on the size of the active region, while the other three nonpotentiality measures (L(sub SS), L(sub SG), and I(sub N)) are non-normalized measures in that they do depend directly on active-region size. We find (1) Each of the five nonpotentiality measures is statistically significantly correlated (correlation confidence level greater than 95%) with future CME productivity and has a CME prediction success rate of approximately 80%. (2) None of the nonpotentiality measures is a significantly better CME predictor than the others. (3) The active-region phi shows some correlation with CME productivity, but well below a statistically significant level (correlation confidence level less than approximately 80%; CME prediction success rate less than approximately 65%). (4) In addition to depending on magnetic twist, CME productivity appears to have some direct dependence on active-region size (rather than only an indirect dependence through a correlation of magnetic twist with active-region size), but it will take a still larger sample of active regions (50 or more) to certify this. (5) Of the five nonpotentiality measures, L(sub SG) appears to be the best for operational CME forecasting because it is as good or better a CME predictor than the others and it alone does not require a vector magnetogram; L(sub SG) can be measured from a line-of-sight magnetogram such as from the Michelson Doppler Imager (MDI) on the Solar and Heliospheric Observatory (SOHO).

Author

Coronal Mass Ejection; Magnetic Signatures; Productivity; Predictions

20040027578 Massachusetts Inst. of Tech., MA, USA

Investigations into Gravitational Wave Emission from Compact Body Inspiral Into Massive Black Holes

Hughes, Scott A.; January 2004; 3 pp.; In English

Contract(s)/Grant(s): NAGW-12906; No Copyright; Avail: CASI; A01, Hardcopy

Much of the grant's support (and associated time) was used in developmental activity, building infrastructure for the core of the work that the grant supports. Though infrastructure development was the bulk of the activity supported this year, important progress was made in research as well. The two most important 'infrastructure' items were in computing hardware and personnel. Research activities were primarily focused on improving and extending. Hughes' Teukolsky-equation-based gravitational-wave generator. Several improvements have been incorporated into this generator.

Derived from text

Black Holes (Astronomy); Gravitational Waves; Wave Excitation

20040027603 Boston Coll., Chestnut Hill, MA

Validation of Ionospheric Models

Doherty, Patricia H.; Mar. 31, 2000; 42 pp.; In English

Contract(s)/Grant(s): F19628-96-C-0039; Proj-1010

Report No.(s): AD-A419681; AFRL-VS-TR-2003-1591; No Copyright; Avail: CASI; A03, Hardcopy

During the period of April 1999 through March 2000, research efforts continued in the Validation of ionospheric Models. These efforts included the development and augmentation of a model that predicts positioning errors for the single-frequency GPS user. This model has the ability to utilize the Parameterized ionosphere Model (PIM) or the Parameterized Real-time ionosphere Model (PRISM). This model has further been assimilated into the Operational Space Environment Network Display (OP-SEND) space weather product Other efforts included comprehensive validations of PIM and PRISM together with comparisons of PIM with other climatological models. Advancements were also made in the development of analytical

techniques to theoretically model Equatorial Spread F. A database of TEC from the TOPEX satellite was accessed and used to describe longitudinal dependence of the equatorial anomaly and to test ExB control of the anomaly features of the LowLat model. Finally, efforts to define a relationship between rapid changes in TEC and amplitude scintillation were made.
DTIC
Earth Ionosphere; Atmospheric Models; Global Positioning System; Augmentation

20040027604 Boston Coll., Chestnut Hill, MA
Validation of Ionospheric Models
Doherty, Patricia; Mar. 31, 2001; 25 pp.; In English
Contract(s)/Grant(s): F19628-96-C-0039; Proj-1010
Report No.(s): AD-A419680; AFRL-VS-TR-2003-1592; No Copyright; Avail: CASI; A03, Hardcopy

During the period of April 2000 through March 2001, research efforts have continued in the Validation of Ionospheric Models. These efforts included testing and utilizing the Ionospheric Forecast Model (IFM) and the Coupled ionosphere Thermosphere Electrodynamic Forecast Model (CITEFM) to define low latitude ionospheric characteristics. Other efforts included continued validations of the Parametrized Real-time Ionospheric Specification Model (PRISM) and development of a data preprocessor that will allow various data types to be integrated into PRISM. Data analysis studies included the mid-latitude response to major magnetic storm activity. Work was also made to refine and transition the Global Positioning System (GPS) Single-Frequency Position Error Maps to the 55th Space Weather Squadron. This resulted in being part of the team that was awarded the Annual Air Force Merewether Award of 2000 for the Most Significant Technical Contribution. Finally, we contributed to the development of an alternate derivation of the Alfven- Falthammer formula for the parallel E-field in upward auroral- current regions.
DTIC
Atmospheric Models; Magnetohydrodynamic Waves; Thermosphere; Earth Ionosphere; Magnetic Storms

20040030555 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Seeing Red and Shooting Blanks: A Study of Red Quasars and Blank Field X-Ray Sources
Oliversen, Ronald J., Technical Monitor; Elvis, Martin; February 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9206; No Copyright; Avail: CASI; A01, Hardcopy

One type of 'Blank Field X-ray Source' is now being seen in deep Chandra and XMM-Newton surveys. These are the newly dubbed 'XBONGs' (X-ray Bright, Optically Normal Galaxies). The study of the brighter counterparts from ROSAT and XMM- Newton serendipitous surveys is therefore of renewed interest and topicality. We continue to define the properties of the ROSAT sample which is the basis of this grant. We expect to publish the SEDs of these sources soon.
Author
Quasars; X Ray Sources; Surveys; Brightness

20040031483 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Submillimeter Probe of the Evolution of Cosmic Structure (SPECS)
Leisawitz, David; [2003]; 1 pp.; In English; New Perspectives for Post-Herschel Far Infared Astronomy From Space, 1-4 Sep. 2003, Madrid, Spain; No Copyright; Avail: Other Sources; Abstract Only

The NASA roadmap mission SPECS is conceived as an imaging and spectral interferometer that will have the sensitivity needed to reach back in time to the formation epoch of the first luminous objects, the angular resolution needed to image proto-planetary systems and galaxies at high redshift, and the spectral resolution needed to probe the physical conditions and measure the flows of interstellar gas in young galaxies, nascent stars, and the dust-enshrouded nuclei of galaxies that harbor massive black holes. With a 1 km maximum baseline and the capability to sample the u-v plane completely, SPECS will produce images with angular resolution 20 (lambda / 100 microns) mas over the wavelength range 40 less than lambda less than 800 microns. In this talk I will give the scientific motivation for SPECS, describe mission concepts and telescope measurement capabilities, and compare these capabilities with those of the next-generation IR telescopes, and with the complementary JWST and ALMA.
Author
Submillimeter Waves; Probes; Cosmology; Imaging Techniques; Interferometers; Infrared Telescopes; Stellar Evolution

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20040016302 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Discovery of an Obscured Supernova in Arp 299
Neff, Susan; Ulvstad, James; Teng, Stacy; [2003]; 1 pp.; In English; 202nd American Astronomical Society Meeting; No Copyright; Avail: Other Sources; Abstract Only

The galaxy merger Arp 299, at a distance of 40 Mpc, is one of the most extensively studied interacting starburst galaxies known. It has been the site of 4 known supernovae (SNe) since 1990. Arp 299 contains a number of strong radio and infrared condensations, with the strongest starburst occurring in 'Source A,' in the nuclear region of the eastern galaxy. Source A has an inferred supernova rate of 0.5-0.7/yr, and its star formation peaked 6-8 Myr ago. Our recent observations identify a new radio-loud SN in Source A, which occurred sometime between April 2002 and February 2003. We imaged Arp 299 at milliarcsecond resolution at two epochs, in April 2002 and February 2003, using the Very Long Baseline Array and (at the first epoch) the Green Bank Telescope. In 2002, four compact radio sources were found in Source A at 2.3 GHz, with flux densities ranging from 0.3 to 1.7 mJy. In 2003, 8.4 GEz images revealed a new 3 mJy source, as well as the four objects detected a year earlier. The new radio SN is more than 1000 times more powerful than the galactic supernova remnant Cassiopeia A and is located located only 12 milliarcseconds (2.5 pc projected) from the strongest source seen in 2002. Milliarcsecond radio imaging is the only technique that could have detected this supernova, since it is embedded within an 80 mJy VLA source and buried in gas and dust (Av 15-25 mag). We suggest that both the new supernova and its nearest neighbor are occurring within a super star cluster, perhaps a newly formed globular cluster akin to those seen in a number of nearby galaxies and particularly galaxy mergers. If so, we are observing this cluster just as its massive stars have begun to explode into a very dense surrounding medium. The likelihood that most supernovae in such a medium will be radio-loud implies that future VLBI imaging over a number of years could lead to a direct measurement of the supernova rate in the Source A starburst, placing powerful constraints on models of present-day star formation processes.
Author
Supernovae; Starburst Galaxies; Radio Astronomy; Radio Sources (Astronomy)

20040020045 Lawrence Livermore National Lab., Livermore, CA
Design and Performance of Capping Layers for EUV Multilayer Mirrors
Bajt, S.; Chapman, H. N.; Nuygen, N.; Alameda, J.; Robinson, J. C.; Mar. 10, 2003; 20 pp.; In English
Report No.(s): DE2003-15005065; UCRL-JC-152459; No Copyright; Avail: Department of Energy Information Bridge

The reflectance stability of multilayer coatings for extreme ultraviolet lithography (EUVL) in a commercial tool environment is of uttermost importance to ensure continuous exposures with minimum maintenance cost. We have made substantial progress in designing the protective capping layer coatings, understanding their performance and estimating their lifetimes based on accelerated electron beam and EUV exposure studies. Our current capping layer coatings have about 40 times longer lifetimes than Si-capped multilayer optics. Nevertheless, the lifetime of current Ru-capped multilayers is too short to satisfy commercial tool requirements and further improvements are essential.
NTIS
Lithography; Extreme Ultraviolet Radiation; Cost Effectiveness

20040020075 NASA Marshall Space Flight Center, Huntsville, AL, USA
Magnetosphere-Ionosphere Coupling and Associated Ring Current Energization Processes
Liemohn, M. W.; Khazanov, G. V.; [2004]; 2 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Adiabatic processes in the ring current are examined. In particular, an analysis of the factors that parameterize the net adiabatic energy gain in the inner magnetosphere during magnetic storms is presented. A single storm was considered, that of April 17, 2002. Three simulations were conducted with similar boundary conditions but with different electric field descriptions. It is concluded that the best parameter for quantifying the net adiabatic energy gain in the inner magnetosphere during storms is the instantaneous value of the product of the maximum westward electric field at the outer simulation boundary with the nightside plasma sheet density. However, all of the instantaneous magnetospheric quantities considered in this study produced large correlation coefficients. Therefore, they all could be considered useful predictors of the net adiabatic energy gain of the ring current. Long integration times over the parameters lessen the significance of the correlation. Finally,

some significant differences exist in the correlation coefficients depending on the electric field description.
Author
Magnetosphere-Ionosphere Coupling; Adiabatic Conditions; Ring Currents; Boundary Conditions

20040020111 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Studies of Circumstellar Disk Evolution
Hartmann, Lee W.; January 2004; 3 pp.; In English
Contract(s)/Grant(s): NAG5-13210; No Copyright; Avail: CASI; A01, Hardcopy

Spitzer Space Telescope infrared data for our program on disk evolution has been taken (the main IRAC - 3-8 micron exposures; the 24 and 70 micron MIPS data are to come later). We now have deep maps in the four IRAC bands of the 3-Myr-old cluster Trumpler 37, and the 10-Myr-old cluster NGC 7160. Analysis of these data has now begun. We will be combining these data with our ground-based photometric and spectroscopic data to obtain a complete picture of disk frequency as a function of mass through this important age range, which spans the likely epoch of (giant) planet formation in most systems. Analysis of the SIRTF data, and follow-on ground-based spectroscopy on the converted MMT telescope using the wide-field, fiber-fed, multiobject spectrographs, Hectospec and Hectochelle, will be the major activity during the next year.Work was also performed on the following: protoplanetary disk mass accretion rates in very low-mass stars; the inner edge of T Tauri disks; accretion in intermediate-mass T Tauri stars (IMPS); and the near-infrared spectra of the rapidly-accreting protostellar disks FU Ori and V1057 Cyg.
Derived from text
Accretion Disks; Protoplanetary Disks; Space Infrared Telescope Facility; T Tauri Stars

20040020112 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
The Interaction of Hot and Cold Gas in the Disk and Halo of Galaxies
Slavin, Jonathan; Salamon, Michael, Technical Monitor; February 2004; 5 pp.; In English
Contract(s)/Grant(s): NAG5-13287; No Copyright; Avail: CASI; A01, Hardcopy

Most of the thermal energy in the Galaxy and perhaps most of the baryons in the Universe are found in hot (log T approximately 5.5 - 7) gas. Hot gas is detected in the local interstellar medium, in supernova remnants (SNR), the Galactic halo, galaxy clusters and the intergalactic medium (IGM). In our own Galaxy, hot gas exists in large superbubbles up to several hundred pc in diameter that locally dominate the interstellar medium (ISM) and determine its thermal and dynamic evolution. While X-ray observations using ROSAT, Chandra and XMM have allowed us to make dramatic progress in mapping out the morphology of the hot gas and in understanding some of its spectral characteristics, there remain fundamental questions that are unanswered. Chief among these questions is the way that hot gas interacts with cooler phase gas and the effects these interactions have on hot gas energetics. The theoretical investigations we proposed in this grant aim to explore these interactions and to develop observational diagnostics that will allow us to gain much improved information on the evolution of hot gas in the disk and halo of galaxies. The first of the series of investigations that we proposed was a thorough exploration of turbulent mixing layers and cloud evaporation. We proposed to employ a multi-dimensional hydrodynamical code that includes non-equilibrium ionization (NEI), radiative cooling and thermal conduction. These models are to be applied to high velocity clouds in our galactic halo that are seen to have O VI by FUSE (Sembach et ai. 2000) and other clouds for which sufficient constraining observations exist.
Author
Cold Gas; Disk Galaxies; Galactic Clusters; Thermal Energy; Astrophysics; High Temperature Gases

20040020113 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Uncovering the Properties of Young Neutron Stars and their Surrounding Supernova Remnants
Oliversen, Ronald J., Technical Monitor; Slane, Patrick O.; January 2004; 3 pp.; In English
Contract(s)/Grant(s): NAG5-9281
Report No.(s): Rept.-4; No Copyright; Avail: CASI; A01, Hardcopy

This five-year grant involves the study of young neutron stars, particularly those in supernova remnants.In the fourth year of this program, the following studies have been undertaken in support of this effort: 1.CTA 1: Following up on our ROSAT and ASCA studies of this SNR, we obtained observations with the XMM-Newton observatory to investigate the central compact source and surrounding nebula. 2. 3C 58: Based upon our earlier Chandra observations, we submitted a successful Chandra Large Project proposal for a 350 ks observation of this young neutron star and its wind nebula. 3. G347.3 - - 0.5: Our Chandra observations of portions of this SNR were aimed at studying the nonthermal X-ray emission from the remnant

shell. 4. Chandra Survey for Compact Objects in Supernova Remnants: We have formed a collaboration to carry out an extensive search for young neutron stars in nearby supernova remnants. Using X-ray observations from an approved Chandra Large Project, as well as from additional approved XMM observations, we are investigating a volume-limited sample of SNRs for which there is currently no evidence of associated neutron stars.
Derived from text
Neutron Stars; Supernova Remnants; Surveys; Nonthermal Radiation; Emission

20040021340
Might Dark Matter be Actually Black
Chen, P.; Aug. 2003; 8 pp.; In English
Report No.(s): DE2003-815244; SLAC-PUB-10096; BABAR-PUB-03/028; No Copyright; Avail: Department of Energy Information Bridge

There have been proposals that primordial black hole remnants (BHRs) are the dark matter, but the idea is somewhat vague. We argue here first that the generalized uncertainty principle (GUP) may prevent black holes from evaporating completely, in a similar way that the standard uncertainty principle prevents the hydrogen atom from collapsing. Secondly we note that the hybrid inflation model provides a plausible mechanism for production of large numbers of small black holes. Combining these we suggest that the dark matter might be composed of Planck-size BHRs and discuss the possible constraints and signatures associated with this notion.
NTIS
Black Holes (Astronomy); Dark Matter

20040021389 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Symmetric Waveguide Orthomode Junctions
Wollack, E. J.; Grammer, W.; [2003]; 1 pp.; In English; National Radio Astronomy Observatory Users Committee, 12-14 Jun. 2003, Socorro, New Mexico, USA; No Copyright; Avail: CASI; A01, Hardcopy

Imaging applications at millimeter and submillimeter wavelengths demand precise characterization of the amplitude, spectrum, and polarization of the electromagnetic radiation. The use of a waveguide orthomode transducer (OMT) can help achieve these goals by increasing spectral coverage and sensitivity while reducing exit aperture size, optical spill, instrumental polarization offsets, and lending itself to integration in focal plane arrays. For these reasons, four-old symmetric OMTs are favored over a traditional quasi-optical wire grid for focal plane imaging arrays from a systems perspective. The design, fabrication, and test of OMTs realized with conventional split-block techniques for millimeter wave-bands are described. The design provides a return loss is -20 dB over a full waveguide band (40% bandwidth), and the cross-polarization and isolation are greater than -40 dB for tolerances readily achievable in practice. Prototype examples realized in WR10.0 and WR3.7 wavebands will be considered in detail.
Author
Submillimeter Waves; Millimeter Waves; Electromagnetic Radiation; Spectral Sensitivity; Cross Polarization; Focal Plane Devices

20040027515 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Spectroscopy of the Perseus Cluster
Jones, Christine; Mushotzky, Richard F., Technical Monitor; January 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9944; No Copyright; Avail: CASI; A01, Hardcopy

We present preliminary results of a XMM-Newton 50 ks observation of the Perseus Cluster that provides an unprecedented view of the central 0.5 Mpc region. The projected gas temperature declines smoothly by a factor of 2 from a maximum value of approx. 7 keV in the outer regions to just above 3 keV at the cluster center. Over this same range, the heavy-element abundance rises slowly from 0.4 to 0.5 solar as the radius decreases from 14 ft. to 5 ft., and then it rises to a peak of almost 0.7 solar at 1&farcm;25 before declining to 0.4 at the center. Th global east-west asymmetry of the gas temperature and surface brightness distributions, approximately aligned with the chain of bright galaxies, suggests an ongoing merger, although the modest degree of the observed asymmetry certainly excludes a major merger interpretation. The chain of galaxies probably traces the filament along which accretion started some time ago and is continuing at the present time. A cold and dense (low-entropy) cluster core like Perseus is probably well 'protected' against the penetration of the gas of infalling groups and poor clusters, whereas in non-cooling core clusters such as Coma and A1367, infalling subclusters can penetrate deeply into the core region. In Perseus, gas associated with infalling groups may be stripped completely at the

outskirts of the main cluster and only compression waves (shocks) may reach the central regions. We argue, and show supporting simulations, that the passage of such a wave(s) can qualitatively explain the overall horseshoe shaped appearance of the gas temperature map (the hot horseshoe surrounds the colder, low-entropy core) as well as other features of the Perseus Cluster core. These simulations also show that as compression waves traverse the cluster core, they can induce oscillatory motion of the cluster gas that can generate multiple sharp 'edges' on opposite sides of the central galaxy. Gas motions induced by mergers may be a natural way to explain the high frequency of 'edges' seen in clusters with cooling cores.
Derived from text
Computer Programs; Galactic Clusters; Heavy Elements; Gas Temperature

20040027539 NASA Ames Research Center, Moffett Field, CA, USA
Wavelength Shifts of the 7.7 Micron Emission Band in Reflection Nebulae
Bregman, Jesse; Temi, Pasquale; August 07, 2003; 10 pp.; In English
Contract(s)/Grant(s): 279-00-03-47
Report No.(s): SSA-126; Copyright; Avail: Other Sources; Abstract Only

Using spatial-spectral data cubes of reflection nebulae obtained by ISOCAM, we have observed a shift in the central wavelength of the 7.7 micron band within several reflection nebulae. The band shifts progressively from approx. 7.8 microns near the edge of the nebulae to approx. 7.6 microns towards the center of the nebulae. The ratio of the 11.3/7.7 micron bands also changes with distance from the central star, first rising from the center towards the edge of the nebula, then falling at the largest distances from the star, consistent with the 11.3/7.7 micron band ratio being controlled by the PAH ionization state. The behavior of the 7.7 micron band center can be explained either by assuming that anions are the origin of the 7.85 micron band and cations the 7.65 micron band, or that the band center wavelength depends on the chemical nature of the PAHs.
Author
Reflection Nebulae; Emission Spectra; Infrared Astronomy

20040027551 Carnegie Institution of Washington, Washington, DC, USA
Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program
O'D. Alexander, Conel; [2003]; 7 pp.; In English
Contract(s)/Grant(s): NAG5-11912; No Copyright; Avail: CASI; A02, Hardcopy

The discovery of presolar grains in meteorites is one of the most exciting recent developments in meteoritics. Six types of presolar grain have been discovered: diamond, Sic, graphite, Si3N4, Al2O3 and MgAl2O4. These grains have been identified as presolar because their isotopic compositions are very different from those of Solar System materials. Comparison of their isotopic compositions with astronomical observations and theoretical models indicates most of the grains formed in the envelopes of highly evolved stars. They are, therefore, a new source of information with which to test astrophysical models of the evolution of these stars. In fact, because several elements can often be measured in the same grain, including elements that are not measurable spectroscopically in stars, the grain data provide some very stringent constraints for these models. Our primary goal is to create large, unbiased, multi-isotope databases of single presolar Sic, Si,N,, oxide and graphite grains in meteorites, as well as any new presolar grain types that are identified in the future. These will be used to: (i) test stellar and nucleosynthetic models, (ii) constrain the galactic chemical evolution (GCE) paths of the isotopes of Si, Ti, O and Mg, (iii) establish how many stellar sources contributed to the Solar System, (iv) constrain relative dust production rates of various stellar types and (v) assess how representative of galactic dust production the record in meteorites is. The primary tool for this project is a highly automated grain analysis system on the Carnegie 6f ion probe.
Derived from text
Meteorites; Silicon Nitrides; Meteoritic Composition; Galactic Evolution; Cosmochemistry

20040027557 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dying Pulse Trains in Cygnus XR-1: Initial Results of X-Ray Searches
Dolan, Joseph F.; [2003]; 1 pp.; In English; IAU XXV Meeting, 2 Jul. 2003, Sydney, Australia; No Copyright; Avail: Other Sources; Abstract Only

Dying pulse trains (DPT's) are a signature of a black hole as described by general relativity. Detecting DPT's would establish the existence of black holes by ruling out more exotic objects in systems in which a neutron star or white dwarf component has already been excluded by maximum mass arguments. The positive identification of a black hole would also be an additional test of general relativity. Two possible DPT's were detected in W photometry of Cygnus XR-1, the leading candidate for a stellar mass sized BH, in 3 hours of observational data. A search of X-ray photometry of Cygnus XR-1 from

the Ross1 X-ray Timing Explorer (RXTE) has begun. No DPT's have been detected in the first 4 hours of data searched. Because of the low event rate detected in the W data, these initial results are consistent with such disparate scenarios as the rate of DPT occurrence being dependent on the luminosity state of the system; or being more difficult to detect in the X-ray region relative to the W region; or occurring at the same rate in the W and X-ray regions; or even not occurring at all from Cygnus XR-1. The search for DPT's in RXTE photometry is continuing.
Author
Black Holes (Astronomy); Neutron Stars; Signatures; Stellar Mass; X Rays

20040027575 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Environmental Effects on the Metallicities of Early-Type Galaxies
Oliversen, Ronald J., Technical Monitor; Jones, Christine; January 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9096; No Copyright; Avail: CASI; A01, Hardcopy

In this multi-year project to investigate the metal enrichment of early-type galaxies, we have used ROSAT, ASCA and now Chandra observations to study samples of galaxies. We have published two papers and a third paper that incorporates Chandra archival observations is nearing completion. Below, we briefly describe our findings. Our first paper 'SN IA Enrichment in Virgo Early-type Galaxies from ROSAT and ASCA Observations' was published in the Astrophysical Journal (vol 539, 603) reported on the properties of nine X-ray bright elliptical galaxies in the Virgo cluster observed by ROSAT and ASCA. We measured iron abundance gradients as a function of radius in three galaxies. We found that the magnesium and silicon abundance gradients were in general flatter than those of iron. We suggest this is due to a metallicity dependence in the metal production rates of SN Ia's. We calculate SN Ia rates in the center of these galaxies that are comparable to those measured optically. Our second paper 'ASCA Observations of Groups at Radii of Low Overdensity: Implications for Cosmic Preheating' also was published in the Astrophysical Journal (vol 578, 74). This paper reported on the ASCA spectroscopy of nine groups of galaxies. We found that the entropy profile in groups is driven by nongravitational heating processes, and could be explained by a short period of preheating by galactic winds. The third paper (in preparation) uses a sample of about 200 galaxies from both ROSAT and Chandra observations. In this paper we characterize both the nuclear and the extended X-ray emission for this sample. We will use these observations to determine the 'on-time' of the X-ray emitting AGN and the fraction of 'fossil groups' as well as to investigate how large AGN outbursts can sweep the galaxy of its hot ISM, thus leading to changes in the ISM metal enrichment.
Author
Enrichment; Environment Effects; Metallicity; Active Galactic Nuclei; Astrophysics

20040027676 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Physics of Galaxy Clusters and How it Affects Cosmological Tests
Oliversen, Ronald J., Technical Monitor; Vikhlinin, Alexey; February 2004; 3 pp.; In English
Contract(s)/Grant(s): NAG5-9217; No Copyright; Avail: CASI; A01, Hardcopy

We have worked on the analysis of the Chandra and XMM observations of the nearby and distant clusters of galaxies, and on the extended sample of the distant x- ray clusters selected in the archival ROSAT PSPC data. Some of the scientific results are discussed below.
Author
Galactic Clusters; X Rays

20040027713
Space Weather Effects: Decay Phases in Gradual and Impulsive Solar Energetic Particle Events
Stolpovskii, Vladislav G.; Jun. 2003; 83 pp.; In English
Report No.(s): AD-A419755; No Copyright; Avail: CASI; A05, Hardcopy

This report results from a contract tasking Skobeltzin Nuclear Physics Institute of Moscow State University as follows: This is an investigation of the decay phases of gradual and impulsive solar energetic particle (SEP) events associated and non-associated to coronal mass ejections (CMEs) and CME-driven shocks. The contractor will use the multispacecraft (mis) data obtained in the 1970s and 1980s to develop understanding of processes of particle transport and losses and the role of travelling shocks for formation of particle intensity-time profiles at late phase of event at different radial distances and heliologitudes of the observer. This will be done based on a database of energetic protons, airphas and electrons, as well as solar wind and interplanetary magnetic field, from the Prognoz, the Venera, the Vega, the Phobos 2, the Helios and IMP 7,8 spacecraft. The correlated observations will be used to test modem models of SEP event formation. Practical application of

the results to be obtained is related to the problems of space weather, as well as radiation hazards during manned space missions and radiation affects on metals and instruments.
DTIC
Solar Cosmic Rays; Space Weather; Decay; Nuclear Physics; Solar Flares

20040027869 Astrophysikalisches Inst., Potsdam, Germany
Upgrade of the Aerial Guidance system for Automatic High Time and Spectral Resolution Solar Radio Observations at the Astrophysical Institute Potsdam
Aurass, Henry; Dec. 2003; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F61775-01-WE094
Report No.(s): AD-A419828; SPC-01-4094; No Copyright; Avail: CASI; A02, Hardcopy

Between the Air Force Geophysics Research Lab (AFGRL) and the Astrophysikalisches Institut Potsdam (AIP) there is a common research interest on the discrimination between particle species accelerated by (flare) magnetic field reconnection, and another particle species energized during the CME formation and propagation. During the cooperative scientific work between both institutions it became clear that the All radio spectral observations in Central Europe are an important and necessary part of the world wide solar activity patrol network. This concerns radio spectral observations on a high standard, and with regular scientifically founded data publication in NOAA Solar Geophysical Data. Due to budget cuts it was impossible to save the high and regular time coverage of the observations after the observatory service had to be changed into a fully automatic regime. It was the subject of the given (first AFGRL-All) EOARD-supported project to upgrade the mechanics and electronics of the All observatory's solar radio spectrometer aerial guiding system. This became urgent to avoide rising interruption intervals of the regular observations, and thus missing reports to NOAA Solar Geophysical Data.
DTIC
Radio Astronomy; Solar Spectrometers; Magnetic Field Reconnection; Radio Observation

20040028010 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
RR Tel: Getting under the Flux Limit - An Observation with FUSE
Sonnenborn, George, Technical Monitor; Kenyon, Scott J.; Sokoloski, Jennifer L.; January 2004; 5 pp.; In English
Contract(s)/Grant(s): NAG5-12420; No Copyright; Avail: CASI; A01, Hardcopy

The goal of our FUSE proposal was to acquire observations of X-ray emission throughout an outburst cycle of a symbiotic stars. If symbiotics are thermonuclear powered, we expect the emission to follow the evolution of a typical classical nova, where soft X-ray emission strengthens as the optical brightness fades. In accretion models, we expect the X-ray emission to follow the behavior exhibited by dwarf novae, where hard X-rays strengthen relative to soft X-rays as the optical brightness fades. During the time period for this grant, we were fortunate that the prototypical symbiotic Z And began a major eruption and is only now returning to quiescence.
Author
Symbiotic Stars; X Ray Astronomy; Bursts

20040028030 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Motions and Initial Conditions in Star-Forming Dense Cores
Myers, Philip C.; January 2004; 3 pp.; In English
Contract(s)/Grant(s): NAG5-13050; No Copyright; Avail: CASI; A01, Hardcopy

The main focus was the study of star-forming regions through high spectral- and spatial resolution observations of mm-wavelength lines, and through models of the observations. The main accomplishments were a) demonstration that more than 15 starless cores show substantial evidence of extended inward motion at about half the sound speed; b) observations of infall asymmetry in several cores, in lines of N2H(+) and DCO(+), low- depletion tracers of the 'inner core'; c) observation of 'infall asymmetry' of spectral lines over approx. 0.5 pc in the NGC1333 cluster-forming region; d) observations indicating that cores are nearly at rest with respect to their envelopes; and e) development of analytic, power-series solutions to the equations of motions for condensing 1-D systems (layers, cylinders and spheres).
Derived from text
Analysis (Mathematics); Cores; D Region; Line Spectra; Power Series; Spatial Resolution; Star Formation

20040030513 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Chemical Compositions and Abundance Anomalies in Stellar Coronae ADP 99
Oliversen, Ronald J., Technical Monitor; Drake, Jeremy; February 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9105; No Copyright; Avail: CASI; A01, Hardcopy

New atomic data for tackling some of our spectra have been investigated by co-I Laming (NRL), including the effects of recombination on spectral line fluxes that are not included in, for example, the CHIANTI database models. Promising new progress has been made with modelling some of the recent abundance anomaly results in terms of Alven wave-driven separation of neutrals and ions in the upper chromosphere. The problems that existing models have is that they cannot simultaneously explain the low-FIP enhanced solar-like coronae and the high-FIP rich active coronae of RS CVn-like stars. The Alven wave model shows promise with both of these scenarios, with the fractionation or suppression of low-FIP ions depending on the characteristics of the chromosphere. This work is currently in the writing up stage. In summary, the work to-date is making good progress in mapping abundance anomalies as a function of spectral type and activity level. We are also making good progress with modelling that we will be able to test with our observational results. With one more year of effort, we'anticipate that the bulk of the work described above can be published, together with outstanding key studies on anomalies among the different active binaries.
Derived from text
Chemical Composition; Anomalies; Stellar Coronas

20040030519 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Outbursts in Symbiotic Binaries
Sonneborn, George, Technical Monitor; Kenyon, Scott J.; February 2004; 5 pp.; In English
Contract(s)/Grant(s): NAG5-11207; No Copyright; Avail: CASI; A01, Hardcopy

Two models have been proposed for the outbursts of symbiotic stars. In the thermonuclear model, outbursts begin when the hydrogen burning shell of a hot white dwarf reaches a critical mass. After a rapid increase in the luminosity and effective temperature, the white dwarf evolves at constant luminosity to lower effective temperatures, remains at optical maximum for several years, and then returns to quiescence along a white dwarf cooling curve. In disk instability models, the brightness rises when the accretion rate from the disk onto the central white dwarf abruptly increases by factors of 5-20. After a few month to several year period at maximum, both the luminosity and the effective temperature of the disk decline as the system returns to quiescence. If most symbiotic stars undergo thermonuclear eruptions, then symbiotics are probably poor candidates for type I supernovae. However, they can then provide approx. 10% of the material which stars recycle back into the interstellar medium. If disk instabilities are the dominant eruption mechanism, symbiotics are promising type Ia candidates but recycle less material into the interstellar medium.
Derived from text
Bursts; Symbiotic Stars; Mathematical Models; Interstellar Matter; Dwarf Stars; Brightness

20040030554 Submillimeter Observatory, Hilo, HI, USA, Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Tracing the Magnetic Field in Orion A
Dowell, C. Darren; Hildebrand, Roger H.; Dotson, Jessie L.; Vaillancourt, John E.; Phillips, Thomas G.; Peng, Rui-Sheng; Bastien, Pierre; [2003]; 49 pp.; In English
Contract(s)/Grant(s): NSF AST-99-80846; NSF AST-99-87441; NSF AST-02-04886
Report No.(s): Rept-2003-4; Copyright; Avail: CASI; A03, Hardcopy

We use extensive 350 micron polarimetry and continuum maps obtained with Hertz and SHARC II along with HCN and HCO(sup +) spectroscopic data to trace the orientation of the magnetic field in the Orion A star-forming region. Using the polarimetry data, we find that the direction of the projection of the magnetic field in the plane of the sky relative to the orientation of the integral-shaped filament varies considerably as one moves from north to south. While in IRAS 05327-0457 and OMC-3 MMS 1-6 the projection of the field is primarily perpendicular to the filament it becomes better aligned with it at OMC-3 MMS 8-9 and well aligned with it at OMC-2 FIR 6. The OMC-2 FIR 4 cloud, located between the last two, is a peculiar object where we find almost no polarization. There is a relatively sharp boundary within its core where two adjacent regions exhibiting differing polarization angles merge. The projected angle of the field is more complicated in OMC-1 where it exhibits smooth variations in its orientation across the face of this massive complex. We also note that while the relative orientation of the projected angle of the magnetic field to the filament varies significantly in the OMC-3 and OMC-2 regions, its orientation relative to a fixed position on the sky shows much more stability. This suggests that, perhaps, the orientation of the field is relatively unaffected by the mass condensations present in these parts of the molecular cloud. By combining the polarimetry and spectroscopic data we were able to measure a set of average d u e s for the inclination angle of the magnetic field relative to the line of sight. We find that the field is oriented quite close to the plane of the sky in most places. More precisely, the inclination of the magnetic field is approx. = 73 deg around OMC-3 MMS 6, approx. = 74 deg at OMC-3 MMS 8-9, approx. = 80 deg at OMC-2 FIR 4, approx. = 65 deg in the northeastern part of OMC-1, and approx. = 49 deg in the Bas. The small difference in the inclination of the field between OMC-3 and OMC-2 seems to strengthen the idea that the

orientation of the magnetic field is relatively unaffected by the agglomeration of matter located in these regions. We also present polarimetry data for the OMC-4 region located some 13 min. south of OMC-1.
Author
Magnetic Fields; Tracking (Position); Orion Nebula; Data Acquisition; A Stars; Astrophysics; Hydrocyanic Acid

20040031459 NASA Goddard Space Flight Center, Greenbelt, MD, USA
How Can The SN-GRB Time Delay Be Measured?
Norris, J. P.; Bonnell, J. T.; December 2, 2003; 4 pp.; In English; Gamma Ray Burst Symposium, 8-12 Sep. 2003, Santa Fe, New Mexico, USA; No Copyright; Avail: CASI; A01, Hardcopy

The connection between SNe and GRBs, launched by SN 1998bw / GRB 980425 and clinched by SN 2003dh / GRB 030329-with the two GRBs differing by a factor of approximately 50000 in luminosity-so far suggests a rough upper limit of approximately 1-2 days for the delay between SN and GRB. Only four SNe have had nonnegligible coverage in close coincidence with the initial explosion, near the W shock breakout: two Qpe II, and two Type IC, SN 1999ex and SN 1998bw. For the latter, only a hint of the minimum between the UV maximum and the radioactivity bump served to help constrain the interval between SN and GRB. Swift GRB alerts may provide the opportunity to study many SNe through the UV breakout phase: GRB 980425 look dikes -apparently nearby, low- luminosity, soft-spectrum, long-lag GRBs-accounted for half of BATSE bursts near threshold, and may dominate the Swift yield near threshold, since it has sensitivity to lower energies than did BATSE. The SN to GRB delay timescale should be better constrained by prompt UV/optical observations alerted by these bursts. Definitive delay measurements may be obtained if long-lag bursters are truly nearby: The SNe/GRBs could emit gravitational radiation detectable by LIGO-II if robust non-axisymmetric bar instabilities develop during core collapse, and/or neutrino emission may be detectable as suggested by Meszaros et al.
Author
Gamma Ray Bursts; Astrophysics; Supernova Remnants; Time Lag

20040031463 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Solar Flares, Type III Radio Bursts, CMEs, and Energetic Particles
Cane, H. V.; January 2004; 4 pp.; In English; Solar Wind Ten: Proceedings of the Tenth International Solar Wind Conference, 17-22 Jun. 2002, Pisa, Italy; Copyright; Avail: CASI; A01, Hardcopy

Despite the fact that it has been well known since the earliest observations that solar energetic particle events are well associated with solar flares it is often considered that the association is not physically significant. Instead, in large events, the particles are considered to be only accelerated at a shock driven by the coronal mass ejection (CME) that is also always present. If particles are accelerated in the associated flare, it is claimed that such particles do not find access to open field lines and therefore do not escape from the low corona. However recent work has established that long lasting type III radio bursts extending to low frequencies are associated with all prompt solar particle events. Such bursts establish the presence of open field lines. Furthermore, tracing the radio bursts to the lowest frequencies, generated near the observer, shows that the radio producing electrons gain access to a region of large angular extent. It is likely that the electrons undergo cross field transport and it seems reasonable that ions do also. Such observations indicate that particle propagation in the inner heliosphere is not yet fully understood. They also imply that the contribution of flare particles in major particle events needs to be properly addressed.
Author
Coronal Mass Ejection; Energetic Particles; Solar Flares; Type 3 Bursts; Astrophysics

20040031465 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Phenomena Associated With EIT Waves
Thompson, B. J.; Biesecker, D. A.; Gopalswamy, N.; [2003]; 1 pp.; In English; Obsservatorio Astronomico di Palermo Meeting, 28 Aug. 2003 - 14 Sep. 2003, Italy; No Copyright; Avail: Other Sources; Abstract Only

We discuss phenomena associated with 'EIT Wave' transients. These phenomena include coronal mass ejections, flares, EUV/SXR dimmings, chromospheric waves, Moreton waves, solar energetic particle events, energetic electron events, and radio signatures. Although the occurrence of many phenomena correlate with the appearance of EIT waves, it is difficult to mfer which associations are causal. The presentation will include a discussion of correlation surveys of these phenomena.
Author
Extreme Ultraviolet Radiation; Telescopes; Imaging Techniques; Surges; Radio Emission

20040031467 Washington Univ., Seattle, WA, USA
Buoyancy-Driven Instabilities in Single-Bubble Sonoluminescence
Matula, Thomas J.; [2003]; 5 pp.; In English
Contract(s)/Grant(s): NAG3-2379; No Copyright; Avail: CASI; A01, Hardcopy

The principal objectives of this study are to determine how gravity affects the emission of light from single-bubble sonoluminescence (SBSL), and whether or not the bubble extinction is directly related to gravity. Our experimental task involves designing glass or quartz spherical levitation cells that generate very stable SL bubbles. The cells must have minimized vibration, and some temperature control. The experimental system will reside in a light-tight enclosure. Aside from acceleration, the frequency, pressure amplitude, and light intensity must be measured. A computer program will be constructed to perform all aspects of the experiment.
Author
Gravitation; Luminous Intensity; Bubbles; Light Emission

20040031490 L-3 Communication Government Services, Inc., Chantilly, VA, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA
Connecting Shock Parameters to the Radiation Hazard from Energetic Particles
Berdichevsky, Daniel B.; Reames, Donald V.; Lepping, Ronald P.; Schwenn, Rainer W.; February 23, 2004; 5 pp.; In English
Contract(s)/Grant(s): NASW-02035
Report No.(s): Rept-1042-0023-rpt4; Copyright; Avail: CASI; A01, Hardcopy

We use data from Helios, IMP-8, and other spacecraft (e.g. ISEE) to systematically investigate solar energetic particle (SEP) events from different longitudes and distances in the heliosphere. The purpose of the project is to assess empirically the connection between the morphology of the travelling shock and strength with observed enhancements in the flow of energized particles in shock accelerated particle (SEP) events (also often identified as 'gradual' solar energetic particle events). Activities during this first year centered on the organization of the SEPs events and their correlation with solar wind observations at multiple spacecraft locations. From an identified list of more than 30 SEPs events at multiple spacecraft locations, currently four single cases for detailed study were selected and are in an advance phase of preparation for publication. Preliminary results of these four cases were presented at AGU Spring and Fall 2003 meetings, and other meetings on SEPs.
Author
Energetic Particles; Radiation Hazards; Heliosphere; Solar Wind; Sun; Shock Waves

20040031514 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Atomic Data and Spectral Line Intensities for S XI
Landi, E.; Bhatia, A. K.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Electron impact collision strengths, energy levels, oscillator strengths and spontaneous radiative decay rates are calculated for S XI. The configurations included are 2s(sup 2)2psup 2), 2s2p(sup 3), 2p(sup 4), 2s(sup 2)2p3l and 2s(sup 2)2p4l (I = s , p , d) giving rise to 72 fine-structure levels in intermediate coupling. Collision strengths are calculated at five incident energies, 32, 60, 90, 120, and 150 Ry. Excitation rate coefficients are calculated as a function of electron temperature by assuming a Maxwellian electron velocity distribution. Using the excitation rate coefficients and the radiative transition rates, statistical equilibrium equations for level populations are solved: The effects of resonances, proton rates, photoexcitation and cascades on level populations have been investigate. The predicted S XI line intensities are compared with EUV and UV observations of the quiet and active Sun.
Author
Atoms; Data Acquisition; Computation; Collisions; Electron Impact; Electron Energy; Oscillator Strengths; Line Spectra

20040031596 Lawrence Livermore National Lab., Livermore, CA
ULXs, Microblazers, and the Unidentified EGRET Sources
Butt, Y. M.; Romero, G. E.; Torres, D. F.; May 01, 2003; 12 pp.; In English
Report No.(s): DE2003-15004712; UCRL-JC-152956; No Copyright; Avail: Department of Energy Information Bridge

We suggest that ultraluminous X-ray sources (ULXs) and some of the variable low latitude EGRET gamma-ray sources may be two different manifestations of the same underlying phenomena: high-mass microquasars with relativistic jets forming a small angle with the line of sight (i.e. microblazars). Microblazars with jets formed by relatively cool plasma (Lorentz factors for the leptons up to a few hundreds) naturally lead to ULXs. If the jet contains very energetic particles (high-energy cutoff above Lorentz factors of several thousands) the result is a relatively strong gamma-ray source. As pointed out by Kaufman

Bernads, Romero & Mirabel (2002), a gamma-ray microblazar will always have an X-ray counterpart (although it might be relatively weak), whereas X-ray microblazars might have no gamma-ray counterparts.
NTIS
Gamma Ray Observatory; Gamma Ray Telescopes; Luminosity; 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*.

20040016367 Lawrence Livermore National Lab., Livermore, CA
Characterization of Adaptive Optics at Keck Observatory
van Dam, M. A.; Macintosh, B. A.; Jul. 2003; 16 pp.; In English
Report No.(s): DE2003-15004428; UCRL-JC-154624; No Copyright; Avail: Department of Energy Information Bridge
In this paper, the adaptive optics (AO) system at Keck Observatory is characterized. The AO system is described in detail. The physical parameters of the lenslets. CCD and deformable mirror, the calibration procedures and the signal processing algorithms are explained.
NTIS
Adaptive Optics; Telescopes; Deformable Mirrors; Charge Coupled Devices

20040020047 Lawrence Livermore National Lab., Livermore, CA
Astronomy Applications of Adaptive Optics at Lawrence Livermore National Laboratory
Bauman, B. J.; Gavel, D. T.; Apr. 23, 2003; 16 pp.; In English
Report No.(s): DE2003-15005080; UCRL-JC-152945; No Copyright; Avail: Department of Energy Information Bridge
Astronomical applications of adaptive optics at Lawrence Livermore National Laboratory (LLNL) has a history that extends from 1984. The program started with the Lick Observatory Adaptive Optics system and has progressed through the years to lever-larger telescopes: Keck, and now the proposed CELT (California Extremely Large Telescope) 30m telescope. LLNL AO continues to be at the forefront of AO development and science.
NTIS
Adaptive Optics; Astronomy; Optics

20040027548 SRI International Corp., Menlo Park, CA, USA
Acquisition and Analysis of NASA Ames Sunphotometer Measurements during SAGE III Validation Campaigns and other Tropospheric and Stratospheric Research Missions
Livingston, John M.; January 2004; 4 pp.; In English
Contract(s)/Grant(s): NCC2-1251; SRI Proj. P11341
Report No.(s): SRI-11341-FR-04-020; No Copyright; Avail: CASI; A01, Hardcopy
NASA Cooperative Agreement NCC2-1251 provided funding from April 2001 through December 2003 for Mr. John Livingston of SRI International to collaborate with NASA Ames Research Center scientists and engineers in the acquisition and analysis of airborne sunphotometer measurements during various atmospheric field studies. Mr. Livingston participated in instrument calibrations at Mauna Loa Observatory, pre-mission hardware and software preparations, acquisition and analysis of sunphotometer measurements during the missions, and post-mission analysis of data and reporting of scientific findings. The atmospheric field missions included the spring 2001 Intensive of the Asian Pacific Regional Aerosol Characterization Experiment (ACE-Asia), the Asian Dust Above Monterey-2003 (ADAM-2003) experiment, and the winter 2003 Second SAGE III Ozone Loss and Validation Experiment (SOLVE II).
Derived from text
Airborne Equipment; Photometers; Aerosols; Calibrating

20040027550 Carnegie Institution of Washington, Washington, DC, USA
Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program
O'D.Alexander, Conel; January 2004; 6 pp.; In English
Contract(s)/Grant(s): NAG5-4328; No Copyright; Avail: CASI; A02, Hardcopy
The discovery of presolar grains in meteorites is one of the most exciting recent developments in meteoritics. Six types

of presolar grain have been discovered: diamond, Sic, graphite, Si3N4, Al2O3 and MgAl2O4. These grains have been identified as presolar because their isotopic compositions are very different from those of Solar System materials. Comparison of their isotopic compositions with astronomical observations and theoretical models indicates most of the grains formed in the envelopes of highly evolved stars. They are, therefore, a new source of information with which to test astrophysical models of the evolution of these stars. In fact, because several elements can often be measured in the same grain, including elements that are not measurable spectroscopically in stars, the grain data provide some very stringent constraints for these models. Our primary goal is to create large, unbiased, multi-isotope databases of single presolar Sic, Si,N,, oxide and graphite grains in meteorites, as well as any new presolar grain types that are identified in the future. These will be used to: (i) test stellar and nucleosynthetic models, (ii) constrain the galactic chemical evolution (GCE) paths of the isotopes of Si, Ti, 0 and Mg, (iii) establish how many stellar sources contributed to the Solar System, (iv) constrain relative dust production rates of various stellar types and (v) assess how representative of galactic dust production the record in meteorites is. The primary tool for this project is a highly automated grain analysis system we have developed for the Carnegie 6f ion probe.
Author
Aluminum Oxides; Astronomical Models; Chemical Evolution; Cosmochemistry; Galactic Evolution; Meteoritic Composition

20040027552 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Studies of Planet Formation Using a Hybrid N-Body + Planetesimal Code
Kenyon, Scott J.; January 2004; 5 pp.; In English
Contract(s)/Grant(s): NAG5-13278; No Copyright; Avail: CASI; A01, Hardcopy

The goal of our proposal was to use a hybrid multi-annulus planetesimal/n-body code to examine the planetesimal theory, one of the two main theories of planet formation. We developed this code to follow the evolution of numerous 1 m to 1 km planetesimals as they collide, merge, and grow into full-fledged planets. Our goal was to apply the code to several well-posed, topical problems in planet formation and to derive observational consequences of the models. We planned to construct detailed models to address two fundamental issues: (1) icy planets: models for icy planet formation will demonstrate how the physical properties of debris disks - including the Kuiper Belt in our solar system - depend on initial conditions and input physics; and (2) terrestrial planets: calculations following the evolution of 1-10 km planetesimals into Earth-mass planets and rings of dust will provide a better understanding of how terrestrial planets form and interact with their environment.
Author
Terrestrial Planets; Planetary Evolution; Protoplanets; Many Body Problem

20040030478 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Pointing Control System Design and Performance Evaluation for TPF Coronagraph
Liu, Kuo-Chia; Blaurock, Carl; Mosier, Gary; [2004]; 1 pp.; In English; Astronomical Telescopes and Instrumentation 2004, 21-25 Jun. 2004, Glasgow, Scotland, UK; No Copyright; Avail: Other Sources; Abstract Only

The Terrestrial Planet Finder (TPF) program aims to detect and characterize extra-solar Earth-like planets. The coronagraph telescope is one of the four mission concepts being studied. In order to reject the star flux and detect the planet flux in the visible light range, the coronagraph telescope must achieve a rejection ratio on the order of a billion to one. Dynamic jitter, introduced by environmental and on-board mechanical disturbances, degrades the optical performance, as characterized primarily by contrast ratio. The feasibility of using passive vibration isolation combined with active attitude and line-of- sight control systems to stabilize the spacecraft and the optical components to the requisite level is being studied. The telescope is also required to slew between targets. The slew mode control law must be designed to balance the need for efficient large-angle maneuvers while simultaneously avoiding the excitation of flexible modes in order to minimize settling time.
NASA
Coronagraphs; Control Systems Design; Evaluation; Extrasolar Planets; Performance Tests; Pointing Control Systems

20040031500 NASA Marshall Space Flight Center, Huntsville, AL, USA
Strategic Research Directions in Microgravity Materials Science
Clinton, Raymond G.; Semmes, Ed; Cook, Beth; Wargo, Michael J.; Marzwell, Neville; [2003]; 1 pp.; In English; 42nd AIAA Aerospace Sciences Meeting, 5-8 Jan. 2004, Reno, NV, USA; No Copyright; Avail: Other Sources; Abstract Only

The next challenge of space exploration is the development of the capabilities for long-term missions beyond low earth orbit. NASA s scientific advisory groups and internal mission studies have identified several fundamental issues which require substantial advancements in new technology if these goals are to be accomplished. Crews must be protected from the severe

radiation environment beyond the earth s magnetic field. Chemical propulsion must be replaced by systems that require less mass and are more efficient. The overall launch complement must be reduced by developing repair and fabrication techniques which utilize or recycle available materials.
Author
Space Exploration; Low Earth Orbits; Microgravity; Geomagnetism; Chemical Propulsion

20040031558 NASA Langley Research Center, Hampton, VA, USA
Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission
Desai, Prasun N.; Blanchard, Robert C.; Powell, Richard W.; [2003]; 8 pp.; In English; International Workshop on Planetary Probe Atmospheric Entry and Descent Trajectory Analysis and Science, 6-9 Oct. 2003, Lisbon, Portugal
Contract(s)/Grant(s): 149-30-06; No Copyright; Avail: CASI; A02, Hardcopy

The Mars Exploration Rover (MER) mission will land two landers on the surface of Mars, arriving in January 2004. Both landers will deliver the rovers to the surface by decelerating with the aid of an aeroshell, a supersonic parachute, retro-rockets, and air bags for safely landing on the surface. The reconstruction of the MER descent trajectory and atmosphere profile will be performed for all the phases from hypersonic flight through landing. A description of multiple methodologies for the flight reconstruction is presented from simple parameter identification methods through a statistical Kalman filter approach.
Author
Mars Exploration; Computational Fluid Dynamics; Descent Trajectories; Mars Roving Vehicles; Mars Landing Sites; Methodology; Space Missions

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20040021353 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy
Bowers, Charles W.; Woodgate, Bruce E.; Lyon, Richard G.; [2003]; 1 pp.; In English; SPIE Meeting, San Diego, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Detection of extra-solar, and especially terrestrial-like planets, using coronagraphy requires an extremely high level of wavefront correction. For example, the study of Woodruff et al. (2002) has shown that phase uniformity of order 10(exp -4)lambda(rms) must be achieved over the critical range of spatial frequencies to produce the approx. 10(exp 10) contrast needed for the Terrestrial Planet Finder (TPF) mission. Correction of wavefront phase errors to this level may be accomplished by using a very high precision deformable mirror (DM). However, not only phase but also amplitude uniformity of the same scale (10(exp -4)) and over the same spatial frequency range must be simultaneously obtained to remove all residual speckle in the image plane. We present a design for producing simultaneous wavefront phase and amplitude uniformity to high levels from an input wavefront of modest quality. The design uses a dual Michelson interferometer arrangement incorporating two DMs and a single, fixed mirror (all at pupils) and two beamsplitters: one with unequal (asymmetric) beam splitting and one with symmetric beam splitting. This design allows high precision correction of both phase and amplitude using DMs with relatively coarse steps, is substantially achromatic and permits a simple correction algorithm.
Author
Terrestrial Planets; Wave Fronts; Critical Frequencies; Algorithms; Accuracy; Amplitudes

20040021386 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Narrow Scale Flow and a Weak Field by the Top of Earth's Core: Evidence from Orsted, Magsat and Secular Variation
Voorhies, Coerte V.; January 2004; 53 pp.; In English
Contract(s)/Grant(s): 579-31-07; 579-31-08; 622-72-03; No Copyright; Avail: CASI; A04, Hardcopy

As Earth's main magnetic field weakens, our magnetic shield against the onslaught of the solar wind thins. And the field strength needed to fend off battering by solar coronal mass ejections is decreasing, just when the delicate complexity of modem, vulnerable, electro-technological systems is increasing at an unprecedented rate. Recently, a working group of distinguished scientist from across the nation has asked NASA's Solid Earth and Natural Hazards program a key question: What are the dynamics of Earth s magnetic field and its interactions with the Earth system? Paleomagnetic studies of crustal rocks magnetized in the geologic past reveal that polarity reversals have occurred many times during Earth s history. Networked super-computer simulations of core field and flow, including effects of gravitational, pressure, rotational Coriolis,

magnetic and viscous forces, suggest how this might happen in detail. And space-based measurements of the real, time-varying magnetic field help constrain estimates of the speed and direction of fluid iron flowing near the top of the core and enable tests of some hypotheses about such flow. Now scientists at NASA s Goddard Space Flight Center have developed and applied methods to test the hypotheses of narrow scale flow and of a dynamically weak magnetic field near the top of Earth s core. Using two completely different methods, C. V. Voorhies has shown these hypotheses lead to specific theoretical forms for the 'spectrum' of Earth s main magnetic field and the spectrum of its rate of change. Much as solar physicists use a prism to separate sunlight into its spectrum, from long wavelength red to short wavelength blue light, geophysicists use a digital prism, spherical harmonic analysis, to separate the measured geomagnetic field into its spectrum, from long to short wavelength fields. They do this for the rate of change of the field as well.
Derived from text
Geomagnetism; Geodynamics; Earth Core; Magnetic Fields; Solar Wind

20040027507 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Contraints on Solar Wind Plasma Properties Derived from Coordinated Coronal Observations
Esser, Ruth; Wagner, William, Technical Monitor; January 2004; 7 pp.; In English
Contract(s)/Grant(s): NAG5-9564; No Copyright; Avail: CASI; A02, Hardcopy

The goal of the proposed research was to increase the understanding of coronal plasma phenomena by making use of different observational approaches and combine the observations with the necessary theoretical considerations. During the funding period we studied the formation of spectral lines in the corona and transition region. We compared the spectral line ratios that would arise from the type of temperature profile commonly used to explain in situ ion fractions with the actual observed line ratios. We also carried out a theoretical study to investigate how large the electron temperatures can be in the near sun region. We carried out more detailed studies to show that differential flow speeds between ions of the same element can not bridge the above gap between low coronal electron temperatures and high in situ ion fractions. To investigate the drift between core and halo in the electron distribution function, which is observed in situ in the solar wind, we developed the first solar wind model with two electron populations. It was found that the anomalous frictional forces acting on the halo electrons are the dominant factor inhibiting the core-halo drift in the East solar wind. We used kinetic modeling to investigate the Alfvenic turbulence in the extended corona. In these studies we also included the effects of proton heating.
Author (revised)
Solar Wind; Solar Corona

20040027771 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Local Helioseismology: A New Window into the Sun
Duvall, Thomas; [2003]; 1 pp.; In English; EUG-AGU, April 2003, Nice, France; No Copyright; Avail: Other Sources; Abstract Only

In recent years the focus of helioseismology has shifted from the classical measurements of global properties using normal mode frequencies to possibly a more difficult problem of measuring the three-dimensional, time-dependent structure of the solar interior, now called local helioseismology. Problems to be studed include the subsurface structure of observed surface features such as sunspots, convective flow patterns, and the magnetic field of the 1 1-year sunspot cycle. A variety of techniques have been developed to attack these problems, including a 'local' normal mode method, a method of measuring travel times between &stant locations, and a method for holographically reconstructing the acoustic signal in the solar interior. Recent results from the field will be reviewed.
Author
Helioseismology; Solar Interior; Magnetic Fields; Convective Flow

20040030506 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Cosmic Ray Propagation and Acceleration
Moskalenko, Igor V.; [2003]; 21 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tsukuba, Japan; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

Theoretical views on particle acceleration in astrophysical sources and propagation of cosmic rays (CR) depend very much on the quality of the data, which become increasingly accurate each year and therefore more constraining. On the other hand, direct measurements of CR are possible in only one location on the outskirts of the Milky Way and present only a snapshot of very dynamic processes. The theoretical papers presented during the conference offer exciting insights into the physics of cosmic accelerators and processes which underlie the measured abundances and spectra of CR species. This paper

is based on a rapporteur talk given at the 28th International Cosmic Ray Conference held on July 31-August 7, 2003 at Tsukuba. It covers the sessions OG 1.3 Cosmic ray propagation, OG 1.4 Acceleration of cosmic rays, and a part of HE 1.2 Theory and simulations (including origins of the knee).
Author
Cosmic Rays; Propagation Velocity; Acceleration (Physics); Milky Way Galaxy

20040030510 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Reply to Gopalswamy et al.
Cane, H. V.; Richardson, I. G.; [2003]; ISSN 0094-8276; 3 pp.; In English; Copyright; Avail: Other Sources

The comment of Gopalswamy et al. (thereafter GMY) relates to a letter discussing coronal mass ejections (CMEs), interplanetary ejecta and geomagnetic storms. GMY contend that Cane et al. incorrectly identified ejecta (interplanetary CMEs) and hypothesize that this is because Cane et al. fail to understand how to separate ejecta from 'shock sheaths' when interpreting solar wind and energetic particle data sets. They (GMY) are wrong be cause the relevant section of the paper was concerned with the propagation time to 1 AU of any potentially geoeffective structures caused by CMEs, i.e. upstream compression regions with or without shocks, or ejecta. In other words, the travel times used by Cane et al. were purposefully and deliberately distinct from ejecta travel times (except for those slow ejecta, approx. 30% of their events, which generated no upstream features), and no error in identification was involved. The confusion of GMY stems from the description did not characterize the observations sufficiently clearly.
Derived from text
Coronal Mass Ejection; Energetic Particles; Magnetic Storms; Wind Measurement

20040031460 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections
Richardson, I. G.; Cane, H. V.; Lepri, S. T.; Zurbuchen, T. H.; Gosling, J. T.; [2003]; 4 pp.; In English; Solar Wind Ten, June 2002, Pisa, Italy; Copyright; Avail: CASI; A01, Hardcopy

Interplanetary coronal mass ejections (ICMEs) are characterized by a number of signatures. In particular, we examine the relationship between Fe charge states and other signatures during ICMEs in solar cycle 23. Though enhanced Fe charge states characterize many ICMEs, average charge states vary from event to event, are more likely to be enhanced in faster or flare-related ICMEs, and do not appear to depend on whether the ICME is a magnetic cloud.
Author
Coronal Mass Ejection; Interplanetary Medium; Spectral Signatures; Spatial Distribution

20040031510 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere
Jackman, Charles H.; vonKonig, Miriam; Anderson, John; Roble, Raymond G.; McPeters, Richard D.; Fleming, Eric L.; Russell, James M.; [2004]; 1 pp.; In English; IUGG 2003, 30 Jun. - 11 Jul. 2003, Sapporo, Japan; No Copyright; Avail: Other Sources; Abstract Only

Solar proton events (SPEs) can cause changes in constituents in the Earth's middle atmosphere. The highly energetic protons cause ionizations, excitations, dissociations, and dissociative ionizations of the background constituents, which lead to the production of HO(x) (H, OH, HO2) and NO(y) (N, NO, NO2, NO3, N2O5, HNO3, HO2NO2, ClONO2, BrONO2). The HO(x) increases lead to short-lived ozone decreases in the mesosphere and upper stratosphere due to the short lifetimes of the HO, constituents. The NO(x) increases lead to long-lived stratospheric ozone changes because of the long lifetime of NO(y) constituents in this region. Solar cycle 23 was quite active with SPEs and very large fluxes of high energy protons occurred in July and November 2000, November 200 1, and April 2002. Smaller, but still substantial, proton fluxes impacted the Earth during other months in the 1997-2003 time period. The impact of the very large SPEs on the neutral middle atmosphere during solar cycle 23 will be discussed, including the HO(x), NO(y), ozone variations and induced atmospheric transport changes. Two multi-dimensional models, the Goddard Space Flight Center (GSFC) Two-dimensional (2D) Model and the Thermosphere Ionosphere Mesosphere Electrodynamic General Circulation Model (TIME-GCM), were used in computing the influence of the SPEs. The results of the GSFC 2D Model and the TIME-GCM will be shown along with comparisons to the Upper Atmosphere Research Satellite (UARS) Halogen Occultation Experiment (HALOE) and Solar Backscatter Ultraviolet 2 (SBUV/2) instruments.
Author
Solar Protons; Solar Cycles; Neutral Atmospheres; Middle Atmosphere

20040031589 NASA Marshall Space Flight Center, Huntsville, AL, USA
Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21
Hagyard, M. J.; Pevtsov, A. A.; Canfield, R. C.; Blehm, Z.; Smith, J. E.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We report the results of a study of magnetic helicity in solar active regions during solar cycles 21 and 22 from observations with the Marshall Space Flight Center's solar vector magnetograph. Using the force-free parameter a as the proxy for helicity, we calculated an average value of a for each of 91 active regions fiom a total of 683 vector magnetograms that were obtained during the period March 1980 to July 1993. The signs of these average values of alpha were correlated with the latitude of the active regions to test the hemispherical rule of helicity that has been proposed for solar magnetic fields: negative helicity predominant in northern latitudes, positive in the southern ones. We have found that of the 65 regions that were observed in cycle 21,49% obey the hemispherical rule and 51% do not. On the other hand, for the 26 regions in cycle 22,65% do exhibit this correlation.
Author
Solar Cycles; Magnetometers; Solar Instruments; Solar Magnetic Field

99
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.

20040016345 NASA Marshall Space Flight Center, Huntsville, AL, USA
Meeting NASA's Mission Through Commercial Partnerships
Nall, Mark; [2003]; 1 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 4-8 Jan. 2004, Reno, NV, USA; No Copyright; Avail: Other Sources; Abstract Only

This paper examines novel approaches to furthering NASA's missions through the use of commercial partnerships. The exploration of space ha proven to be a costly endeavor requiring the development of new technologies at significant expense. One of the prime factors holding bac the robust development of space is insufficient investment in the technologies necessary to make it a reality. The key to success in bringin needed space development technologies to maturation lies in bringing technology investors together from government, industry and academia. aggressive road map for developing space will require a diverse set of interest to industry or other government agencies. By having each invest(contributing to the part of the technology development of interest to them development of space systems can be put together at a cost far below wl would be required to develop for a stand-alone effort. The NASA Space Partnership Division has been employing this technique to leverage a 30 million dollar NASA investment into at 100 million dollar advanced technology development effort focused on meeting NASA's mission needs.
Author
Aerospace Engineering; Aerospace Systems; Space Exploration

20040031435 North Atlantic Treaty Organization, The Hague, Netherlands
Human Behaviour Representation: Application Areas
Dompke, Uwe; Simulation of and for Military Decision Making; June 2003, pp. 12-1 - 12-16; In English; See also 20040031429; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

This paper is taken from the Final report of LTSS SAS-017 on Human Behaviour Representation It gives an overview on the different applications of HBR. It starts with the new military environment. Based on this description the applications in the areas of Instruction, Training and Exercise, Defense Planning, Acquisition and Support to Operations are described. A summary on the importance of HBR is given at the end.
Author
Military Operations; Resources Management

20040031539 NASA Ames Research Center, Moffett Field, CA, USA
IS0 9000 Implementation and Assessment: A Guide to Developing and Evaluating Quality Management Systems
Navarro, Robert J.; Grimm, Barry; September 1996; 75 pp.; In English
Contract(s)/Grant(s): UPN 323-93-95
Report No.(s): NASA-RP-1392; A-962836; No Copyright; Avail: CASI; A04, Hardcopy

The agency has developed this reference publication to aid NASA organizations and their suppliers in the transition to IS0 9000. This guide focuses on the standard s intent, clarifies its requirements, offers implementation examples and highlights interrelated areas. It can assist anyone developing or evaluating NASA or supplier quality management systems. The IS0 9000 standards contain the basic elements for managing those processes that affect an organization's ability to consistently meet customer requirements. IS0 9000 was developed through the International Organization for Standardization and has been adopted as the US. national standard. These standards define a flexible foundation for customer focused process measurement, management and improvement that is the hallmark of world class enterprises.
Author
Management Systems; Quality Control; Technology Assessment; NASA Programs; Standards

Subject Term Index

A STARS

Tracing the Magnetic Field in Orion A – 217

ABORTED MISSIONS

Evaluation of the Space Shuttle Transatlantic Abort Landing Atmospheric Sounding System – 16

ABSORPTION SPECTRA

Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses – 186

Sensitivity Studies for Space-based Measurements of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight – 108

ABSORPTION

Black Carbon Measurements in SOLVE-2 – 78

ABSTRACTS

Compilation of Theses Abstracts – 203

International Workshop on Quantum Cascade Lasers. Meeting Program, Abstract Book & Attendee Roster. January 4-8, 2004, Seville, Spain – 83

ACCELERATION (PHYSICS)

Cosmic Ray Propagation and Acceleration – 223

ACCELERATORS

Hydrodynamic Modeing of a Multi-Pulse X-Ray Converter Target for DARHT-II – 174

Modern Trends in Induction Accelerator Technology – 175

ACCELEROMETERS

An Analysis of Airship Acceleration Dynamics for Airborne Gravimetry – 105

Micromachined Precision Inertial Instruments – 87

ACCEPTABILITY

Aircraft Optimization for Minimum Environmental Impact – 8

ACCRETION DISKS

Studies of Circumstellar Disk Evolution – 212

ACCURACY

A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy – 222

ACETALDEHYDE

Heterogeneous Interactions of Acetaldehyde and Sulfuric Acid – 33

ACETYLENE

Quantum Dynamics Scattering Study of AB+CDE Reactions: A Seven Dimensional Treatment for the H2+C2H Reaction – 33

ACOUSTIC ATTENUATION

Frequency Dependence of Effective Bottom Attenuation Due to Environmental Variability – 177

Seabed Attenuation Estimated From Chirp Sonar Data Collected Along Acoustic Propagation Lines During ASIAEX in the South China Sea – 177

ACOUSTIC PROPAGATION

Acoustic Propagation in a Water-Filled Cylindrical Pipe – 176

The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation – 177

ACOUSTIC PROPERTIES

Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS) – 178

ASIAEX South China Sea Acoustic Fluctuations (and Physical Oceanography) – 177

Broadband Geoacoustic Matched Field Inversion with Multi-step Strategy from ASIAEX 2001 – 178

ACOUSTIC SCATTERING

Frequency and Angular Dependence of Low Frequency East China Sea Bottom Scattering Strengths – 178

ACOUSTIC SOUNDING

An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications – 166

Nonlinear Internal Waves in the South China Sea During ASIAEX – 165

ACTIVE CONTROL

Active Control of Integrated Inlet/Compression Systems – 73

Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

Experiment and Theory for Active Control of Nonlinear Dynamics in Compression/Combustion Systems – 69

Modeling and Control of the ARCP in Power and Drive Systems – 66

Toward a Fast-Response Active Turbine Tip Clearance Control – 12

ACTIVE GALACTIC NUCLEI

Environmental Effects on the Metallicities of Early-Type Galaxies – 215

ACTUATORS

Preliminary Sizings for an Integrated SME Actuator System for the STAR system – 85

Stress Fracture Etiology as Dependent on Mechanically Induced Fluid Flow – 126

ADAPTATION

Quality of Service Routing in Tactical Mobile Ad Hoc Networks – 56

System Level Applications of Adaptive Computing (SLAAC) – 156

Unified Debug Environment for Adaptive Computing Systems – 152

ADAPTIVE CONTROL

Development of Methodologies for IV and V of Neural Networks – 147

ADAPTIVE OPTICS

Adaptive Optics Applications in Vision Science – 185

Astronomy Applications of Adaptive Optics at Lawrence Livermore National Laboratory – 220

Characterization of Adaptive Optics at Keck Observatory – 220

Long Focal Length Large Mirror Fabrication System – 188

Rational Approximations of the Power Spectral Density of Atmospheric Turbulence Arising in Adaptive Optics – 162

Scene-Based Wave-Front Sensing for Remote Imaging – 183

Wavefront Control for Extreme Adaptive Optics – 183

ADDITIVES

Numerical Simulation of High Drag Reduction in a Turbulent Channel Flow with Polymer Additives – 74

ADDUCTS

Diagnosis of Exposure to Chemical Warfare Agents – 134

ADENOVIRUSES

Derivation of Double-Targeted Adenovirus Vectors for Gene Therapy of Prostate Cancer – 131

ADHESION

Testing of the Joining Rubber Metal of Ultrasound Silencing Devices – 91

ADIABATIC CONDITIONS

Magnetosphere-Ionosphere Coupling and Associated Ring Current Energization Processes – 211

AEROACOUSTICS

An Analysis of Model Scale Data Transformation to Full Scale Flight Using Chevron Nozzles – 11

Broadband Trailing Edge Noise Predictions in the Time Domain – 180

Computing Axisymmetric Jet Screech Tones using Unstructured Grids – 179

Temporal Characterization of Aircraft Noise Sources – 178

AEROBES

Running Performance as an Indicator of VO(2max): A Replication of Distance Effects – 134

AEROBIOLOGY

Relationship of Ambient Atmosphere and Biological Aerosol Responses from a Fielded Pyrolysis-Gas Chromatography-Ion Mobility Spectrometry Bioanalytical Detector – 132

AERODYNAMIC CONFIGURATIONS

Wind-US Flow Calculations for the M2129 S-Duct Using Structured and Unstructured Grids – 68

AERODYNAMIC INTERFERENCE

UAV Aerial Refueling - Wind Tunnel Results and Comparison with Analytical Predictions – 2

AERODYNAMIC NOISE

An Analysis of Model Scale Data Transformation to Full Scale Flight Using Chevron Nozzles – 11

AERODYNAMICS

Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

The Wind and Beyond: A Documentary Journey into the History of Aerodynamics in America – 3

AEROELASTICITY

Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

AEROSOLS

Acquisition and Analysis of NASA Ames Sunphotometer Measurements during SAGE III Validation Campaigns and other Tropospheric and Stratospheric Research Missions – 220

Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

Characteristics and Global Impact of Aerosols from Southern Africa and Eastern Asia – 112

In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols – 180

Relationship of Ambient Atmosphere and Biological Aerosol Responses from a Fielded Pyrolysis-Gas Chromatography-Ion Mobility Spectrometry Bioanalytical Detector – 132

Review of Sampling and Analysis Methods for Assessing Airborne Microbiological Contamination on Commerical Aircraft. A Literature Survey and Review – 101

Toxic Hazards Tests for Vehicles and Other Equipment – 102

Transmission Measurements of Femtosecond Laser Pulses Through Aerosols – 83

TRMM Fire Algorithm, Product and Applications – 93

AEROSPACE ENGINEERING

A High Efficiency DC Bus Regulator/RPC for Spacecraft Applications – 65

Mechanical Components Branch Test Facilities and Capabilities – 86

Meeting NASA's Mission Through Commercial Partnerships – 225

AEROSPACE ENVIRONMENTS

Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

Overview of the Air Force ESEX Flight Experiment – 22

Space Weather Effects on Spacecraft Systems – 204

AEROSPACE MEDICINE

National Space Biomedical Research Institute – 135

AEROSPACE SYSTEMS

An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

L-C Measurement Acquisition Method for Aerospace Systems – 81

Meeting NASA's Mission Through Commercial Partnerships – 225

NASA Efforts on Nanotechnology – 60

Next Generation Aerospace Composites Through Nanotechnology – 29

Observing the Global Water Cycle from Space – 96

Space Weather Effects on Spacecraft Systems – 204

AEROSPACE VEHICLES

Advanced Control Surface Seal Development for Future Space Vehicles – 86

Biologically Inspired Micro-Flight Research – 9

Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development' – 1

AFRICA

African Easterly Waves and Their Association with Precipitation – 116

AGING (MATERIALS)

Thermal Decomposition of New and Aged LX-04 and PBX 9501 – 25

AGRICULTURE

Practical Remote Sensing Application for Agriculture – 95

AIR CARGO

Air Cargo Security, Updated September 11, 2003. CRS Report for Congress – 3

AIR FLOW

Magneto-Aerodynamic Hypersonics – 173

Modeling of Building Scale Flow and Disperson – 76

AIR LAND INTERACTIONS

Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

AIR POLLUTION

GIS-Integrated Traffic Input Models for Mobile-Source Emissions Analysis – 102

Review of Sampling and Analysis Methods for Assessing Airborne Microbiological Contamination on Commerical Aircraft. A Literature Survey and Review – 101

Survey Report: Evaluation of an Air Shower for Reducing Exposure to Carbon Monoxide at USA Port of Entry, Calexico, California – 101

AIR QUALITY

GIS-Integrated Traffic Input Models for Mobile-Source Emissions Analysis – 102

Volatile Organic Chemical Emissions from Structural Insulated Panel (SIP) Materials and Implications for Indoor Air Quality – 99

AIR SAMPLING

Application of Beryllium-7 and Lead-210 Concentration Measurements to Monitoring the Validity of Effluent Air Sampling at the Waste Isolation Pilot Plant – 102

AIR TO AIR REFUELING

UAV Aerial Refueling - Wind Tunnel Results and Comparison with Analytical Predictions – 2

AIR TRAFFIC CONTROL

A CDMA Spotbeam Architecture for the Next Generation Satellite System (NGSS) for the Aeronautical Telecommunications Network (ATN) – 59

AIR TRAFFIC

A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies – 5

AIR TRANSPORTATION

Review of Sampling and Analysis Methods for Assessing Airborne Microbiological Contamination on Commerical Aircraft. A Literature Survey and Review – 101

AIR WATER INTERACTIONS

The Okhotsk Sea Kashevarov Bank Polynya: Its Dependence on Diurnal and Fortnightly Tides and its Initial Formation – 110

Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

AIRBORNE EQUIPMENT

Acquisition and Analysis of NASA Ames Sunphotometer Measurements during SAGE III Validation Campaigns and other Tropospheric and Stratospheric Research Missions – 220

An Analysis of Airship Acceleration Dynamics for Airborne Gravimetry – 105

AIRCRAFT ACCIDENTS

Flightfax: Army Aviation Risk-Management Information. Volume 31, Number 12, December 2003 – 4

AIRCRAFT DESIGN

Aerodynamic Design Study of an Advanced Active Twist Rotor – 7

Aircraft Optimization for Minimum Environmental Impact – 8

Biologically Inspired Micro-Flight Research – 9

The Wind and Beyond: A Documentary Journey into the History of Aerodynamics in America – 3

AIRCRAFT ICING

Preliminary Analysis of X-Band and Ka-Band Radar for Use in the Detection of Icing Conditions Aloft – 5

AIRCRAFT MAINTENANCE

AF ManTech Highlights, Winter 2003 – 4

The Role of Haptics in Service Manual Task Validation – 55

AIRCRAFT MODELS

A Flight Dynamics Model for a Small Glider in Ambient Winds – 2

AIRCRAFT NOISE

An Analysis of Model Scale Data Transformation to Full Scale Flight Using Chevron Nozzles – 11

AIRCRAFT SAFETY

Flightfax: Army Aviation Risk-Management Information. Volume 31, Number 12, December 2003 – 4

AIRCRAFT STRUCTURES

Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications – 7

AIRCRAFT

Cooperative Mobile Sensing Networks – 6

AIRFRAMES

Health Monitoring of RLV Airframe Structures – 87

Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications – 7

AIRSHIPS

An Analysis of Airship Acceleration Dynamics for Airborne Gravimetry – 105

Initial Feasibility Assessment of a High Altitude Long Endurance Airship – 6

AIR

Optical Levitation of Micro-Scale Particles in Air – 190

Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

ALGEBRA

Partial Dynamical Symmetry in Nuclear Systems – 170

ALGORITHMS

A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy – 222

Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

Asteroid Search with Advanced Detection Algorithms – 206

Description of a Normal-Force In-Situ Turbulence Algorithm for Airplanes – 4

Enhancements of Systems Based on Bayesian Networks and Structural Equation Models for Command and Control Support – 167

Fast and Accurate Fault Detection/Location Algorthms for Double-Circuit/Three-Terminal Lines using Phasor Measurement Units – 163

Hybrid QR Factorization Algorithm for High Performance Computing Architectures – 150

Linear State-Space Representation of the Dynamics of Relative Motion, Based on Restricted Three Body Dynamics – 18

Multi-Dimensional Signal Processing for Sparse Radar Arrays – 63

Nonlinear Observers for Gyro Calibration Coupled with a Nonlinear Control Algorithm – 13

Optimal Scheduling With Flexible Resources – 162

Path Elongation for UAV Task Assignment – 6

Short Vector SIMD Code Generation for DSP Algorithms – 162

Sonoluminescence Bubble Measurements using Vision-Based Algorithms – 159

Spacecraft Formation Design Near the Sun-Earth L(sub 2) Point – 18

Successive Bit-Vector Search Algorithm for CELP Vocoders – 164

Test Results for Entry Guidance Methods for Reusable Launch Vehicles – 17

TRMM Fire Algorithm, Product and Applications – 93

Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models – 123

ALKALI HALIDES

Atomic-Based Calculations of Two-Detector Doppler-Broadening Spectra – 175

ALKYL COMPOUNDS

1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

ALKYLATION

Sulfur Mustard Damage to Cornea With Emphasis on Skin: Preventative Studies – 127

ALLOYS

Microbiologically-Facilitated Effects on the Surface Composition of Alloy 22, A Candidate Nuclear Waste Packaging Material – 44

ALUMINUM ALLOYS

Durability Assessment of Gamma TiAl – 47

High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

Investigation of the Effect of Corrosion Pitting on Fatigue Life of Aluminum Structure – 46

Investigations of the Electronic Properties and Surface Structures of Aluminum-Rich Quasicrystalline Alloys – 32

Process for Producing a Cast Article from a Hypereutectic Aluminum-Silicon Alloy – 44

ALUMINUM OXIDES

Alumina-Reinforced Zirconia Composites – 89

Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 220

Thermal Conductivity of Alumina-Toughened Zirconia Composites – 30

ALUMINUM

Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

Investigation of the Effect of Corrosion Pitting on Fatigue Life of Aluminum Structure – 46

AMMONIUM NITRATES

HAN-Based Monopropellant Technology Development – 23

AMPLIFICATION

Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

Parametric Techniques for Extreme-Contrast, High-Energy Petawatt Pulses – 185

AMPLITUDES

A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy – 222

Finding the Radiation Amplitude Zero in W gamma Production-Is it Unique to the Standard Model – 169

ANALOG TO DIGITAL CONVERTERS

A 10-Bit 10 GSPS Optical ADC for Radar Signal Processing – 144

Test Stand for Linear Induction Accelerator Optimization – 171

ANALYSIS (MATHEMATICS)

Motions and Initial Conditions in Star-Forming Dense Cores – 216

ANESTHESIA

The Effects of Gender on Receovery Times Following General Anesthesia with Propofol and Sevoflurane – 131

ANESTHETICS

The Effects of Gender on Receovery Times Following General Anesthesia with Propofol and Sevoflurane – 131

ANGULAR DISTRIBUTION

Frequency and Angular Dependence of Low Frequency East China Sea Bottom Scattering Strengths – 178

ANGULAR RESOLUTION

Development of High Resolution Hard X-Ray Telescope with Multilayer Coatings – 191

ANHYDRIDES

Reevaluation of Tetrahydrophthalic Anhydride as an End Cap for Improved Oxidation Resistance in Addition Polyimides – 42

ANISOTROPY

A Cartesian Adaptive Level Set Method for Two-Phase Flows – 70

Measurement of Anisotropic Elastic Constitutive Properties at High Temperatures – 196

Simulation of a Spherical Wave Experiment in Marble Using a Multidirectional Damage Model – 25

ANNIHILATION REACTIONS

Atomic-Based Calculations of Two-Detector Doppler-Broadening Spectra – 175

ANNUAL VARIATIONS

Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

Survey Report: Evaluation of an Air Shower for Reducing Exposure to Carbon Monoxide at USA Port of Entry, Calexico, California – 101

ANOMALIES

Chemical Compositions and Abundance Anomalies in Stellar Coronae ADP 99 – 216

Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

Interactive Software Fault Analysis Tool for Operational Anomaly Resolution – 148

ANTARCTIC REGIONS

Modeling and Observational Study of the Global Atmospheric Impacts of Antarctic Sea Ice Anomalies – 113

ANTENNA ARRAYS

Confined Plasma Resonance Antenna and Plasma Resonance Antenna Array – 67

ANTICHOLINERGICS

Improving Blood Monitoring of Enzymes as Biomarkers of Risk Form Anticholinergic Pesticides and Chemical Warfare Agents – 127

ANTIMONY ALLOYS

Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

APPLICATION SPECIFIC INTEGRATED CIRCUITS

Design and Implementation for the Prototype of a Microstimulator – 62

Unified Debug Environment for Adaptive Computing Systems – 152

APPLICATIONS OF MATHEMATICS

Analytic Prediction of Emergent Dynamics for Autonomous Negotiating Team (ANT) Systems – 201

Multidisciplinary Research in Mine Detection and Neutralization Systems: Missouri-Led Muri – 81

APPLICATIONS PROGRAMS (COMPUTERS)

Joint Battlespace Infosphere Repository Prototype – 201

Software Engineering Improvement Activities/Plan – 145

User's Guide to GIS-Based Application for Traffic Inputs to MOBILE6 Emissions Factor Model – 101

APPROXIMATION

A Self-Contained Mapping Closure Approximation for Scalar Mixing – 71

Approximating the Helium Wavefunction in Positronium-Helium Scattering – 173

Rational Approximations of the Power Spectral Density of Atmospheric Turbulence Arising in Adaptive Optics – 162

AQUATIC PLANTS

Nutrients in the Upper Mississippi River: Scientific Information to Support Management Decisions. The Upper Mississippi River - Values and Vulnerability – 179

ARC JET ENGINES

Overview of the Air Force ESEX Flight Experiment – 22

ARCHITECTURE (COMPUTERS)

A CDMA Spotbeam Architecture for the Next Generation Satellite System (NGSS) for the Aeronautical Telecommunications Network (ATN) – 59

C++ Infrastructure for Automatic Introduction and Translation of OpenMP Directives – 139

CAX System Architecture and Services – 157

Hybrid QR Factorization Algorithm for High Performance Computing Architectures – 150

MONARCH: A Morphable Networked micro-ARCHitecture – 63

Multidimensional Performance Modeling for Advanced Embedded Signal Processors – 151

Preliminary Design Review: PCA Integrated Radar- Tracker Application – 144

Securing Mobile Networks in an Operational Setting – 156

Signal Processing Architectures for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Applications – 80

Trends in HPC and HPEC Convergence – 155

Understanding the CCA Standard Through Decaf – 140

ARCTIC REGIONS

Arctic Shoreline Delineation & Feature Detection Using RADARSAT-1 Interferometry: Case Study Over Alert – 97

ARGON

Pulsed Inductive Thruster (PIT): Modeling and Validation Using the MACH2 Code – 22

ARMED FORCES

Computer Generated Forces: Layout and Architecture – 143

The Acute Respiratory Distress Syndrome (ARDS) and Military Relevant Inhalation Injury: A Brief Review – 133

ARMOR

Ceramic Armour against Heavy KE-Threats – 49

ARRAYS

The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

ARTIFICIAL INTELLIGENCE

Robot Acquisition of Active Maps Through Teleoperation and Vector Space Analysis – 160

ASSESSMENTS

Integrating Formal Methods and Testing 2002 – 148

ASTEROID DETECTION
Asteroid Search with Advanced Detection Algorithms – 206

ASTEROIDS
[Calibration, Analysis, and Interpretation of SERTS and EUNIS Observation] – 192

ASTHMA
Health Surveillance in the U.S. Navy: Asthma – 125

ASTRONAUTS
Partitioning of Inorganic Elements Consumed by Humans Between the Various Fractions of Human Wastes: A Review and Analysis of Existing Literature – 34

ASTRONOMICAL MODELS
Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 220

ASTRONOMICAL OBSERVATORIES
The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

ASTRONOMY
Astronomy Applications of Adaptive Optics at Lawrence Livermore National Laboratory – 220

Highlights of the ASPE 2004 Winter Topical Meeting on Free-Form Optics: Design, Fabrication, Metrology, Assembly – 190

The Beauty and Limitations of 10 Micron Heterodyne Interferometry (ISI) – 208

ASTROPHYSICS
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Environmental Effects on the Metallicities of Early-Type Galaxies – 215

How Can The SN-GRB Time Delay Be Measured? – 218

Observations of Distant Clusters – 208

Solar Flares, Type III Radio Bursts, CMEs, and Energetic Particles – 218

The Interaction of Hot and Cold Gas in the Disk and Halo of Galaxies – 212

Tracing the Magnetic Field in Orion A – 217

ASYMMETRY
Observation of the Decay Beta(sup 0) approximately Tau(sup 0)Tau(sup 0) – 172

ATMOSPHERIC BOUNDARY LAYER
Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer – 116

Large-eddy Simulation of Stratocumulus-topped Atmospheric Boundary Layers with Dynamic Subgrid-scale Models – 119

ATMOSPHERIC CHEMISTRY
Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

Orbit Optimization for the Geospace Electrodynamics Connections (GEC) Mission – 92

ATMOSPHERIC CIRCULATION
Heating Structures Derived from Satellite – 112

Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models – 112

Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

ATMOSPHERIC COMPOSITION
Advanced Global Atmospheric Gases Experiment (AGAGE): MIT Contribution – 115

Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

ATMOSPHERIC CORRECTION
Historical Precision of an Ozone Correction Procedure for AMO Solar Cell Calibration – 99

ATMOSPHERIC EFFECTS
Modeling and Observational Study of the Global Atmospheric Impacts of Antarctic Sea Ice Anomalies – 113

ATMOSPHERIC GENERAL CIRCULATION MODELS
Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

On the Cause of the 1930s Dust Bowl – 113

Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models – 123

ATMOSPHERIC HEATING
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models – 112

ATMOSPHERIC MODELS
Characteristics and Global Impact of Aerosols from Southern Africa and Eastern Asia – 112

Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

Evaluating the Carbon Cycle of a Coupled Atmosphere-Biosphere Model – 109

Heating Structures Derived from Satellite – 112

Modeling and Observational Study of the Global Atmospheric Impacts of Antarctic Sea Ice Anomalies – 113

Momentum Transport: 2D and 3D Cloud Resolving Model Simulations – 114

Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development' – 1

The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

Validation of Ionospheric Models – 103

Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

ATMOSPHERIC MOISTURE
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

ATMOSPHERIC PHYSICS
Orbit Optimization for the Geospace Electrodynamics Connections (GEC) Mission – 92

ATMOSPHERIC PRESSURE
Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

ATMOSPHERIC SOUNDING
Current results from AIRS/AMSU/HSB – 120

Evaluation of the Space Shuttle Transatlantic Abort Landing Atmospheric Sounding System – 16

Sensitivity Studies for Space-based Measurements of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight – 108

ATMOSPHERIC TEMPERATURE
Climate Impacts on Tropospheric Ozone and Hydroxyl – 113

Current results from AIRS/AMSU/HSB – 120

Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

ATMOSPHERIC TURBULENCE
Description of a Normal-Force In-Situ Turbulence Algorithm for Airplanes – 4

ATOMIC FORCE MICROSCOPY
Development and Application of Molecular- Resolution Chemically-Sensitive Nanotube Probes – 36

ATOMIC SPECTRA
Determination of Copper Cyanide Plating Solutions and Cadmium in Cadmium Cyanide Plating Solutions by Atomic Absorption Spectrometry – 38

ATOMS
Atomic Data and Spectral Line Intensities for S XI – 219

Atomistic Simulation of Dislocation-Defet Interactions in Cu – 44

Molecular Dynamics Simulations of Coulomb Explosion – 170

Proposal for Testing and Validation of Vacuum Ultra-Violet Atomic Laser-Induced Fluorescence as a Method to Analyze Carbon Grid Erosion in Ion Thrusters – 25

ATTITUDE CONTROL
Nonlinear Observers for Gyro Calibration Coupled with a Nonlinear Control Algorithm – 13

AUDITORY SIGNALS
Modern Techniques in Acoustical Signal and Image Processing – 139

Power Consumption of Customized Numerical Representations for Audio Signal Processing – 162

AUGMENTATION
Nanotechnology Infrared Optics for Astronomy Missions – 207

Parametric Techniques for Extreme-Contrast, High-Energy Petawatt Pulses – 185

Validation of Ionospheric Models – 209

AUTOMATA THEORY
Adaptive Framework for Automated Mapping and Architecture Trades for Embedded Heterogeneous Systems – 160

AUTOMATIC CONTROL
A Study on the Effects of J2 Perturbations on a Drag-Free Control System for Spacecraft in Low Earth Orbit – 97

Adaptive Framework for Automated Mapping and Architecture Trades for Embedded Heterogeneous Systems – 160

Automated Command and Control Information Systems (ACCIS) and CAX – 157

Hyper-X Stage Separation Trajectory Validation Studies – 19

Image Systems Using RFID Tag Positioning Information – 159

SafePatch for Windows. Version 1.0 User Manual – 139

AUTOMATIC FLIGHT CONTROL
Development and Testing of the Phase 0 Autonomous Formation Flight Research System – 53

AUTONOMY
Analytic Prediction of Emergent Dynamics for Autonomous Negotiating Team (ANT) Systems – 201

AVIATION METEOROLOGY
Preliminary Analysis of X-Band and Ka-Band Radar for Use in the Detection of Icing Conditions Aloft – 5

AXISYMMETRIC FLOW
Computational Study of Axisymmetric Off-Design Nozzle Flows – 2

Computing Axisymmetric Jet Screech Tones using Unstructured Grids – 179

BACILLUS
Relationship of Ambient Atmosphere and Biological Aerosol Responses from a Fielded Pyrolysis-Gas Chromatography-Ion Mobility Spectrometry Bioanalytical Detector – 132

BACKSCATTERING
Mid-Frequency Bottom Backscatter, Environmental Measurements, Model/data Comparison, and Implications to Reverberations – 178

BACTERIA
Corrosion Mechanisms of UNS N04400 in Sea Water – 35

Relationship of Ambient Atmosphere and Biological Aerosol Responses from a Fielded Pyrolysis-Gas Chromatography-Ion Mobility Spectrometry Bioanalytical Detector – 132

Review of Sampling and Analysis Methods for Assessing Airborne Microbiological Contamination on Commerical Aircraft. A Literature Survey and Review – 101

BARYONS
Measurement of the Branching Fractions of Lambda(C)+ -> P Anti-K N(Pi) – 169

Observation of an Excited Charmed Baryon Decaying into xi(c)0 pi+ – 171

Study of Semileptonic Decays of B Mesons to Charmed Baryons – 169

BAYES THEOREM
Enhancements of Systems Based on Bayesian Networks and Structural Equation Models for Command and Control Support – 167

BEAMFORMING
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

BEARING (DIRECTION)
Magnetic Bearing Controller Improvements for High Speed Flywheel System – 21

BERYLLIUM 7
Application of Beryllium-7 and Lead-210 Concentration Measurements to Monitoring the Validity of Effluent Air Sampling at the Waste Isolation Pilot Plant – 102

BIBLIOGRAPHIES
List of US Army Research Institute Research and Technical Publications – 202

BINARY ALLOYS
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

BINDERS (MATERIALS)
Preparation of Propellants Adapted for ETC and Polymeric Matrix for ADN-Based Propellants – 52

Thermal Decomposition of New and Aged LX-04 and PBX 9501 – 25

BIOCHEMISTRY
Technology Development of Miniaturized Far-Infrared Sources for Biomolecular Spectroscopy – 35

BIOCOMPATIBILITY
Engineering Titanium for Improved Biological Response – 43

BIOINSTRUMENTATION
Biosensors Made from Carbon and Polymer Composite Micro-Electromechanical Systems (MEMS) – 62

BIOLOGICAL EFFECTS
Engineering Titanium for Improved Biological Response – 43

BIOLOGICAL WEAPONS
Sealed Window Glazing System for Chemical Biological Protected Space Applications – 89

BIOLOGY
Biologically Inspired Micro-Flight Research – 9

BIOMASS BURNING
Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

Discoveries about Tropical Ozone from Satellite and SHADOZ (Southern Hemisphere ADditional Ozonesondes) – 114

BIOMETRICS
Defense Healthcare Information Assurance Program (DHIAP) Phase III – 202

BIOSPHERE
Evaluating the Carbon Cycle of a Coupled Atmosphere-Biosphere Model – 109

BITS
Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 159

BLACK HOLES (ASTRONOMY)
Dying Pulse Trains in Cygnus XR-1: Initial Results of X-Ray Searches – 214

Formation Control of the MAXIM L2 Libration Orbit Mission – 205

Investigations into Gravitational Wave Emission from Compact Body Inspiral Into Massive Black Holes – 209

Might Dark Matter be Actually Black – 213

Simultaneous X-Ray and Optical Timing Observations of GX 339-4 – 184

BLADE TIPS

Toward a Fast-Response Active Turbine Tip Clearance Control – 12

BLENDED-WING-BODY CONFIGURATIONS

Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

BLOOD

Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

BLOWOUTS

Real-Time Control of Lean Blowout in a Turbine Engine for Minimizing No(x) Emissions – 21

BODY-WING AND TAIL CONFIGURATIONS

Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

BONDING

Investigating the Effect of Interfacial Strength on Deformation and Failure Mechanisms in Bond Systems – 26

BONE DEMINERALIZATION

Molecular Basis of Mechano-Signal Transduction in Vascular Endothelial Cells – 133

BONES

Determinants of Stress Fracture and Bone Mass in Elite Military Cadets – 128

Efficacy of Calcium and Vitamin D Supplementation for the Prevention of Stress Fractures in Female Naval Recruits – 126

Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

Stress Fracture Etiology as Dependent on Mechanically Induced Fluid Flow – 126

BORIC ACIDS

Determination of Nickel, Nickel Chloride Hexahydrate and Boric Acid in Nickel Sulfamate Plating Solutions by Titration – 39

BORIDES

Astro-E2 Magnesium Diboride High Current Leads – 195

BOUNDARIES

Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation – 123

BOUNDARY CONDITIONS

A High Resolution, Three-Dimensional, Computationally Efficient, Diagnostic Wind Model: Initial Development Report – 115

Magnetosphere-Ionosphere Coupling and Associated Ring Current Energization Processes – 211

Momentum Transport: 2D and 3D Cloud Resolving Model Simulations – 114

Sub-Optimal Finite Dimensional Observer-Based Boundary Controller Design for Distributed Parameter Systems on a Planar Domain – 164

BOUNDARY LAYER FLOW

The Design and Control of Smart Structures – 54

BOUNDARY LAYER TRANSITION

Transition in Hypersonic Flows Including High-temperature Gas Effects – 72

BOUNDARY LAYERS

Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

BRANCHING (PHYSICS)

Measurement of B(D0 -> K-pi+ pi0)/B(D0 -> K- pi+) – 171

Measurement of B(sup 0) -> D(sub s)(*)+D*- Branching Fractions and B(sup 0) ->D(sup s)*- Polarization with a Partial Reconstruction Technique – 168

Measurement of the Branching Fraction for D(S) -> phi pi- – 171

Measurement of the Branching Fractions of Lambda(C)+ -> P Anti-K N(Pi) – 169

BRIGHTNESS

Outbursts in Symbiotic Binaries – 217

Seeing Red and Shooting Blanks: A Study of Red Quasars and Blank Field X-Ray Sources – 210

BRILLOUIN EFFECT

Stimulated Brillouin Scattering from Helium-Hydrogen Plasmas – 194

BROADBAND

Broadband Trailing Edge Noise Predictions in the Time Domain – 180

Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 63

Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 64

BROKEN SYMMETRY

Partial Dynamical Symmetry in Nuclear Systems – 170

BUBBLES

Buoyancy-Driven Instabilities in Single-Bubble Sonoluminescence – 219

Sonoluminescence Bubble Measurements using Vision-Based Algorithms – 159

The Effect of the Density Ratio on the Nonlinear Dynamics of the Unstable Fluid Interface – 75

Theoretical and Experimental Investigation of the Stability of an Evaporating Constrained Vapor Bubble – 72

BUILDINGS

Modeling of Building Scale Flow and Disperson – 76

BURNERS

Development of a High-Pressure Gaseous Burner for Calibrating Optical Diagnostic Techniques – 11

BURSTS

Outbursts in Symbiotic Binaries – 217

RR Tel: Getting under the Flux Limit - An Observation with FUSE – 216

C++ (PROGRAMMING LANGUAGE)

Understanding the CCA Standard Through Decaf – 140

CADMIUM

Determination of Copper Cadmium and Iron in Metal Cyanide Waste Solutions by Atomic Absorption Spectroscopy – 37

Determination of Copper Cyanide Plating Solutions and Cadmium in Cadmium Cyanide Plating Solutions by Atomic Absorption Spectrometry – 38

CALCIFEROL

Efficacy of Calcium and Vitamin D Supplementation for the Prevention of Stress Fractures in Female Naval Recruits – 126

CALIBRATING

Absolute Optical Calibrations Using a Simple Tungsten Bulb: Theory – 204

Accessing and Understanding MODIS Data – 120

Acquisition and Analysis of NASA Ames Sunphotometer Measurements during SAGE III Validation Campaigns and other Tropospheric and Stratospheric Research Missions – 220

Development of a High-Pressure Gaseous Burner for Calibrating Optical Diagnostic Techniques – 11

Historical Precision of an Ozone Correction Procedure for AMO Solar Cell Calibration – 99

Irradiance Calibration of Space-Based Infrared Sensors – 79

Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

Lawrence Livermore National Laboratory Probabilistic Seismic Hazard Codes Validation – 140

Radiant Temperature Nulling Radiometer – 78

CAMERAS

A Precision Metrology System for the Hubble Space Telescope Wide Field Camera 3 Instrument – 77

Diagnostic Instrumentation – 62

The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

The Light Field Video Camera – 79

CAMOUFLAGE

Performance of Low-VOC Paint for Vehicles of the Dutch Army – 51

CANCELLATION

Design of a System for Active Echo-Cancellation – 56

CANCER

A Study of Transrectal Tumor Oxygen Measurements in Patients With Clinically Localized Prostate Cancer – 125

An Evaluation of Stereoscopic Digital Mammography for Earlier Detection of Breast Cancer and Reduced Rate of Recall – 131

Bioactive Lipids: Role in Prostate Cancer Angiogenesis – 127

Cyclin E, a Powerful Predictor of Survival in Breast Cancer - A Prospective Study – 130

Delivering DNA Vaccine by Transdermal Electroporation – 130

Derivation of Double-Targeted Adenovirus Vectors for Gene Therapy of Prostate Cancer – 131

Differential Expression of DNA Double-Strand Break Repair Proteins in Breast Cells – 132

Do the Effects of Exercise on Breast Cancer Prevention Vary With Environment – 127

Genetic Variation in the HSD3B2 Gene and Prostate Cancer – 129

Is Breast Tissue from Women Who Carry Germ-Line BRCA1 or BRCA2 Mutations 'Normal'? - An Immuno- Histopathological Study – 130

Prostate Cancer Cell Growth: Role of Neurotensin in Mediating Effect of Dietary Fat and Mechanism of Action – 129

Role of a Novel Splice Variant of the Steroid Receptor Coactivator AIB1 in Breast Cancer – 128

Training Program in the Molecular Basis of Breast Cancer Research – 126

CAPACITORS

Leak and Pipe Detection Method and System – 59

CARBON CYCLE

Evaluating the Carbon Cycle of a Coupled Atmosphere-Biosphere Model – 109

CARBON DIOXIDE CONCENTRATION

Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

Sensitivity Studies for Space-based Measurements of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight – 108

CARBON DIOXIDE

Sensitivity Studies for Space-based Measurements of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight – 108

CARBON FIBERS

Mechanical Properties of Heat-treated Carbon Fibers – 89

Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

CARBON MONOXIDE

Survey Report: Evaluation of an Air Shower for Reducing Exposure to Carbon Monoxide at USA Port of Entry, Calexico, California – 101

CARBON NANOTUBES

Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

Highly Ordered Carbon Nanotube Arrays and Nanotube- Polymer Nanocomposite Superlattices for Full-Color Sensing and Coating – 39

CARBON TETRACHLORIDE

Advanced Global Atmospheric Gases Experiment (AGAGE): MIT Contribution – 115

CARBONACEOUS CHONDRITES

Isolation of Purines and Pyrimidines from the Murchison Meteorite – 125

CARBONACEOUS METEORITES

Isolation of Purines and Pyrimidines from the Murchison Meteorite – 125

CARBON

Barrier Foil Heating Simulations Using LASNEX – 174

Biosensors Made from Carbon and Polymer Composite Micro-Electromechanical Systems (MEMS) – 62

Black Carbon Measurements in SOLVE-2 – 78

Carbon Nanotube Atomic Force Microscopy for Proteomics and Biological Forensics – 51

Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

Proposal for Testing and Validation of Vacuum Ultra-Violet Atomic Laser-Induced Fluorescence as a Method to Analyze Carbon Grid Erosion in Ion Thrusters – 25

X-37 C-Sic CMC Control Surface Components Development [Status of the NASA/Boeing/USAF Orbital Vehicle and Related Efforts] – 49

CARDIOVASCULAR SYSTEM

Molecular Basis of Mechano-Signal Transduction in Vascular Endothelial Cells – 133

CARTESIAN COORDINATES

A Cartesian Adaptive Level Set Method for Two-Phase Flows – 70

Detection of Randomness in Sparse Data Set of Three Dimensional Time Series Distributions – 161

GSRP/David Marshall: Fully Automated Cartesian Grid CFD Application for MDO in High Speed Flows – 75

CASTING

Process for Producing a Cast Article from a Hypereutectic Aluminum-Silicon Alloy – 44

CELL DIVISION

Prostate Cancer Cell Growth: Role of Neurotensin in Mediating Effect of Dietary Fat and Mechanism of Action – 129

Training Program in the Molecular Basis of Breast Cancer Research – 126

CELLS (BIOLOGY)

Compact Liquid Waste Evaporator for Cleanup on Hanford's Hot Cells – 100

Cyclin E, a Powerful Predictor of Survival in Breast Cancer - A Prospective Study – 130

Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

Role of a Novel Splice Variant of the Steroid Receptor Coactivator AIB1 in Breast Cancer – 128

CENSUS

2003 DTIC Customer Satisfaction Survey Report – 202

CENTER OF MASS

Study of Semileptonic Decays of B Mesons to Charmed Baryons – 169

CERAMIC MATRIX COMPOSITES

Recent Advances in the Development of Thick-Section Melt-Infiltrated C/SiC Composites – 29

Ultra-High Temperature Ceramic Composites for Leading Edges – 29

X-37 C-Sic CMC Control Surface Components Development [Status of the NASA/Boeing/USAF Orbital Vehicle and Related Efforts] – 49

CERAMICS

Ceramic Armour against Heavy KE-Threats – 49

Predicting the Effect of Defect Distributions in the Bulk and on Surfaces of Ceramic Materials – 50

CHANNEL FLOW

Grid-Independent Large-Eddy Simulation in Turbulent Channel Flow using Three-Dimensional Explicit Filtering – 70

Numerical Simulation of High Drag Reduction in a Turbulent Channel Flow with Polymer Additives – 74

'Hypothetical' Heavy Particles Dynamics in LES of Turbulent Dispersed Two-Phase Channel Flow – 69

CHANNELS (DATA TRANSMISSION)

Decision Feedback Equalization Pre-Processor with Turbo Equalizer – 179

CHARACTERIZATION

Delamination Failure Investigation for Out-of-Plane Loading in Laminates – 28

NASA IKONOS Characterization Methodologies – 94

CHARGE COUPLED DEVICES

Characterization of Adaptive Optics at Keck Observatory – 220

CHARGED PARTICLES

Transport Methods Conquering the Seven-Dimensional Mountain – 170

CHARM (PARTICLE PHYSICS)

Measurement of the Branching Fractions of Lambda(C)+ -> P Anti-K N(Pi) – 169

Observation of an Excited Charmed Baryon Decaying into xi(c)0 pi+ – 171

Study of Semileptonic Decays of B Mesons to Charmed Baryons – 169

CHECKOUT

Unified Debug Environment for Adaptive Computing Systems – 152

CHEMICAL ANALYSIS

A Wavelet based Suboptimal Kalman Filter for Assimilation of Stratospheric Chemical Tracer Observations – 165

Automatic Coulometric Titration of Sulfuric Acid in Chromium Plating Solutions – 40

Determination of Copper Cadmium and Iron in Metal Cyanide Waste Solutions by Atomic Absorption Spectroscopy – 37

Determination of Copper Cyanide Plating Solutions and Cadmium in Cadmium Cyanide Plating Solutions by Atomic Absorption Spectrometry – 38

Determination of Nickel, Nickel Chloride Hexahydrate and Boric Acid in Nickel Sulfamate Plating Solutions by Titration – 39

Determination of PCB's in Watervliet Arsenal Machine Oils by Gas Chromatography – 38

X-Ray Fluorescence On-Stream Analysis of Standard Reference Solution Concentrations of Chromium Plating and Polishing Solutions – 40

CHEMICAL BONDS

Next Generation Aerospace Composites Through Nanotechnology – 29

CHEMICAL COMPOSITION

Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Chemical Compositions and Abundance Anomalies in Stellar Coronae ADP 99 – 216

CHEMICAL ELEMENTS

Partitioning of Inorganic Elements Consumed by Humans Between the Various Fractions of Human Wastes: A Review and Analysis of Existing Literature – 34

CHEMICAL EVOLUTION

Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 220

CHEMICAL PROPULSION

Strategic Research Directions in Microgravity Materials Science – 221

CHEMICAL REACTIONS

Dynamics of Etching at the Gas-Surface Interface – 36

Heterogeneous Interactions of Acetaldehyde and Sulfuric Acid – 33

Quantum Dynamics Scattering Study of AB+CDE Reactions: A Seven Dimensional Treatment for the H2+C2H Reaction – 33

RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

CHEMICAL WARFARE

Diagnosis of Exposure to Chemical Warfare Agents – 134

Improving Blood Monitoring of Enzymes as Biomarkers of Risk Form Anticholinergic Pesticides and Chemical Warfare Agents – 127

CHEMISTRY

Chemistry Laboratory Operations Manual – 203

CHINA

Direct Path Fluctuations Due to Shallow Water Volume Variability – 176

Low-Frequency Shallow Water Reverberation and Bottom Scattering Model – 176

The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation – 177

CHIRP SIGNALS

Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

CHLOROFLUOROCARBONS

Advanced Global Atmospheric Gases Experiment (AGAGE): MIT Contribution – 115

CHLOROPHYLLS

Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

CHROMATOGRAPHY

Utilization of Ion Chromatography and Statistics to Determine Important Acids in Chromium Plating and Electropolishing Solutions – 38

CHROMIC ACID

Determination of Wastewater Acids from Chromium Plating and Electropolishing Solutions – 41

Laboratory Automatic Titration of Chromium Plating and Electropolishing Solutions – 39

Online Automatic Titration of Chromic Acid in Chromium Plating Solutions and Phosphoric and Sulfuric Acids in Electropolishing Solutions – 41

Utilization of Ion Chromatography and Statistics to Determine Important Acids in Chromium Plating and Electropolishing Solutions – 38

CHROMIUM ALLOYS

High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

CHROMIUM

Automatic Coulometric Titration of Sulfuric Acid in Chromium Plating Solutions – 40

X-Ray Fluorescence On-Stream Analysis of Standard Reference Solution Concentrations of Chromium Plating and Polishing Solutions – 40

CIRCUITS

Mixed Electromagnetic and circuit Simulations using Higher-Order Elements and Bases – 171

Streams-C; Sc2 C-to-FPGA Compiler – 149

CISLUNAR SPACE

A Comprehensive Survey of Earth-Moon Libration Orbits: Stationkeeping Strategies And Intra-Orbit Transfers – 15

CLAMPS

Seal Ring Installation – 85

CLEANING

Tests of the Contamination Analysis Unit, Phase 2 – 21

CLEARANCES

Toward a Fast-Response Active Turbine Tip Clearance Control – 12

CLIMATE CHANGE

Climate Impacts on Tropospheric Ozone and Hydroxyl – 113

Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

CLIMATE MODELS

A Physical Validation Program for the GPM Mission – 119

Characteristics and Global Impact of Aerosols from Southern Africa and Eastern Asia – 112

Climate Impacts on Tropospheric Ozone and Hydroxyl – 113

Heating Structures Derived from Satellite – 112

Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

Modeling and Observational Study of the Global Atmospheric Impacts of Antarctic Sea Ice Anomalies – 113

Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models – 112

Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models – 123

CLIMATE

Advanced Global Atmospheric Gases Experiment (AGAGE): MIT Contribution – 115

Discoveries about Tropical Ozone from Satellite and SHADOZ (Southern Hemisphere ADditional Ozonesondes) – 114

CLIMATOLOGY

Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development' – 1

Tides and Decadal Variability – 120

Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals – 117

CLINICAL MEDICINE

A Study of Transrectal Tumor Oxygen Measurements in Patients With Clinically Localized Prostate Cancer – 125

Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications – 132

Cyclin E, a Powerful Predictor of Survival in Breast Cancer - A Prospective Study – 130

The Acute Respiratory Distress Syndrome (ARDS) and Military Relevant Inhalation Injury: A Brief Review – 133

CLOUD PHYSICS

A Physical Validation Program for the GPM Mission – 119

Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer – 116

Momentum Transport: 2D and 3D Cloud Resolving Model Simulations – 114

CLOUDS (METEOROLOGY)

Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals – 117

CLUSTER ANALYSIS

K-Means Re-Clustering Algorithmic Options with Quantifiable Performance Comparisons – 141

CMOS

New High-Speed Low-Power Current-Mode CMOS Sense Amplifier – 64

The Light Field Video Camera – 79

COATINGS

Development of Product Descriptions for Lead- Immobilizing Overcoating Systems – 27

Magneto-Optically Guided and Fully Ionized Metal/Carbon Arc Plasma Source for Thin Film Coatings to Control, Wear, and Fretting – 27

Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels – 174

Solid State THz Sources – 66

COATING

Gun Barrel Erosion and Coating of Gun Barrels: A Literature Review – 49

COBALT

Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation – 46

COHERENT LIGHT

X-Ray Optics and Diagnostics for the First Experiments on the Linac Coherent Light Source – 193

X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultrashort X-ray Pulses with Matter – 185

COHERENT RADIATION

Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS) – 178

COLD GAS

The Interaction of Hot and Cold Gas in the Disk and Halo of Galaxies – 212

COLD TOLERANCE

Cold Air Data Acquisition System Documentation – 134

COLLAGENS

Determinants of Stress Fracture and Bone Mass in Elite Military Cadets – 128

COLLISIONS

Atomic Data and Spectral Line Intensities for S XI – 219

COLORIMETRY

Improving Blood Monitoring of Enzymes as Biomarkers of Risk Form Anticholinergic Pesticides and Chemical Warfare Agents – 127

COMBAT

Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Improved Air Combat Awareness; with AESA and Next- Generation Signal Processing – 7

COMBUSTION CHAMBERS

Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Real-Time Control of Lean Blowout in a Turbine Engine for Minimizing No(x) Emissions – 21

COMBUSTION PHYSICS

Development of a High-Pressure Gaseous Burner for Calibrating Optical Diagnostic Techniques – 11

Experiment and Theory for Active Control of Nonlinear Dynamics in Compression/Combustion Systems – 69

COMBUSTION PRODUCTS

Real-Time Control of Lean Blowout in a Turbine Engine for Minimizing No(x) Emissions – 21

COMBUSTION

Advanced Global Atmospheric Gases Experiment (AGAGE): MIT Contribution – 115

Numerical Simulations of Shock-Induced Mixing and Combustion – 76

Physics of Combustion of New Oxidizer/Polymer Mixtures – 51

Toxic Hazards Tests for Vehicles and Other Equipment – 102

COMMAND AND CONTROL

Automated Command and Control Information Systems (ACCIS) and CAX – 157

Closing the Gaps A Strategy for Gaining the Initiative in the War on Terror – 58

Practical Examples and Future Needs for Computer Assisted Exercises at the Operational Level of Military Decision Making – 157

Risk-Based Decision-Making and the Use of Operational Risk Management in Developing a Course of Action (COA) for the Joint Task Force (JTF) – 57

Simulation of and for Military Decision Making – 142

The Increasing Need for the Representation of Decision Making and Human Behaviour in Simulations Used for Computer Assisted Exercises in NATO – 198

COMMERCE

New Ways to Empower Indonesia with the Internet and ICTs – 141

COMMERCIAL AIRCRAFT

A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies – 5

Description of a Normal-Force In-Situ Turbulence Algorithm for Airplanes – 4

COMMUNICATION NETWORKS

An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications – 166

Energy Efficient Wireless Sensor Networks Using Fuzzy Logic – 57

Global Information Enterprise Simulation Laboratory (GIESIM LAB) – 54

Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 159

Wireless Temperature-Monitoring System – 61

COMMUNICATION

For Further Innovation – 166

COMMUNITIES

Wildfires Dynamics in Mid-Siberian Larch Dominated Communities – 95

COMPACTING

Compaction of Space Mission Wastes – 137

COMPETITION

R and D that can Capture Value – 198

COMPILERS

Design Space Exploration and Optimization of Embedded Cache Systems via a Compiler – 149

Monolithic Compiler Experiments Using C++ Expression Templates – 149

Streaming and Dynamic Compilers for High Performance Embedded Computing – 149

Streams-C; Sc2 C-to-FPGA Compiler – 149

COMPLEX SYSTEMS

CAX System Architecture and Services – 157

PROTEUS: Assessment and Adaptation Through Dynamic Architecture Technology – 151

COMPOSITE MATERIALS

Molybdenum-Copper Composite Material – 28

Next Generation Aerospace Composites Through Nanotechnology – 29

Thermal Conductivity of Alumina-Toughened Zirconia Composites – 30

COMPOSITE PROPELLANTS

Preparation of Propellants Adapted for ETC and Polymeric Matrix for ADN-Based Propellants – 52

COMPOSITE STRUCTURES

Comparison of Matrix Cracking in Melt-Infiltrated SiC/SiC Composites with 3D and 2D-Woven Orthogonal Architectures – 29

COMPRESSIBLE FLOW

Application of New Algorithms for the Simulation of Multidisciplinary Problems: Fluid Structure Thermal and Control Coupling – 73

COMPRESSION LOADS

Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

Experiment and Theory for Active Control of Nonlinear Dynamics in Compression/Combustion Systems – 69

COMPUTATIONAL FLUID DYNAMICS

Advances in High Performance Computational Methods for Large Scale Fluid/Structure Interaction – 68

Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

Broadband Trailing Edge Noise Predictions in the Time Domain – 180

Computational Study of Axisymmetric Off-Design Nozzle Flows – 2

Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

GSRP/David Marshall: Fully Automated Cartesian Grid CFD Application for MDO in High Speed Flows – 75

Modeling of Building Scale Flow and Disperson – 76

Spatially Resolved Sub-Doppler Overtone Gain Measurements in a Small Scale Supersonic HF Laser – 35

Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

VE-Suite: Coupling Visualization and Computational Environments to Support on-the-fly Engineering Design – 67

Wind-US Flow Calculations for the M2129 S-Duct Using Structured and Unstructured Grids – 68

COMPUTATIONAL GRIDS

Structural Integrity of a Wind Tunnel Balance – 91

COMPUTATION

Atomic Data and Spectral Line Intensities for S XI – 219

From Materials to Missions. Assess-Predict- Optimize: A Computational Approach to Adaptive Design – 165

Scoping Inventory Calculations for the Rare Isotope Accelerator – 181

Web-Based HLA Federations and Simulations: Methods and Possibilities – 55

COMPUTER AIDED DESIGN

Computer Generated Forces: Background, Definition and Basic Technologies – 157

Embedded High Performance Scalable Computing Systems – 150

COMPUTER AIDED MAPPING

Adaptive Framework for Automated Mapping and Architecture Trades for Embedded Heterogeneous Systems – 160

COMPUTER GRAPHICS

VE-Suite: Coupling Visualization and Computational Environments to Support on-the-fly Engineering Design – 67

COMPUTER INFORMATION SECURITY

Defense Healthcare Information Assurance Program (DHIAP) Phase III – 202

COMPUTER NETWORKS

Merlot Design – 139

Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153

Quality of Service Routing in Tactical Mobile Ad Hoc Networks – 56

Reference Document for Management of Tactical Infrastructure Networks – 156

Scalable Content Delivery Technology – 155

Securing Mobile Networks in an Operational Setting – 156

COMPUTER PROGRAMMING

CAX System Architecture and Services – 157

Unified Debug Environment for Adaptive Computing Systems – 152

COMPUTER PROGRAMS

Algorithmic Advances for Software Radios – 57

An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Computer Generated Forces: Background, Definition and Basic Technologies – 157

Development of Methodologies for IV and V of Neural Networks – 147

Globe Teachers Guide and Photographic Data on the Web – 146

Intelligent Software for System Design and Documentation – 146

Interactive Software Fault Analysis Tool for Operational Anomaly Resolution – 148

Lawrence Livermore National Laboratory Probabilistic Seismic Hazard Codes Validation – 140

Optimal Scheduling With Flexible Resources – 162

ParaDyn A Parallel Nonlinear, Explicit, Three-Dimensional Finite-Element Code for Solid and Structural Mechanics User Manual – 88

Real-Time Embedded Software Verification and Validation 2001 – 22

Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 150

Software Engineering Improvement Activities/Plan – 145

Software for Preprocessing Data From Rocket-Engine Tests – 146

Software for Simulation of Hyperspectral Images – 145

Spectroscopy of the Perseus Cluster – 213

Technical Design for the TTA Component of the 120mm HE C2 Mortar Ammunition – 153

COMPUTER SYSTEMS DESIGN

NASA's Virtual Product Laboratory: An Overview – 158

Semantic Metrics for Object Oriented Design – 158

COMPUTER SYSTEMS PERFORMANCE

Completing the Loop: Linking Software Features to Failures – 144

COMPUTER SYSTEMS PROGRAMS

Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions – 159

R and D that can Capture Value – 198

Reference Document for Management of Tactical Infrastructure Networks – 156

SafePatch for Windows. Version 1.0 User Manual – 139

Scalable Content Delivery Technology – 155

COMPUTER TECHNIQUES

Automated Command and Control Information Systems (ACCIS) and CAX – 157

Computer Assisted Exercises: Background – 154

Computer Generated Forces: Background, Definition and Basic Technologies – 157

Computer Generated Forces: Future Needs – 143

Computer Generated Forces: Integration into the Operational Environment – 143

Computer Generated Forces: Layout and Architecture – 143

FY 2002 Report on Software Visualization Techniques for IV and V – 145

Military Operational Requirements for Computer Assisted eXercises (CAX) in NATO – 154

Practical Examples and Future Needs for Computer Assisted Exercises at the Operational Level of Military Decision Making – 157

COMPUTER VISION

Sonoluminescence Bubble Measurements using Vision-Based Algorithms – 159

COMPUTERIZED SIMULATION

An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Application of New Algorithms for the Simulation of Multidisciplinary Problems: Fluid Structure Thermal and Control Coupling – 73

Barrier Foil Heating Simulations Using LASNEX – 174

Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Computational Simulation of a Heavy Vehicle Trailer Wake – 1

Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

Hyper-X Stage Separation Trajectory Validation Studies – 19

Migration of a SEDRIS Application for Dismounted Infantry Simulation – 151

Military Operational Requirements for Computer Assisted eXercises (CAX) in NATO – 154

NATO Modelling and Simulation (M and S) Orientation Course – 154

Numerical Errors: Reliable Numerical Simulations – 143

Passive Superconducting Shielding: Experimental Results and Computer Models – 145

Predicting the Effect of Defect Distributions in the Bulk and on Surfaces of Ceramic Materials – 50

Simulation of and for Military Decision Making – 142

Simulations of Underground Structures Subjected to Dynamic Loading using the Distinct Element Method – 88

Software for Simulation of Hyperspectral Images – 145

Solar Array in Simulated LEO Plasma Environment – 195

TRACE-P OH and HO2 Measurements with the Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) on the DC-8 – 115

Web-Based HLA Federations and Simulations: Methods and Possibilities – 55

COMPUTERS

Computer Assisted Exercises: Background – 154

Real-Time Geo-Registration on High-Performance Computers – 80

Setting up a Grid: A Guide for Beginners by a Beginner – 124

CONCENTRATION (COMPOSITION)

Toxic Hazards Tests for Vehicles and Other Equipment – 102

CONDENSATION

Simulation of Inviscid Compressible Multi-Phase Flow with Condensation – 72

CONDUCTING FLUIDS

Leak and Pipe Detection Method and System – 59

CONDUCTIVE HEAT TRANSFER

Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

CONFERENCES

HFES 2002 Travelreport – 137

CONFIDENCE LIMITS

Integrating Formal Methods and Testing 2002 – 148

Study of Semileptonic Decays of B Mesons to Charmed Baryons – 169

CONFORMAL MAPPING

A Self-Contained Mapping Closure Approximation for Scalar Mixing – 71

CONIFERS

Wildfires Dynamics in Mid-Siberian Larch Dominated Communities – 95

CONSISTENCY

Simplifying a Lifted Plan Graph Using Domain Splitting – 142

CONSTELLATIONS

The Constellation-X Observatory – 182

CONSTRUCTION

Construction of a Virtual Scanning Electron Microscope (VSEM) – 191

CONTAINMENT

Rationale for Maintaining the Double Containment Requirement for Plutonium Shipments – 102

CONTAMINANTS

Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

CONTAMINATION

Determination of PCB's in Watervliet Arsenal Machine Oils by Gas Chromatography – 38

Tests of the Contamination Analysis Unit, Phase 2 – 21

CONTINUOUS RADIATION

Continuous-Wave Tunable Midwave Infrared Generation Near 4.5 micrometers with an Intracavity Optical Parametric Oscillator and Difference Frequency Generation – 38

Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics – 13

Improving Blood Monitoring of Enzymes as Biomarkers of Risk Form Anticholinergic Pesticides and Chemical Warfare Agents – 127

CONTROL EQUIPMENT

Practical Remote Sensing Application for Agriculture – 95

Real-Time Control of Lean Blowout in a Turbine Engine for Minimizing No(x) Emissions – 21

Unitized Regenerative Fuel Cell System Development – 98

CONTROL SURFACES

Advanced Control Surface Seal Development for Future Space Vehicles – 86

CONTROL SYSTEMS DESIGN

Intelligent Software for System Design and Documentation – 146

Pointing Control System Design and Performance Evaluation for TPF Coronagraph – 221

Small Signal Modelling and Control of the Hydrogen Mixer for Facility E1 – 61

CONTROLLERS

Magnetic Bearing Controller Improvements for High Speed Flywheel System – 21

Modeling and Validation of a Propellant Mixer for Controller Design – 24

CONVECTION

Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

The Tropical Convective Spectrum – 107

Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models – 112

CONVECTIVE FLOW

Local Helioseismology: A New Window into the Sun – 223

CONVERGENCE

Trends in HPC and HPEC Convergence – 155

COPOLYMERS

Electro Optical Properties of Copolymer Blends – 50

COPPER ALLOYS

High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

COPPER COMPOUNDS

Determination of Copper Cyanide Plating Solutions and Cadmium in Cadmium Cyanide Plating Solutions by Atomic Absorption Spectrometry – 38

COPPER

Determination of Copper Cadmium and Iron in Metal Cyanide Waste Solutions by Atomic Absorption Spectroscopy – 37

Molybdenum-Copper Composite Material – 28

CORES

Motions and Initial Conditions in Star-Forming Dense Cores – 216

CORONAGRAPHS

Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics – 13

Pointing Control System Design and Performance Evaluation for TPF Coronagraph – 221

CORONAL MASS EJECTION

Prediction of Active-Region CME Productivity from Magnetograms – 209

Reply to Gopalswamy et al. – 224

Solar Flares, Type III Radio Bursts, CMEs, and Energetic Particles – 218

Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections – 224

CORONAS

Coronal Activity in Low-Mass Pre-Main Sequence Stars: NGC 2264 – 207

CORRELATION

Running Performance as an Indicator of VO(2max): A Replication of Distance Effects – 134

CORRELATORS

Decision Feedback Equalization Pre-Processor with Turbo Equalizer – 179

CORROSION TESTS

The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

CORROSION

Corrosion Mechanisms of UNS N04400 in Sea Water – 35

Corrosion of Exhaust and Filtration Equipment in a Radioactive Waste Incinerator – 33

Investigation of the Effect of Corrosion Pitting on Fatigue Life of Aluminum Structure – 46

COSMIC RAY SHOWERS

Survey Report: Evaluation of an Air Shower for Reducing Exposure to Carbon Monoxide at USA Port of Entry, Calexico, California – 101

COSMIC RAYS

Cosmic Ray Propagation and Acceleration – 223

COSMOCHEMISTRY

Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 214

COSMOLOGY

The Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) – 210

COST EFFECTIVENESS

Design and Performance of Capping Layers for EUV Multilayer Mirrors – 211

Practical Examples and Future Needs for Computer Assisted Exercises at the Operational Level of Military Decision Making – 157

COST ESTIMATES

Reduction of Total Ownership Cost – 151

COST REDUCTION

Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 63

COSTS

A Comprehensive Survey of Earth-Moon Libration Orbits: Stationkeeping Strategies And Intra-Orbit Transfers – 15

Civilian Power from Space in the Early 21st Century – 98

COULOMB POTENTIAL

Molecular Dynamics Simulations of Coulomb Explosion – 170

COULOMETERS

Automatic Coulometric Titration of Sulfuric Acid in Chromium Plating Solutions – 40

COUPLING

The Nonlinear Coupling of Alfven and Lower Hybrid Waves in Space Plasma – 193

COVARIANCE

Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

CRACK BRIDGING

Matrix Cracking in Four Different 2D SiC/SiC Composite Systems – 31

CRACK PROPAGATION

Alumina-Reinforced Zirconia Composites – 89

CRACKING (FRACTURING)

Matrix Cracking in 3D Orthogonal Melt-Infiltrated SiC/SiC Composites with Various Z-Fiber Types – 30

CRACKS

Comparison of Matrix Cracking in Melt-Infiltrated SiC/SiC Composites with 3D and 2D-Woven Orthogonal Architectures – 29

Logistic Fuel Processor Development – 52

CRITICAL FREQUENCIES

A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy – 222

CRITICAL PATH METHOD
Interactive Software Fault Analysis Tool for Operational Anomaly Resolution – 148

CROP INVENTORIES
Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

CROSS FLOW
Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

Computation of Transverse Injection Into Supersonic Crossflow With Various Injector Orifice Geometries – 10

CROSS POLARIZATION
Symmetric Waveguide Orthomode Junctions – 213

CRUCIBLES
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

CRYOGENIC FLUIDS
Cryogenic Transfer Line Chilldown – 53

CRYOGENIC ROCKET PROPELLANTS
Modeling and Validation of a Propellant Mixer for Controller Design – 24

CRYOGENICS
Ge Semiconductor Devices for High-Performance Cryogenic Power Electronics – 60

Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

CRYSTAL DEFECTS
Characterization of the Microstructure of Fine Energetic Materials – 173

CRYSTAL MORPHOLOGY
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

CRYSTALS
Continuous-Wave Tunable Midwave Infrared Generation Near 4.5 micrometers with an Intracavity Optical Parametric Oscillator and Difference Frequency Generation – 38

Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

CURRENT DENSITY
The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters – 10

CURRENT DISTRIBUTION
Electron Cyclotron Heating and Current Drive for Maintaining Minimum q in Negative Central Shear Discharges – 175

CURVATURE
Analysis of Curved Microstrip Antennas – 65

CYANIDES
Determination of Copper Cyanide Plating Solutions and Cadmium in Cadmium Cyanide Plating Solutions by Atomic Absorption Spectrometry – 38

CYLINDRICAL BODIES
Acoustic Propagation in a Water-Filled Cylindrical Pipe – 176

Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

Simulation of a Spherical Wave Experiment in Marble Using a Multidirectional Damage Model – 25

CYTOLOGY
Do the Effects of Exercise on Breast Cancer Prevention Vary With Environment – 127

D REGION
Motions and Initial Conditions in Star-Forming Dense Cores – 216

DARK MATTER
Might Dark Matter be Actually Black – 213

The Constellation-X Observatory – 182

DATA ACQUISITION
An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Atomic Data and Spectral Line Intensities for S XI – 219

[Calibration, Analysis, and Interpretation of SERTS and EUNIS Observation] – 192

Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

Seabed Attenuation Estimated From Chirp Sonar Data Collected Along Acoustic Propagation Lines During ASIAEX in the South China Sea – 177

Tracing the Magnetic Field in Orion A – 217

Tradeoffs in Polarimeter Design – 203

DATA BASES
A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies – 5

CESDIS – 200

Globe Teachers Guide and Photographic Data on the Web – 146

Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset – 199

Intelligent Software for System Design and Documentation – 146

DATA COMPRESSION
Multi-Resolution Modeling of Large Scale Scientific Simulation Data – 138

DATA PROCESSING EQUIPMENT
Detection of Randomness in Sparse Data Set of Three Dimensional Time Series Distributions – 161

DATA PROCESSING
Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

Generation of Custom DSP Transform IP Cores: Case Study Walsh-Hadamard Transform – 162

DATA SIMULATION
Satellite Hyperspectral Imaging Simulation – 95

DATA SYSTEMS
An Overview of the Medical Data Surveillance System (MDSS) – 200

Earth Observing System: Global Observations to Study the Earth's Environment – 96

DECAY
Space Weather Effects: Decay Phases in Gradual and Impulsive Solar Energetic Particle Events – 215

DECIDUOUS TREES
Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

DECISION MAKING
Practical Examples and Future Needs for Computer Assisted Exercises at the Operational Level of Military Decision Making – 157

Risk-Based Decision-Making and the Use of Operational Risk Management in Developing a Course of Action (COA) for the Joint Task Force (JTF) – 57

The Increasing Need for the Representation of Decision Making and Human Behaviour in Simulations Used for Computer Assisted Exercises in NATO – 198

DECISION SUPPORT SYSTEMS
(Sigma)QL: A Decision Support Tool for Target Recognition in a Multisensor Environment – 187

DECISION THEORY
Analytic Prediction of Emergent Dynamics for Autonomous Negotiating Team (ANT) Systems – 201

DECOMPOSITION
A Domain Decomposition Parallelization of the Fast Marching Method – 152

DEFENSE INDUSTRY
Mixed Reality in Military Applications. A Pilot Study with Certain Focus on Integration of Gaze-Tracker and Head Mounted Displays – 140

DEFENSE PROGRAM
Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153

Mixed Reality in Military Applications. A Pilot Study with Certain Focus on Integration of Gaze-Tracker and Head Mounted Displays – 140

DEFORMABLE MIRRORS
Characterization of Adaptive Optics at Keck Observatory – 220

DEFORMATION
Crystal Level Model for Phase Transformation Allowing for Large Volume Changes – 26

Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska – 93

Investigating the Effect of Interfacial Strength on Deformation and Failure Mechanisms in Bond Systems – 26

DELAY
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures – 52

DELTA WINGS
Pitfalls in the Interpretation of Delta Wing Flow Visualisation – 9

DEMODULATION
Algorithmic Advances for Software Radios – 57

DENDRITIC CRYSTALS
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

DENSITY (MASS/VOLUME)
Proposal for Testing and Validation of Vacuum Ultra-Violet Atomic Laser-Induced Fluorescence as a Method to Analyze Carbon Grid Erosion in Ion Thrusters – 25

DEOXYRIBONUCLEIC ACID
Differential Expression of DNA Double-Strand Break Repair Proteins in Breast Cells – 132

DEPLOYMENT
Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153

DESCENT TRAJECTORIES
Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

DESIGN ANALYSIS
Design of an L-Band Microwave Radiometer with Active Mitigation of Interference – 60

Microrelay – 60

Optimal Scheduling With Flexible Resources – 162

The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

DESIGN OPTIMIZATION
An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications – 166

Design Space Exploration and Optimization of Embedded Cache Systems via a Compiler – 149

DESIGN TO COST
Aircraft Optimization for Minimum Environmental Impact – 8

DETECTION
Application of Operating System Concepts to Coordination in Pervasive Sensing and Computing Systems – 155

Control of the Laser Interferometer Space Antenna – 205

Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics – 13

On the Implementation of Iterative Detection in Real-World MIMO Wireless Systems – 173

Preliminary Analysis of X-Band and Ka-Band Radar for Use in the Detection of Icing Conditions Aloft – 5

DETECTORS
Biosensors Made from Carbon and Polymer Composite Micro-Electromechanical Systems (MEMS) – 62

CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

DETONATION WAVES
Investigation of Explosively Driven Fragmentation of Metals-Two=Dimensional Fracture and Fragmentation of Metal Shells: Progress Report II – 175

Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

DETONATORS
Comparative NIR Detector Characterization for NGST – 78

DEUTERONS
Precision Measurement of the Proton and Deuteron Spin Structure Functions g(sub 2)* – 168

DIAGNOSIS
Diagnosis of Exposure to Chemical Warfare Agents – 134

Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

Multimegawatt Quasi-Steady MPD Thruster Facility – 23

DIAMETERS
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

DIAMONDS
CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

DIETS
Factors Related to Nonadherence of a Low Sodium Diet in Heart Failure Patients – 133

Prostate Cancer Cell Growth: Role of Neurotensin in Mediating Effect of Dietary Fat and Mechanism of Action – 129

DIFFRACTION PATTERNS
Characterization of the Microstructure of Fine Energetic Materials – 173

DIFFRACTION
Nanotechnology Infrared Optics for Astronomy Missions – 207

DIFFRACTIVE OPTICS
Twenty Meter Space Telescope Based on Diffractive Fresnel Lens – 205

DIFFUSION
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

DIGITAL DATA
Generation of Custom DSP Transform IP Cores: Case Study Walsh-Hadamard Transform – 162

DIGITAL SYSTEMS
A New Approach to Blind Channel Identification for OFDM Systems – 149

Merlot Design – 139

DIGITAL TO ANALOG CONVERTERS
High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

DIMENSIONAL MEASUREMENT
Mechanisms of Photorefractivity in Polymeric Materials – 50

DIPOLE MOMENTS
Near-Field Magnetic Dipole Moment Analysis – 103

DIRECT NUMERICAL SIMULATION
On the Computation of Space-Time Correlations by Large-Eddy Simulation – 70

DIRECTIONAL SOLIDIFICATION (CRYSTALS)
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

DISK GALAXIES
NASA's Far-IR/Submillimeter Roadmap Missions SAFIR and SPECS – 191

The Interaction of Hot and Cold Gas in the Disk and Halo of Galaxies – 212

DISPLAY DEVICES
Hand-Held Ultrasonic Through-the-Wall Monitoring of Stationary and Moving People – 177

Mixed Reality in Military Applications. A Pilot Study with Certain Focus on Integration of Gaze-Tracker and Head Mounted Displays – 140

Test Results for Entry Guidance Methods for Reusable Launch Vehicles – 17

DISSOLVING
Numerical Modeling of Enhanced Nitrogen Dissolution During Gas Tungsten Welding – 45

DISTRIBUTED PARAMETER SYSTEMS
Sub-Optimal Finite Dimensional Observer-Based Boundary Controller Design for Distributed Parameter Systems on a Planar Domain – 164

DIURNAL VARIATIONS
The Okhotsk Sea Kashevarov Bank Polynya: Its Dependence on Diurnal and Fortnightly Tides and its Initial Formation – 110

DOMAINS
Simplifying a Lifted Plan Graph Using Domain Splitting – 142

DOPING (MATERIALS)
Wide Band Gap Semiconductor Technology Initiative – 196

DOPPLER EFFECT
Atomic-Based Calculations of Two-Detector Doppler-Broadening Spectra – 175

DRAG REDUCTION
A Study on the Effects of J2 Perturbations on a Drag-Free Control System for Spacecraft in Low Earth Orbit – 97

Numerical Simulation of High Drag Reduction in a Turbulent Channel Flow with Polymer Additives – 74

DUCTS
Wind-US Flow Calculations for the M2129 S-Duct Using Structured and Unstructured Grids – 68

DURABILITY
Durability Assessment of Gamma TiAl – 47

Ultra-High Temperature Ceramic Composites for Leading Edges – 29

DUST STORMS
On the Cause of the 1930s Dust Bowl – 113

DUST
Characteristics and Global Impact of Aerosols from Southern Africa and Eastern Asia – 112

DWARF STARS
Outbursts in Symbiotic Binaries – 217

DYNAMIC CHARACTERISTICS
3D Computations and Experiments – 194

Experiment and Theory for Active Control of Nonlinear Dynamics in Compression/Combustion Systems – 69

DYNAMIC LOADS
High Dynamic Pressures and Modest Temperatures: A Broad Perspective and Bridging the Gap – 32

Simulations of Underground Structures Subjected to Dynamic Loading using the Distinct Element Method – 88

DYNAMIC MODELS
Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer – 116

DYNAMIC RANGE
An Analysis of Airship Acceleration Dynamics for Airborne Gravimetry – 105

DYNAMIC RESPONSE
ParaDyn A Parallel Nonlinear, Explicit, Three-Dimensional Finite-Element Code for Solid and Structural Mechanics User Manual – 88

DYNAMIC TESTS
Mechanical Components Branch Test Facilities and Capabilities – 86

EARTH CORE
Narrow Scale Flow and a Weak Field by the Top of Earth's Core: Evidence from Orsted, Magsat and Secular Variation – 222

EARTH ENVIRONMENT
Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

EARTH IONOSPHERE
Polar Cap Dynamics and Formation of High-Latitude Ionospheric Irregularities – 104

Validation of Ionospheric Models – 209

EARTH OBSERVING SYSTEM (EOS)
Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

Earth Observing System: Global Observations to Study the Earth's Environment – 96

EARTH ORBITAL ENVIRONMENTS
Dynamics of Etching at the Gas-Surface Interface – 36

Solar Array in Simulated LEO Plasma Environment – 195

EARTH SCIENCES
Earth Observing System: Global Observations to Study the Earth's Environment – 96

The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

Wisconsin Earth and Space Science Education – 200

EARTH SURFACE
On the Cause of the 1930s Dust Bowl – 113

EARTH-MOON SYSTEM
Formation Control of the MAXIM L2 Libration Orbit Mission – 205

EARTHQUAKES
Lawrence Livermore National Laboratory Probabilistic Seismic Hazard Codes Validation – 140

Student Research and Accomplishments: 2001-2002, Multidisciplinary Center for Earthquake Engineering Research – 92

ECHOES
Design of a System for Active Echo-Cancellation – 56

EDDY CURRENTS
PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems – 86

EDUCATION
A NASA SHARP Mentoring Experience Utilizing GP-B – 197

Chemistry Laboratory Operations Manual – 203

Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153

Wisconsin Earth and Space Science Education – 200

EFFLUENTS
Application of Beryllium-7 and Lead-210 Concentration Measurements to Monitoring the Validity of Effluent Air Sampling at the Waste Isolation Pilot Plant – 102

EJECTION
Elastomeric Ejection System with Acoustically Improved Check Valve – 85

ELASTOMERS
Elastomeric Ejection System with Acoustically Improved Check Valve – 85

Recent Advances in Matting Technology for Military Runways – 14

ELECTRIC CONNECTORS
Design of a System for Active Echo-Cancellation – 56

ELECTRIC CONTACTS
Microrelay – 60

ELECTRIC FIELDS
Unfolding of Proteins: Thermal and Mechanical Unfolding – 71

ELECTRIC GENERATORS
Alternate Energy Sources for Thermoplastic Binding Agent Consolidation – 172

ELECTRIC POTENTIAL
Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

New High-Speed Low-Power Current-Mode CMOS Sense Amplifier – 64

ELECTRIC PROPULSION
Mission Steering Profiles of Outer Planetary Orbiters Using Radioisotope Electric Propulsion – 15

Overview of the Air Force ESEX Flight Experiment – 22

ELECTRIC WIRE
Astro-E2 Magnesium Diboride High Current Leads – 195

ELECTRICAL PROPERTIES
Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties – 37

Electric and Optical Properties of Doped Small Molecular Organic Light-Emitting Devices – 186

Investigations of the Electronic Properties and Surface Structures of Aluminum-Rich Quasicrystalline Alloys – 32

ELECTRODE MATERIALS
Electrochemical Hydrogen Sensor for Safety Monitoring – 60

ELECTRODEPOSITION
Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation – 46

ELECTRODYNAMICS
Measuring Electrodynamics of the Ionosphere by Digital Ionosondes and Other HF Techniques – 104

Orbit Optimization for the Geospace Electrodynamics Connections (GEC) Mission – 92

ELECTROLUMINESCENCE
Device Optimization and Transient Electroluminescence Studies of Organic Light Emitting Devices – 185

Electric and Optical Properties of Doped Small Molecular Organic Light-Emitting Devices – 186

ELECTROLYTES
Alumina-Reinforced Zirconia Composites – 89

Electrochemical Hydrogen Sensor for Safety Monitoring – 60

ELECTROLYTIC CELLS
The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

ELECTROMAGNETIC FIELDS
Magneto-Aerodynamic Hypersonics – 173

ELECTROMAGNETIC INTERACTIONS
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

Mixed Electromagnetic and circuit Simulations using Higher-Order Elements and Bases – 171

ELECTROMAGNETIC INTERFERENCE
Exploratory Measurements of the Effect of Electro Magnetic Interference on EO/IR Sensors and Several Mitigation Options – 82

ELECTROMAGNETIC PROPERTIES
Investigations of the Nature and Behavior of Plasma Density Disturbances That May Impact GPS and Other Transionospheric Systems – 104

Ionospheric Sensor Developments for the Year-2000 Solar Maximum – 15

ELECTROMAGNETIC PULSES
Coaxial-Type Resistance Sensor for HPM Applications – 64

ELECTROMAGNETIC RADIATION
Symmetric Waveguide Orthomode Junctions – 213

ELECTROMAGNETIC SPECTRA
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

ELECTRON BEAMS
Gas Ionization by Beam Electron Collisions and by Electron Avalanching in the Self Ez Field of a 2 kA Relativistic Electron Beam Focused on a Conducting Target – 172

ELECTRON CYCLOTRON HEATING
Electron Cyclotron Heating and Current Drive for Maintaining Minimum q in Negative Central Shear Discharges – 175

ELECTRON DENSITY (CONCENTRATION)
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

Validation of Ionospheric Models – 103

ELECTRON ENERGY
Atomic Data and Spectral Line Intensities for S XI – 219

Why are Some e-Government Programs More Successful than Others. The Relevance of Performance Evaluations to Regional e-Government Preparations in Indonesia – 142

ELECTRON IMPACT
Atomic Data and Spectral Line Intensities for S XI – 219

ELECTRON SCATTERING
Gas Ionization by Beam Electron Collisions and by Electron Avalanching in the Self Ez Field of a 2 kA Relativistic Electron Beam Focused on a Conducting Target – 172

ELECTRONIC EQUIPMENT
A Workshop on Vacuum Electronics Research for the DoD – 62

Wireless Temperature-Monitoring System – 61

ELECTRONIC STRUCTURE
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

Investigations of the Electronic Properties and Surface Structures of Aluminum-Rich Quasicrystalline Alloys – 32

ELECTRONS
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

ELECTRO-OPTICAL PHOTOGRAPHY
Diagnostic Instrumentation – 62

ELECTRO-OPTICS
Exploratory Measurements of the Effect of Electro Magnetic Interference on EO/IR Sensors and Several Mitigation Options – 82

ELECTROPOLISHING
Determination of Wastewater Acids from Chromium Plating and Electropolishing Solutions – 41

Laboratory Automatic Titration of Chromium Plating and Electropolishing Solutions – 39

Online Automatic Titration of Chromic Acid in Chromium Plating Solutions and Phosphoric and Sulfuric Acids in Electropolishing Solutions – 41

Utilization of Ion Chromatography and Statistics to Determine Important Acids in Chromium Plating and Electropolishing Solutions – 38

X-Ray Fluorescence On-Stream Analysis of Standard Reference Solution Concentrations of Chromium Plating and Polishing Solutions – 40

ELONGATION
Path Elongation for UAV Task Assignment – 6

EMBEDDING
Adaptive Framework for Automated Mapping and Architecture Trades for Embedded Heterogeneous Systems – 160

Embedded High Performance Scalable Computing Systems – 150

Multidimensional Performance Modeling for Advanced Embedded Signal Processors – 151

Streaming and Dynamic Compilers for High Performance Embedded Computing – 149

Trends in HPC and HPEC Convergence – 155

EMERGENCIES

Manual Manipulation of Engine Throttles for Emergency Flight Control – 13

EMISSION SPECTRA

Package for Interactive Analysis of Line Emission (Analysis of UV-X-Ray High-Resolution Emission Spectra) – 188

Predicted Concentrations in New Relocatable Classrooms of Volatile Organic Compounds Emitted from Standard and Alternate Interior Finish Materials – 100

The Soft Excess Emission in the Hercules Supercluster Observed with the ROSAT Position Sensitive Proportional Counter – 204

Wavelength Shifts of the 7.7 Micron Emission Band in Reflection Nebulae – 214

EMISSION

GIS-Integrated Traffic Input Models for Mobile-Source Emissions Analysis – 102

Uncovering the Properties of Young Neutron Stars and their Surrounding Supernova Remnants – 212

EMITTANCE

Volatile Organic Chemical Emissions from Structural Insulated Panel (SIP) Materials and Implications for Indoor Air Quality – 99

EMITTERS

Device Optimization and Transient Electroluminescence Studies of Organic Light Emitting Devices – 185

ENDOSCOPES

Endoscopic Subsurface Imaging in Tissues – 183

ENERGETIC PARTICLES

Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

Reply to Gopalswamy et al. – 224

Solar Flares, Type III Radio Bursts, CMEs, and Energetic Particles – 218

ENERGY CONSERVATION

Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation – 46

Energy Efficient Wireless Sensor Networks Using Fuzzy Logic – 57

ENERGY CONSUMPTION

Power Consumption of Customized Numerical Representations for Audio Signal Processing – 162

ENERGY GAPS (SOLID STATE)

Ge Semiconductor Devices for High-Performance Cryogenic Power Electronics – 60

ENERGY LEVELS

Why are Some e-Government Programs More Successful than Others. The Relevance of Performance Evaluations to Regional e-Government Preparations in Indonesia – 142

ENERGY TRANSFER

Electric and Optical Properties of Doped Small Molecular Organic Light-Emitting Devices – 186

Numerical Simulation of High Drag Reduction in a Turbulent Channel Flow with Polymer Additives – 74

ENGINE CONTROL

Manual Manipulation of Engine Throttles for Emergency Flight Control – 13

ENGINE INLETS

Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

ENGINE TESTS

Software for Preprocessing Data From Rocket-Engine Tests – 146

ENRICHMENT

Environmental Effects on the Metallicities of Early-Type Galaxies – 215

ENVIRONMENT EFFECTS

Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

Environmental Effects on the Metallicities of Early-Type Galaxies – 215

ENVIRONMENT MODELS

Mid-Frequency Bottom Backscatter, Environmental Measurements, Model/data Comparison, and Implications to Reverberations – 178

ENVIRONMENTAL QUALITY

Earth Observing System: Global Observations to Study the Earth's Environment – 96

Predicted Concentrations in New Relocatable Classrooms of Volatile Organic Compounds Emitted from Standard and Alternate Interior Finish Materials – 100

ENVIRONMENTAL SURVEYS

Aircraft Optimization for Minimum Environmental Impact – 8

ENVIRONMENTAL TESTS

Experimental Study of Arcing on High-Voltage Solar Arrays – 19

EPOXY MATRIX COMPOSITES

Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

EQUATIONS OF MOTION

A Flight Dynamics Model for a Small Glider in Ambient Winds – 2

EROSION

Gun Barrel Erosion and Coating of Gun Barrels: A Literature Review – 49

ERROR ANALYSIS

Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

ERRORS

Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

Numerical Errors: Reliable Numerical Simulations – 143

ESTROGENS

Role of a Novel Splice Variant of the Steroid Receptor Coactivator AIB1 in Breast Cancer – 128

ETHYLENE

Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

EVALUATION

Development of Product Descriptions for Lead- Immobilizing Overcoating Systems – 27

K-Means Re-Clustering Algorithmic Options with Quantifiable Performance Comparisons – 141

Pointing Control System Design and Performance Evaluation for TPF Coronagraph – 221

EVAPORATION

Theoretical and Experimental Investigation of the Stability of an Evaporating Constrained Vapor Bubble – 72

EVAPORATORS

Compact Liquid Waste Evaporator for Cleanup on Hanford's Hot Cells – 100

EXCITATION

8TH International Meeting on Hole Burning Single Molecule and Related Spectroscopies: Science and Applications – 37

Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

Observation of an Excited Charmed Baryon Decaying into xi(c)0 pi+ – 171

EXERCISE PHYSIOLOGY

Guidance for Ability Group Run Speeds and Distances in Basic Combat Training – 129

EXHAUST EMISSION

A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies – 5

Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

EXHAUST GASES

Advanced Global Atmospheric Gases Experiment (AGAGE): MIT Contribution – 115

Corrosion of Exhaust and Filtration Equipment in a Radioactive Waste Incinerator – 33

EXOTHERMIC REACTIONS

Investigation of Exothermic Grinding Sludge Produced from Watervliet Arsenal Gun Steels, Andersol Water- Based Cutting Fluid and Cincinnati Milacron Aluminum Oxide Resin Bond Grinding Wheels – 39

EXPERIMENTATION

Experimental Operations and Support for LITE – 84

EXPERT SYSTEMS

Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions – 159

EXPLOSIONS

Thermal Decomposition of New and Aged LX-04 and PBX 9501 – 25

EXPOSURE

Diagnosis of Exposure to Chemical Warfare Agents – 134

EXTRASOLAR PLANETS

Optical Spectra of Extrasolar Giant Planets – 206

Pointing Control System Design and Performance Evaluation for TPF Coronagraph – 221

EXTRATERRESTRIAL ENVIRONMENTS

Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development' – 1

EXTREME ULTRAVIOLET RADIATION

Design and Performance of Capping Layers for EUV Multilayer Mirrors – 211

Investigations on 10-Hz sub-Joule fs-Laser Pumped Neon- and Nickel-like X-ray Lasers – 195

Novel EUV Mask Blank Defect Repair Developments – 181

Phenomena Associated With EIT Waves – 218

EXTRUDING

Extrusion Based Processing of Ti Alloys: Feasibility Study – 47

F-18 AIRCRAFT

Development and Testing of the Phase 0 Autonomous Formation Flight Research System – 53

FABRICATION

Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

Highlights of the ASPE 2004 Winter Topical Meeting on Free-Form Optics: Design, Fabrication, Metrology, Assembly – 190

Logistic Fuel Processor Development – 52

Long Focal Length Large Mirror Fabrication System – 188

Mechanical Properties of Heat-treated Carbon Fibers – 89

Recent Advances in Optical Switches Using Silica-based PLC Technology – 189

Recent Advances in the Development of Thick-Section Melt-Infiltrated C/SiC Composites – 29

TerraHertz Free Electron Laser Applications for Satellite Remote Sensing – 83

Thermal Conductivity of Alumina-Toughened Zirconia Composites – 30

Ultra-High Temperature Ceramic Composites for Leading Edges – 29

FACTORIZATION

Hybrid QR Factorization Algorithm for High Performance Computing Architectures – 150

FAILURE MODES

High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

FAILURE

Delamination Failure Investigation for Out-of-Plane Loading in Laminates – 28

Experimental Assessment of Gradient Plasticity – 88

Factors Related to Nonadherence of a Low Sodium Diet in Heart Failure Patients – 133

FAR FIELDS

Ion Species Fractions in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

FAR INFRARED RADIATION

NASA's Far-IR/Submillimeter Roadmap Missions SAFIR and SPECS – 191

Technology Development of Miniaturized Far-Infrared Sources for Biomolecular Spectroscopy – 35

FAR UV SPECTROSCOPIC EXPLORER

Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft – 20

FATIGUE LIFE

Investigation of the Effect of Corrosion Pitting on Fatigue Life of Aluminum Structure – 46

FATS

Prostate Cancer Cell Growth: Role of Neurotensin in Mediating Effect of Dietary Fat and Mechanism of Action – 129

FAULT DETECTION

Fast and Accurate Fault Detection/Location Algorthms for Double-Circuit/Three-Terminal Lines using Phasor Measurement Units – 163

FAULT TOLERANCE

Fault Tolerant Magnetic Bearing Testing and Conical Magnetic Bearing Development for Extreme Temperature Environments – 86

FEASIBILITY ANALYSIS

Initial Feasibility Assessment of a High Altitude Long Endurance Airship – 6

The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

The Role of Haptics in Service Manual Task Validation – 55

FEEDBACK CONTROL

Nonlinear Observers for Gyro Calibration Coupled with a Nonlinear Control Algorithm – 13

Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft – 20

FEEDBACK

The Role of Haptics in Service Manual Task Validation – 55

FERROMAGNETIC MATERIALS

Passive Superconducting Shielding: Experimental Results and Computer Models – 145

FIBER COMPOSITES

Matrix Cracking in 3D Orthogonal Melt-Infiltrated SiC/SiC Composites with Various Z-Fiber Types – 30

Matrix Cracking in Four Different 2D SiC/SiC Composite Systems – 31

Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

Student Research and Accomplishments: 2001-2002, Multidisciplinary Center for Earthquake Engineering Research – 92

FIBER ORIENTATION

Matrix Cracking in 3D Orthogonal Melt-Infiltrated SiC/SiC Composites with Various Z-Fiber Types – 30

FIELD OF VIEW

The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

FIELD THEORY (PHYSICS)

R and D that can Capture Value – 198

Unfolding of Proteins: Thermal and Mechanical Unfolding – 71

FIELD-PROGRAMMABLE GATE ARRAYS

Design and Implementation for the Prototype of a Microstimulator – 62

Streams-C; Sc2 C-to-FPGA Compiler – 149

FILAMENT WINDING

Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

FILTRATION

Corrosion of Exhaust and Filtration Equipment in a Radioactive Waste Incinerator – 33

FINITE ELEMENT METHOD

High Temperature Burst Testing of a Superalloy Disk With a Dual Grain Structure – 46

ParaDyn A Parallel Nonlinear, Explicit, Three-Dimensional Finite-Element Code for Solid and Structural Mechanics User Manual – 88

FINITE VOLUME METHOD

Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

FIRE FIGHTING

Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell – 27

FIRES

TRMM Fire Algorithm, Product and Applications – 93

Wildfires Dynamics in Mid-Siberian Larch Dominated Communities – 95

FLAMES

Measurement and Simulation of Spontaneous Raman Scattering Spectra in High-Pressure, Fuel-Rich H2-Air Flames – 43

Stimulation of Propellant Burning by Supplying Electric Energy in the Flame – 51

FLIGHT CONDITIONS

Development of Methodologies for IV and V of Neural Networks – 147

FLIGHT CONTROL

Development of Methodologies for IV and V of Neural Networks – 147

Manual Manipulation of Engine Throttles for Emergency Flight Control – 13

Software Engineering Improvement Activities/Plan – 145

FLIGHT SAFETY

Flightfax: Army Aviation Risk-Management Information. Volume 31, Number 12, December 2003 – 4

FLIGHT TESTS

An Analysis of Model Scale Data Transformation to Full Scale Flight Using Chevron Nozzles – 11

Overview of the Air Force ESEX Flight Experiment – 22

FLOATING POINT ARITHMETIC

A Library of Parameterized Hardware Modules for Floating Point Arithmetic and Its Use – 150

FLOW CHARACTERISTICS

VE-Suite: Coupling Visualization and Computational Environments to Support on-the-fly Engineering Design – 67

FLOW DISTRIBUTION

Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

On the Computation of Space-Time Correlations by Large-Eddy Simulation – 70

Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

FLOW VELOCITY

Cryogenic Transfer Line Chilldown – 53

Spatially Resolved Sub-Doppler Overtone Gain Measurements in a Small Scale Supersonic HF Laser – 35

The Effect of the Density Ratio on the Nonlinear Dynamics of the Unstable Fluid Interface – 75

FLOW VISUALIZATION

Pitfalls in the Interpretation of Delta Wing Flow Visualisation – 9

VE-Suite: Coupling Visualization and Computational Environments to Support on-the-fly Engineering Design – 67

FLUID BOUNDARIES

Modeling Primary Breakup: A Three-Dimensional Eulerian Level Set/Vortex Sheet Method for Two-Phase Interface Dynamics – 75

FLUID DYNAMICS

'Hypothetical' Heavy Particles Dynamics in LES of Turbulent Dispersed Two-Phase Channel Flow – 69

FLUID FLOW

New Type of the Interface Evolution in the Richtmyer-Meshkov Instability – 69

FLUID-SOLID INTERACTIONS

Advances in High Performance Computational Methods for Large Scale Fluid/Structure Interaction – 68

FLUORESCENCE

Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses – 186

FLYWHEELS

Magnetic Bearing Controller Improvements for High Speed Flywheel System – 21

Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

FOCAL PLANE DEVICES

Symmetric Waveguide Orthomode Junctions – 213

FOCUSING

Development of High Resolution Hard X-Ray Telescope with Multilayer Coatings – 191

FORECASTING

A Modified Grey Forecasting Model for Long-Term Prediction – 163

Assessment and Testing of the GODAE Products – 121

Characteristics and Global Impact of Aerosols from Southern Africa and Eastern Asia – 112

Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

FORESTS

Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data – 187

FORMATION FLYING

Development and Testing of the Phase 0 Autonomous Formation Flight Research System – 53

Formation Control of the MAXIM L2 Libration Orbit Mission – 205

Linear State-Space Representation of the Dynamics of Relative Motion, Based on Restricted Three Body Dynamics – 18

Relative Motion of Two Spacecraft Near the Sun-Earth L2 Point – 82

FRACTALS

Testing Fractal Methods on Observed and Simulated Solar Magnetograms – 161

FRACTIONATION

Logistic Fuel Processor Development – 52

FRACTURE MECHANICS

Durability Assessment of Gamma TiAl – 47

Microstructure and Fracture Behavior of Tungsten Heavy Alloys – 45

FRACTURING

Determinants of Stress Fracture and Bone Mass in Elite Military Cadets – 128

FRAGMENTATION

Fragmentation under the Scaling Symmetry and Turbulent Cascade with Intermittency – 75

Investigation of Explosively Driven Fragmentation of Metals-Two=Dimensional Fracture and Fragmentation of Metal Shells: Progress Report II – 175

FREE ELECTRON LASERS

TerraHertz Free Electron Laser Applications for Satellite Remote Sensing – 83

X-Ray Optics and Diagnostics for the First Experiments on the Linac Coherent Light Source – 193

X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultrashort X-ray Pulses with Matter – 185

FREQUENCIES

Frequency and Angular Dependence of Low Frequency East China Sea Bottom Scattering Strengths – 178

Frequency Dependence of Effective Bottom Attenuation Due to Environmental Variability – 177

PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems – 86

FREQUENCY ASSIGNMENT

Batteryless Sensor for Intrusion Detection and Assessment of Threats – 79

FREQUENCY CONVERTERS

New Crystalline Materials for Nonlinear Frequency Conversion, Electro-Optic Modulation, and Mid-Infrared Gain Media – 184

FREQUENCY DISTRIBUTION

Frequency Dependence of Effective Bottom Attenuation Due to Environmental Variability – 177

FREQUENCY STABILITY

8TH International Meeting on Hole Burning Single Molecule and Related Spectroscopies: Science and Applications – 37

FRESNEL LENSES

Twenty Meter Space Telescope Based on Diffractive Fresnel Lens – 205

FUELS

Logistic Fuel Processor Development – 52

FUNCTIONAL DESIGN SPECIFICATIONS

Status Report and Lessons Learned from the Univ. of Arizona NMSD – 187

FUZZY SYSTEMS

Energy Efficient Wireless Sensor Networks Using Fuzzy Logic – 57

GALACTIC CLUSTERS

Observations of Distant Clusters – 208

Physics of Galaxy Clusters and How it Affects Cosmological Tests – 215

Spectroscopy of the Perseus Cluster – 213

The Interaction of Hot and Cold Gas in the Disk and Halo of Galaxies – 212

The Soft Excess Emission in the Hercules Supercluster Observed with the ROSAT Position Sensitive Proportional Counter – 204

GALACTIC EVOLUTION

Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 214

GALLIUM ARSENIDES

Ge Semiconductor Devices for High-Performance Cryogenic Power Electronics – 60

GALLIUM NITRIDES

Solid State THz Sources – 66

GAMMA RAY BURSTS

Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

How Can The SN-GRB Time Delay Be Measured? – 218

GAMMA RAY OBSERVATORY

ULXs, Microblazers, and the Unidentified EGRET Sources – 219

GAMMA RAY TELESCOPES

ULXs, Microblazers, and the Unidentified EGRET Sources – 219

GAS CHROMATOGRAPHY

Measurement of Peroxyacetyl Nitrate (PAN), Peroxypropionyl Nitrate (PPN) and Peroxymethacryloyl Nitrate (MPAN) during TRACE-P – 30

Relationship of Ambient Atmosphere and Biological Aerosol Responses from a Fielded Pyrolysis-Gas Chromatography-Ion Mobility Spectrometry Bioanalytical Detector – 132

GAS DENSITY

Observations of Distant Clusters – 208

GAS DETECTORS

TRACE-P OH and HO2 Measurements with the Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) on the DC-8 – 115

GAS DYNAMICS

Numerical Modeling of Pulse Detonation Rocket Engine Gasdynamics and Performance – 10

GAS FLOW

Development of a High-Pressure Gaseous Burner for Calibrating Optical Diagnostic Techniques – 11

GAS GIANT PLANETS

Optical Spectra of Extrasolar Giant Planets – 206

Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer – 191

GAS IONIZATION

Gas Ionization by Beam Electron Collisions and by Electron Avalanching in the Self Ez Field of a 2 kA Relativistic Electron Beam Focused on a Conducting Target – 172

GAS MIXTURES

Kinetic Understanding of the Syngas-to-DME Reaction System and It's Implications to Process and Economics – 32

Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

GAS TEMPERATURE

Spectroscopy of the Perseus Cluster – 213

GAS TUNGSTEN ARC WELDING

Numerical Modeling of Enhanced Nitrogen Dissolution During Gas Tungsten Welding – 45

GAS TURBINE ENGINES

Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

Fault Tolerant Magnetic Bearing Testing and Conical Magnetic Bearing Development for Extreme Temperature Environments – 86

GASES

Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

GASKETS

Rotating Feeler Gage – 55

GELS

Water Recycling/Removal Using Temperature-Sensitive Hydrogels – 49

GENE EXPRESSION

Cyclin E, a Powerful Predictor of Survival in Breast Cancer - A Prospective Study – 130

Interrogating Androgen Receptor Mediated Gene Expression and Tumor Progression by Molecular Imaging – 128

Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

GENERAL OVERVIEWS

NASA Efforts on Nanotechnology – 60

NASA's Virtual Product Laboratory: An Overview – 158

GENETICS

Bioactive Lipids: Role in Prostate Cancer Angiogenesis – 127

Genetic Variation in the HSD3B2 Gene and Prostate Cancer – 129

Molecular Basis of Mechano-Signal Transduction in Vascular Endothelial Cells – 133

GEODYNAMICS

Narrow Scale Flow and a Weak Field by the Top of Earth's Core: Evidence from Orsted, Magsat and Secular Variation – 222

GEOMAGNETISM

Narrow Scale Flow and a Weak Field by the Top of Earth's Core: Evidence from Orsted, Magsat and Secular Variation – 222

Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment – 16

Strategic Research Directions in Microgravity Materials Science – 221

The Geomagnetic Field During a Reversal – 103

GEOPHYSICS

Globe Teachers Guide and Photographic Data on the Web – 146

GERMANIDES

SiGe Quantum Well Infrared Photodetectors (QWIPs) for Remote Sensing Applications – 80

GERMANIUM

Ge Semiconductor Devices for High-Performance Cryogenic Power Electronics – 60

GLACIERS
Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska – 93

GLIDERS
A Flight Dynamics Model for a Small Glider in Ambient Winds – 2

GLOBAL POSITIONING SYSTEM
Investigations of the Nature and Behavior of Plasma Density Disturbances That May Impact GPS and Other Transionospheric Systems – 104

Validation of Ionospheric Models – 106

GLOBAL WARMING
Observing the Global Water Cycle from Space – 96

GLOW DISCHARGES
Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels – 174

GRANITE
Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

GRAPHICAL USER INTERFACE
Nanotechnology Infrared Optics for Astronomy Missions – 207

GRAPHITE
Barrier Foil Heating Simulations Using LASNEX – 174

GRAPHS (CHARTS)
Simplifying a Lifted Plan Graph Using Domain Splitting – 142

GRAVIMETRY
An Analysis of Airship Acceleration Dynamics for Airborne Gravimetry – 105

GRAVITATIONAL EFFECTS
Molecular Basis of Mechano-Signal Transduction in Vascular Endothelial Cells – 133

Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

Spacecraft Formation Design Near the Sun-Earth L(sub 2) Point – 18

GRAVITATIONAL WAVES
Investigations into Gravitational Wave Emission from Compact Body Inspiral Into Massive Black Holes – 209

GRAVITATION
Buoyancy-Driven Instabilities in Single-Bubble Sonoluminescence – 219

GRAVITY PROBE B
A NASA SHARP Mentoring Experience Utilizing GP-B – 197

GRAZING INCIDENCE
Technical Report on Inversion of the First RUMBLE Sea Trial Data – 122

GREAT PLAINS CORRIDOR (NORTH AMERICA)
On the Cause of the 1930s Dust Bowl – 113

GREENHOUSE EFFECT
Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

GRID COMPUTING (COMPUTER NETWORKS)
Setting up a Grid: A Guide for Beginners by a Beginner – 124

GRID GENERATION (MATHEMATICS)
Application of New Algorithms for the Simulation of Multidisciplinary Problems: Fluid Structure Thermal and Control Coupling – 73

GROUND SUPPORT SYSTEMS
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

GULF STREAM
Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation – 123

GUN LAUNCHERS
Gun Barrel Erosion and Coating of Gun Barrels: A Literature Review – 49

GUNN DIODES
Solid State THz Sources – 66

GYROSCOPES
Micromachined Precision Inertial Instruments – 87

Nonlinear Observers for Gyro Calibration Coupled with a Nonlinear Control Algorithm – 13

HALIDES
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

HALL THRUSTERS
Ion Species Fractions in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters – 10

HANDBOOKS
Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development' – 1

HATCHES
Rotating Feeler Gage – 55

HAZARDOUS MATERIALS
Supercritical Carbon Dioxide-Soluble Ligands for Extracting Actinide Metal Ions from Porous Solids – 31

HAZARDS
Lawrence Livermore National Laboratory Site Specific Standard for Nonnuclear Safety Analysis – 136

HEALTH PHYSICS
Need for Research Programs to Provide Data Applicable to the Estimate of Maximum Permissible Exposure Values for Internally Deposited Radionuclides – 124

HEALTH
An Overview of the Medical Data Surveillance System (MDSS) – 200

Health Surveillance in the U.S. Navy: Asthma – 125

HEART
Factors Related to Nonadherence of a Low Sodium Diet in Heart Failure Patients – 133

HEAT RESISTANT ALLOYS
Evaluation of Candidate Materials for a High-Temperature Stirling Convertor Heater Head – 45

High Temperature Burst Testing of a Superalloy Disk With a Dual Grain Structure – 46

HEAT SHIELDING
Analytic Modeling and Experimental Validation of Intumescent Behavior of Charring Heatshield Materials – 196

HEAT SOURCES
Heating Structures Derived from Satellite – 112

HEAT TRANSFER
Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

Heating Structures Derived from Satellite – 112

Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation – 123

The Okhotsk Sea Kashevarov Bank Polynya: Its Dependence on Diurnal and Fortnightly Tides and its Initial Formation – 110

HEAT TREATMENT
Mechanical Properties of Heat-treated Carbon Fibers – 89

HEAVY ELEMENTS
Spectroscopy of the Perseus Cluster – 213

HELICOPTERS
Laser Obstacle Detection System Flight Testing – 84

Nonspeech Audio in Helicopter Aviation – 8

HELIOSEISMOLOGY
Local Helioseismology: A New Window into the Sun – 223

HELIOSPHERE
Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

HELIUM ATOMS
Approximating the Helium Wavefunction in Positronium-Helium Scattering – 173

HELIUM PLASMA
Stimulated Brillouin Scattering from Helium-Hydrogen Plasmas – 194

HELIUM
Pulsed Inductive Thruster (PIT): Modeling and Validation Using the MACH2 Code – 22

HETEROGENEITY
Heterogeneous Interactions of Acetaldehyde and Sulfuric Acid – 33

HF LASERS
Spatially Resolved Sub-Doppler Overtone Gain Measurements in a Small Scale Supersonic HF Laser – 35

HIGH ALTITUDE
Historical Precision of an Ozone Correction Procedure for AMO Solar Cell Calibration – 99

Initial Feasibility Assessment of a High Altitude Long Endurance Airship – 6

HIGH FREQUENCIES
Measuring Electrodynamics of the Ionosphere by Digital Ionosondes and Other HF Techniques – 104

HIGH PRESSURE
Development of a High-Pressure Gaseous Burner for Calibrating Optical Diagnostic Techniques – 11

Investigations of High Pressure Acoustic Waves in Resonators with Seal-like Features – 180

Measurement and Simulation of Spontaneous Raman Scattering Spectra in High-Pressure, Fuel-Rich H2-Air Flames – 43

HIGH RESOLUTION
A High Resolution, Three-Dimensional, Computationally Efficient, Diagnostic Wind Model: Initial Development Report – 115

Development of High Resolution Hard X-Ray Telescope with Multilayer Coatings – 191

HIGH SPEED
A Novel Strategy for Numerical Simulation of High-speed Turbulent Reacting Flows – 68

Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 150

HIGH STRENGTH STEELS
Determination of AISI 4340 and 8640 Steels Used in M9 Beretta Pistol Slides by Emission Spectroscopy and X-Ray Fluorescence Spectroscopy – 41

HIGH TEMPERATURE ENVIRONMENTS
Fault Tolerant Magnetic Bearing Testing and Conical Magnetic Bearing Development for Extreme Temperature Environments – 86

HIGH TEMPERATURE GASES
The Interaction of Hot and Cold Gas in the Disk and Halo of Galaxies – 212

Transition in Hypersonic Flows Including High-temperature Gas Effects – 72

HIGH TEMPERATURE
Evaluation of Candidate Materials for a High-Temperature Stirling Convertor Heater Head – 45

High Temperature Burst Testing of a Superalloy Disk With a Dual Grain Structure – 46

Ultra-High Temperature Ceramic Composites for Leading Edges – 29

HISTOCHEMICAL ANALYSIS
Differential Expression of DNA Double-Strand Break Repair Proteins in Breast Cells – 132

HOLOGRAPHY
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

HUBBLE SPACE TELESCOPE
A Precision Metrology System for the Hubble Space Telescope Wide Field Camera 3 Instrument – 77

HULLS (STRUCTURES)
Influence of Rubber Honeycomb on Shock Response – 164

HUMAN BEHAVIOR
Feeding Behaviour and Motivation of Feeding Behaviour of (Experienced) Soldiers of Several Entities Concerning the Fighting Ration – 138

Human Behaviour Representation: Definition – 136

Human Behaviour Representation: Relevant Technologies and their Development – 135

HUMAN BODY
Engineering Titanium for Improved Biological Response – 43

HUMAN FACTORS ENGINEERING
HFES 2002 Travelreport – 137

HUMAN RESOURCES
Need for Research Programs to Provide Data Applicable to the Estimate of Maximum Permissible Exposure Values for Internally Deposited Radionuclides – 124

HUMAN WASTES
Partitioning of Inorganic Elements Consumed by Humans Between the Various Fractions of Human Wastes: A Review and Analysis of Existing Literature – 34

HUMIDITY
Current results from AIRS/AMSU/HSB – 120

HYBRID PROPELLANT ROCKET ENGINES
System Modeling and Diagnostics for Liquefying-Fuel Hybrid Rockets – 167

HYBRID PROPELLANTS
System Modeling and Diagnostics for Liquefying-Fuel Hybrid Rockets – 167

HYDROCARBON FUELS
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures – 52

HYDROCYANIC ACID
Tracing the Magnetic Field in Orion A – 217

HYDRODYNAMICS
Assessment and Testing of the GODAE Products – 121

HYDROGEN COMPOUNDS
TRACE-P OH and HO2 Measurements with the Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) on the DC-8 – 115

HYDROGEN PEROXIDE
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures – 52

HYDROGEN PLASMA
Stimulated Brillouin Scattering from Helium-Hydrogen Plasmas – 194

HYDROGEN
Electrochemical Hydrogen Sensor for Safety Monitoring – 60

Measurement and Simulation of Spontaneous Raman Scattering Spectra in High-Pressure, Fuel-Rich H2-Air Flames – 43

Quantum Dynamics Scattering Study of AB+CDE Reactions: A Seven Dimensional Treatment for the H2+C2H Reaction – 33

HYDROLOGICAL CYCLE
Climate Impacts on Tropospheric Ozone and Hydroxyl – 113

Heating Structures Derived from Satellite – 112

Observing the Global Water Cycle from Space – 96

Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

HYDROLYSIS
Improving Blood Monitoring of Enzymes as Biomarkers of Risk Form Anticholinergic Pesticides and Chemical Warfare Agents – 127

HYDROMETEOROLOGY
A Physical Validation Program for the GPM Mission – 119

HYDROSTATICS
Fault Tolerant Magnetic Bearing Testing and Conical Magnetic Bearing Development for Extreme Temperature Environments – 86

HYDROXYL COMPOUNDS
Efficient Synthesis of 4,8-Ditoluoyl-1,5-Dihydroxynaphthalene – 42

HAN-Based Monopropellant Technology Development – 23

HYPERGOLIC ROCKET PROPELLANTS
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures – 52

HYPERSONIC FLOW
Transition in Hypersonic Flows Including High-temperature Gas Effects – 72

HYPERVELOCITY IMPACT
Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

HYPOXIA
International Hypoxia Symposium (13th) for the Publishing of the Conference Proceedings for 2003 Conference – 125

ICE, CLOUD AND LAND ELEVATION SATELLITE
Report from the School of Experience: Lessons-Learned on NASA's EOS/ICESat Mission – 197

ICE
Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska – 93

Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

Momentum Transport: 2D and 3D Cloud Resolving Model Simulations – 114

Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models – 123

IGNITION
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures – 52

CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

Numerical Simulations of Shock-Induced Mixing and Combustion – 76

IMAGE CONVERTERS
Diagnostic Instrumentation – 62

IMAGE PROCESSING
Image Systems Using RFID Tag Positioning Information – 159

Mass Calculations from X-Ray Shadowgraphs Using Image Processing – 81

Modern Techniques in Acoustical Signal and Image Processing – 139

Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

Signal Processing Architectures for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Applications – 80

Stream Processing for High-Performance Embedded Systems – 65

The Light Field Video Camera – 79

IMAGE RESOLUTION
Real-Time Geo-Registration on High-Performance Computers – 80

IMAGERY
Merlot Design – 139

IMAGING SPECTROMETERS
Accessing and Understanding MODIS Data – 120

Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data – 187

Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

IMAGING TECHNIQUES
Endoscopic Subsurface Imaging in Tissues – 183

Formation Control of the MAXIM L2 Libration Orbit Mission – 205

Hyperspectral Imaging on the International Space Station: An Innovative Approach to Commercial Development of Space – 197

Interrogating Androgen Receptor Mediated Gene Expression and Tumor Progression by Molecular Imaging – 128

Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

Phenomena Associated With EIT Waves – 218

Sonoluminescence Bubble Measurements using Vision-Based Algorithms – 159

The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

The Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) – 210

IMPREGNATING
Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

IN SITU MEASUREMENT
Description of a Normal-Force In-Situ Turbulence Algorithm for Airplanes – 4

In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols – 180

IN VITRO METHODS AND TESTS
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

INCINERATORS
Corrosion of Exhaust and Filtration Equipment in a Radioactive Waste Incinerator – 33

INDEXES (DOCUMENTATION)
List of US Army Research Institute Research and Technical Publications – 202

INDICATING INSTRUMENTS
Hand-Held Ultrasonic Through-the-Wall Monitoring of Stationary and Moving People – 177

INDIUM COMPOUNDS
Electrochemical Hydrogen Sensor for Safety Monitoring – 60

INDONESIA
Conditions of Internet Kiosks in Medan, Makassar, Bandung, Jogja and Jakart Suburban. A Survey Report in Both English and Indonesian – 141

Is Telkom-Flexi the New Telkom-Instan: Can it Level the Playing Field and Bridge the Digital Divide – 141

New Ways to Empower Indonesia with the Internet and ICTs – 141

Why are Some e-Government Programs More Successful than Others. The Relevance of Performance Evaluations to Regional e-Government Preparations in Indonesia – 142

INDOOR AIR POLLUTION
Volatile Organic Chemical Emissions from Structural Insulated Panel (SIP) Materials and Implications for Indoor Air Quality – 99

INDUSTRIES
Highlights: US Commercial Remote Sensing Industry Analysis – 198

INERTIAL CONFINEMENT FUSION
Target Designs for an Inertial Fusion Energy Power Plant Driven by Heavy Ions – 193

INFILTRATION
Recent Advances in the Development of Thick-Section Melt-Infiltrated C/SiC Composites – 29

INFORMATION ANALYSIS
Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset – 199

INFORMATION MANAGEMENT
CESDIS – 200

Image Systems Using RFID Tag Positioning Information – 159

Practical Remote Sensing Application for Agriculture – 95

INFORMATION RETRIEVAL
Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions – 159

Joint Battlespace Infosphere Repository Prototype – 201

Retrieval of Similar Objects in Simulation Data Using Machine Learning Techniques – 140

INFORMATION SYSTEMS
2003 DTIC Customer Satisfaction Survey Report – 202

An Overview of the Medical Data Surveillance System (MDSS) – 200

Automated Command and Control Information Systems (ACCIS) and CAX – 157

Computer Generated Forces: Integration into the Operational Environment – 143

Earth Observing System: Global Observations to Study the Earth's Environment – 96

FY 2003 Top 200 Users Survey Report – 201

Practical Examples and Future Needs for Computer Assisted Exercises at the Operational Level of Military Decision Making – 157

Technical Design for the TTA Component of the 120mm HE C2 Mortar Ammunition – 153

The MER/CIP Portal for Ground Operations – 199

Virtual Space Logistics Readiness Center (VSLRC): Concept of Operations – 14

INFRARED ASTRONOMY

Nanotechnology Infrared Optics for Astronomy Missions – 207

Wavelength Shifts of the 7.7 Micron Emission Band in Reflection Nebulae – 214

INFRARED DETECTORS

Exploratory Measurements of the Effect of Electro Magnetic Interference on EO/IR Sensors and Several Mitigation Options – 82

Irradiance Calibration of Space-Based Infrared Sensors – 79

SiGe Quantum Well Infrared Photodetectors (QWIPs) for Remote Sensing Applications – 80

INFRARED INTERFEROMETERS

The Beauty and Limitations of 10 Micron Heterodyne Interferometry (ISI) – 208

INFRARED RADIATION

Continuous-Wave Tunable Midwave Infrared Generation Near 4.5 micrometers with an Intracavity Optical Parametric Oscillator and Difference Frequency Generation – 38

Current results from AIRS/AMSU/HSB – 120

Mechanisms of Photorefractivity in Polymeric Materials – 50

Optical Properties of Zitex in the Infrared Submillimeter – 192

Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer – 191

System Level Applications of Adaptive Computing (SLAAC) – 156

INFRARED RADIOMETERS

Instrument for Measuring Temperature of Water – 77

Radiant Temperature Nulling Radiometer – 78

INFRARED SPECTRA

Highly Ordered Carbon Nanotube Arrays and Nanotube- Polymer Nanocomposite Superlattices for Full-Color Sensing and Coating – 39

INFRARED SPECTROSCOPY

In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols – 180

INFRARED TELESCOPES

The Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) – 210

INGESTION (ENGINES)

Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

INHIBITORS

Bioactive Lipids: Role in Prostate Cancer Angiogenesis – 127

INJECTION

Computation of Transverse Injection Into Supersonic Crossflow With Various Injector Orifice Geometries – 10

INJURIES

The Acute Respiratory Distress Syndrome (ARDS) and Military Relevant Inhalation Injury: A Brief Review – 133

INSTALLING

User's Guide to GIS-Based Application for Traffic Inputs to MOBILE6 Emissions Factor Model – 101

INSTRUMENTS

Compact High Power Repetitive Pulsed Power Instrumentation – 64

INTEGRATED CIRCUITS

A Comparison of Two Computational Technologies for Digital Pulse Compression – 63

An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications – 166

Application of Operating System Concepts to Coordination in Pervasive Sensing and Computing Systems – 155

INTELLECTUAL PROPERTY

NASA's Management and Utilization of the Small Business Innovative Research (SBIR) Program – 199

INTERFACES

Dynamics of Etching at the Gas-Surface Interface – 36

INTERFACIAL TENSION

Recent Progress in Optical Switching Device Technologies in NTT – 189

INTERFEROMETERS

Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer – 191

The Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) – 210

INTERFEROMETRY

Computer Microvision for Microelectromechanical Systems (MEMS) – 65

INTERMETALLICS

Durability Assessment of Gamma TiAl – 47

INTERNAL WAVES

Nonlinear Internal Waves in the South China Sea During ASIAEX – 165

INTERNETS

Conditions of Internet Kiosks in Medan, Makassar, Bandung, Jogja and Jakart Suburban. A Survey Report in Both English and Indonesian – 141

New Ways to Empower Indonesia with the Internet and ICTs – 141

INTEROPERABILITY

Understanding the CCA Standard Through Decaf – 140

INTERPLANETARY MEDIUM

Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections – 224

INTERPOLATION

Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

INTERSTELLAR MATTER

Outbursts in Symbiotic Binaries – 217

INVENTORIES

Scoping Inventory Calculations for the Rare Isotope Accelerator – 181

INVERSIONS

Broadband Geoacoustic Matched Field Inversion with Multi-step Strategy from ASIAEX 2001 – 178

INVERTERS

Multi-Random PWM Inverter with Fixed Switching Frequency – 163

INVISCID FLOW

Simulation of Inviscid Compressible Multi-Phase Flow with Condensation – 72

ION BEAMS

Target Designs for an Inertial Fusion Energy Power Plant Driven by Heavy Ions – 193

ION CYCLOTRON RADIATION

The Nonlinear Coupling of Alfven and Lower Hybrid Waves in Space Plasma – 193

ION DISTRIBUTION

Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

ION ENGINES

Proposal for Testing and Validation of Vacuum Ultra-Violet Atomic Laser-Induced Fluorescence as a Method to Analyze Carbon Grid Erosion in Ion Thrusters – 25

ION PROBES

Ion Species Fractions in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

IONIZATION
Magneto-Aerodynamic Hypersonics – 173

IONOSONDES
Measuring Electrodynamics of the Ionosphere by Digital Ionosondes and Other HF Techniques – 104

IONOSPHERES
Combined Svalbard Optical and Radar Observations for Polar Cusp/Cap Research – 105

Ionospheric Sensor Developments for the Year-2000 Solar Maximum – 15

IONOSPHERIC ELECTRON DENSITY
Investigations of the Nature and Behavior of Plasma Density Disturbances That May Impact GPS and Other Transionospheric Systems – 104

IONOSPHERIC PROPAGATION
Investigations of the Nature and Behavior of Plasma Density Disturbances That May Impact GPS and Other Transionospheric Systems – 104

Validation of Ionospheric Models – 103

IONOSPHERICS
Validation of Ionospheric Models – 106

IRON
Determination of Copper Cadmium and Iron in Metal Cyanide Waste Solutions by Atomic Absorption Spectroscopy – 37

IRRADIANCE
Irradiance Calibration of Space-Based Infrared Sensors – 79

IRRADIATION
Atomistic Simulation of Dislocation-Defet Interactions in Cu – 44

ISOLATION
Passive Isolators for use on the International Space Station – 17

ISOLATORS
Passive Isolators for use on the International Space Station – 17

ISOTROPIC TURBULENCE
A Self-Contained Mapping Closure Approximation for Scalar Mixing – 71

ITERATION
On the Implementation of Iterative Detection in Real-World MIMO Wireless Systems – 173

JAMES WEBB SPACE TELESCOPE
The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

JAVA (PROGRAMMING LANGUAGE)
A Java-Based Active Network Operating System (JANOS) – 149

Globe Teachers Guide and Photographic Data on the Web – 146

JET AIRCRAFT NOISE
Temporal Characterization of Aircraft Noise Sources – 178

JET MIXING FLOW
Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

JOINTS (JUNCTIONS)
Investigating the Effect of Interfacial Strength on Deformation and Failure Mechanisms in Bond Systems – 26

KALMAN FILTERS
A Wavelet based Suboptimal Kalman Filter for Assimilation of Stratospheric Chemical Tracer Observations – 165

Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment – 16

KAZAKHSTAN
Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

KINEMATICS
Preliminary Design Review: Kinematic Tracking for the PCA Integrated Radar-Tracker Application – 155

KINETIC ENERGY
Transport Methods Conquering the Seven-Dimensional Mountain – 170

KINETICS
Kinetic Understanding of the Syngas-to-DME Reaction System and It's Implications to Process and Economics – 32

KUIPER BELT
Mission Steering Profiles of Outer Planetary Orbiters Using Radioisotope Electric Propulsion – 15

LABORATORIES
Chemistry Laboratory Operations Manual – 203

Lawrence Livermore National Laboratory Site Specific Standard for Nonnuclear Safety Analysis – 136

LAMINATES
Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications – 7

LANDSAT 7
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

LARGE EDDY SIMULATION
A Novel Strategy for Numerical Simulation of High-speed Turbulent Reacting Flows – 68

Computational Simulation of a Heavy Vehicle Trailer Wake – 1

Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer – 116

Grid-Independent Large-Eddy Simulation in Turbulent Channel Flow using Three-Dimensional Explicit Filtering – 70

On the Computation of Space-Time Correlations by Large-Eddy Simulation – 70

Rough-Wall Channel Analysis Using Suboptimal Control Theory – 74

LASER APPLICATIONS
Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

New Crystalline Materials for Nonlinear Frequency Conversion, Electro-Optic Modulation, and Mid-Infrared Gain Media – 184

TerraHertz Free Electron Laser Applications for Satellite Remote Sensing – 83

LASER BEAMS
National Ignition Facility: The World's Largest Optics and Laser System – 182

Transmission Measurements of Femtosecond Laser Pulses Through Aerosols – 83

LASER GYROSCOPES
Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft – 20

LASER INDUCED FLUORESCENCE
TRACE-P OH and HO2 Measurements with the Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) on the DC-8 – 115

LASER MATERIALS
Laser-Material Interaction of Powerful Ultrashort Laser Pulses – 26

LASER OUTPUTS
Spatially Resolved Sub-Doppler Overtone Gain Measurements in a Small Scale Supersonic HF Laser – 35

LASER PLASMAS
Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

LASER PROPULSION
Benefit of Constant Momentum Propulsion for Large Delta V Missions -Applications to Laser Propulsion – 84

LASERS
All Fiber Technology for High-Energy Petawatt Front End Laser Systems – 186

International Workshop on Quantum Cascade Lasers. Meeting Program, Abstract Book & Attendee Roster. January 4-8, 2004, Seville, Spain – 83

Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses – 186

Target Designs for an Inertial Fusion Energy Power Plant Driven by Heavy Ions – 193

LAUNCHING
Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

Report from the School of Experience: Lessons-Learned on NASA's EOS/ICESat Mission – 197

LAYOUTS
The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

LEAD ALLOYS
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

LEAD COMPOUNDS
Development of Product Descriptions for Lead- Immobilizing Overcoating Systems – 27

LEAD ISOTOPES
Application of Beryllium-7 and Lead-210 Concentration Measurements to Monitoring the Validity of Effluent Air Sampling at the Waste Isolation Pilot Plant – 102

LEADING EDGES
Ultra-High Temperature Ceramic Composites for Leading Edges – 29

LEARNING
Adaptive Framework for Automated Mapping and Architecture Trades for Embedded Heterogeneous Systems – 160

LEAVES
Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

LENSES
Adaptive Optics Applications in Vision Science – 185

LEPTONS
Search for the Lepton Number Violating Decay (tau)(yields)(mu)(gamma) – 168

LEVITATION
Optical Levitation of Micro-Scale Particles in Air – 190

LIBRATION
A Comprehensive Survey of Earth-Moon Libration Orbits: Stationkeeping Strategies And Intra-Orbit Transfers – 15

Formation Control of the MAXIM L2 Libration Orbit Mission – 205

LIFE CYCLE COSTS
Reduction of Total Ownership Cost – 151

LIFE SUPPORT SYSTEMS
ALS Equivalent System Mass Guidelines Document – 137

Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

LIGHT EMISSION
Buoyancy-Driven Instabilities in Single-Bubble Sonoluminescence – 219

LIGHT MODULATORS
Manipulation of Micro Scale Particles in Optical Traps Using Programmable Spatial Light Modulation – 77

LIGHT SOURCES
X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultrashort X-ray Pulses with Matter – 185

LIGHT (VISIBLE RADIATION)
Black Carbon Measurements in SOLVE-2 – 78

Device Optimization and Transient Electroluminescence Studies of Organic Light Emitting Devices – 185

Optical Spectra of Extrasolar Giant Planets – 206

Sonoluminescence Bubble Measurements using Vision-Based Algorithms – 159

LINE SPECTRA
Atomic Data and Spectral Line Intensities for S XI – 219

Motions and Initial Conditions in Star-Forming Dense Cores – 216

LINEAR ACCELERATORS
RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

Test Stand for Linear Induction Accelerator Optimization – 171

X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultrashort X-ray Pulses with Matter – 185

LIQUID CRYSTALS
Manipulation of Micro Scale Particles in Optical Traps Using Programmable Spatial Light Modulation – 77

LIQUID FUELS
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

LIQUID HYDROGEN
Small Signal Modelling and Control of the Hydrogen Mixer for Facility E1 – 61

LIQUID PHASES
Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

LIQUID-GAS MIXTURES
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures – 52

Simulation of Inviscid Compressible Multi-Phase Flow with Condensation – 72

Small Signal Modelling and Control of the Hydrogen Mixer for Facility E1 – 61

LIQUID-LIQUID INTERFACES
New Type of the Interface Evolution in the Richtmyer-Meshkov Instability – 69

LIQUIDS
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

LISA (OBSERVATORY)
Control of the Laser Interferometer Space Antenna – 205

LITHOGRAPHY
Design and Performance of Capping Layers for EUV Multilayer Mirrors – 211

Direct Write Laser Lithography System – 152

Novel EUV Mask Blank Defect Repair Developments – 181

Proposed Specification of EUVL Mask Substrate Roughness – 67

LOADS (FORCES)
Simulation of a Spherical Wave Experiment in Marble Using a Multidirectional Damage Model – 25

LOGISTICS
Virtual Space Logistics Readiness Center (VSLRC): Concept of Operations – 14

LOW COST
Efficacy of Calcium and Vitamin D Supplementation for the Prevention of Stress Fractures in Female Naval Recruits – 126

LOW EARTH ORBITS
A Study on the Effects of J2 Perturbations on a Drag-Free Control System for Spacecraft in Low Earth Orbit – 97

New NASA SEE LEO Spacecraft Charging Design Guidelines: How to Survive in LEO Rather Than GEO – 18

Solar Array in Simulated LEO Plasma Environment – 195

Strategic Research Directions in Microgravity Materials Science – 221

LOW FREQUENCIES
Frequency and Angular Dependence of Low Frequency East China Sea Bottom Scattering Strengths – 178

Low-Frequency Shallow Water Reverberation and Bottom Scattering Model – 176

The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation – 177

Tides and Decadal Variability – 120

LOW TEMPERATURE
Low Temperature Alpha Measurement – 84

LOWER IONOSPHERE
Orbit Optimization for the Geospace Electrodynamics Connections (GEC) Mission – 92

LUMINAIRES
Absolute Optical Calibrations Using a Simple Tungsten Bulb: Theory – 204

LUMINOSITY
Measurement of B(D0 -> K-pi+ pi0)/B(D0 -> K- pi+) – 171
ULXs, Microblazers, and the Unidentified EGRET Sources – 219

LUMINOUS INTENSITY
Buoyancy-Driven Instabilities in Single-Bubble Sonoluminescence – 219

MACHINE LEARNING
Retrieval of Similar Objects in Simulation Data Using Machine Learning Techniques – 140

MACROMOLECULES
Conformations of Macro Molecules – 36

MAGNESIUM COMPOUNDS
Astro-E2 Magnesium Diboride High Current Leads – 195

MAGNETIC BEARINGS
Fault Tolerant Magnetic Bearing Testing and Conical Magnetic Bearing Development for Extreme Temperature Environments – 86
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8
Magnetic Bearing Controller Improvements for High Speed Flywheel System – 21

MAGNETIC DIPOLES
Near-Field Magnetic Dipole Moment Analysis – 103

MAGNETIC FIELD RECONNECTION
Upgrade of the Aerial Guidance system for Automatic High Time and Spectral Resolution Solar Radio Observations at the Astrophysical Institute Potsdam – 216

MAGNETIC FIELDS
Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24
Local Helioseismology: A New Window into the Sun – 223
Narrow Scale Flow and a Weak Field by the Top of Earth's Core: Evidence from Orsted, Magsat and Secular Variation – 222
Near-Field Magnetic Dipole Moment Analysis – 103
Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment – 16
Testing Fractal Methods on Observed and Simulated Solar Magnetograms – 161
The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters – 10
Tracing the Magnetic Field in Orion A – 217

MAGNETIC FLUX
Observations of Distant Clusters – 208

MAGNETIC LEVITATION VEHICLES
A National MagLev Transportation System – 203

MAGNETIC SIGNATURES
Prediction of Active-Region CME Productivity from Magnetograms – 209

MAGNETIC STORMS
Reply to Gopalswamy et al. – 224
Validation of Ionospheric Models – 210

MAGNETIC SUSPENSION
A National MagLev Transportation System – 203
PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems – 86

MAGNETOHYDRODYNAMIC STABILITY
Electron Cyclotron Heating and Current Drive for Maintaining Minimum q in Negative Central Shear Discharges – 175

MAGNETOHYDRODYNAMIC WAVES
The Nonlinear Coupling of Alfven and Lower Hybrid Waves in Space Plasma – 193
Validation of Ionospheric Models – 210

MAGNETOHYDRODYNAMICS
Pulsed Inductive Thruster (PIT): Modeling and Validation Using the MACH2 Code – 22

MAGNETOMETERS
Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21 – 225
Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment – 16
Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft – 20

MAGNETOPLASMADYNAMIC THRUSTERS
Multimegawatt Quasi-Steady MPD Thruster Facility – 23
NASA GRC High Power Electromagnetic Thruster Program – 23

MAGNETOSPHERE-IONOSPHERE COUPLING
Magnetosphere-Ionosphere Coupling and Associated Ring Current Energization Processes – 211

MAINTENANCE
Direct Write Laser Lithography System – 152
USAF Training Extract, AFSC 2MOX2 - Active Duty, Missile & Space Systems Maintenance, Active Duty, OSSN 2522 – 14

MAMMARY GLANDS
An Evaluation of Stereoscopic Digital Mammography for Earlier Detection of Breast Cancer and Reduced Rate of Recall – 131
Cyclin E, a Powerful Predictor of Survival in Breast Cancer - A Prospective Study – 130
Delivering DNA Vaccine by Transdermal Electroporation – 130
Differential Expression of DNA Double-Strand Break Repair Proteins in Breast Cells – 132
Do the Effects of Exercise on Breast Cancer Prevention Vary With Environment – 127
Is Breast Tissue from Women Who Carry Germ-Line BRCA1 or BRCA2 Mutations 'Normal'? - An Immuno- Histopathological Study – 130
Role of a Novel Splice Variant of the Steroid Receptor Coactivator AIB1 in Breast Cancer – 128
Training Program in the Molecular Basis of Breast Cancer Research – 126

MAN ENVIRONMENT INTERACTIONS
Discoveries about Tropical Ozone from Satellite and SHADOZ (Southern Hemisphere ADditional Ozonesondes) – 114

MAN MACHINE SYSTEMS
Nonspeech Audio in Helicopter Aviation – 8
Overview of MSI Evaluation Methodology for Systems Development – 136

MANAGEMENT ANALYSIS
Report from the School of Experience: Lessons-Learned on NASA's EOS/ICESat Mission – 197

MANAGEMENT SYSTEMS
IS0 9000 Implementation and Assessment: A Guide to Developing and Evaluating Quality Management Systems – 225
Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153
Reduction of Total Ownership Cost – 151

MANAGEMENT
Analytic Prediction of Emergent Dynamics for Autonomous Negotiating Team (ANT) Systems – 201

MANIFOLDS (MATHEMATICS)
From Materials to Missions. Assess-Predict- Optimize: A Computational Approach to Adaptive Design – 165

MANIPULATORS
Manipulation of Micro Scale Particles in Optical Traps Using Programmable Spatial Light Modulation – 77

MANUAL CONTROL
Manual Manipulation of Engine Throttles for Emergency Flight Control – 13

MANUFACTURING
Development of High Resolution Hard X-Ray Telescope with Multilayer Coatings – 191
Durability of Polymeric Glazing Materials for Solar Applications – 98

MANY BODY PROBLEM
Studies of Planet Formation Using a Hybrid N-Body + Planetesimal Code – 221

MARINE METEOROLOGY
Assessment and Testing of the GODAE Products – 121

MARKET RESEARCH
Civilian Power from Space in the Early 21st Century – 98

MARS EXPLORATION
Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

MARS LANDING SITES
Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

MARS (PLANET)
Spectroscopy and Photometry of Mars Trojans – 208

MARS ROVING VEHICLES
Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

The MER/CIP Portal for Ground Operations – 199

MASKING
Novel EUV Mask Blank Defect Repair Developments – 181

Proposed Specification of EUVL Mask Substrate Roughness – 67

MASKS
Proposed Specification of EUVL Mask Substrate Roughness – 67

MASS DISTRIBUTION
Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

MASS SPECTRA
Observation of a Near-Threshold Enhancement in the p-anti-p Mass Spectrum from Radiative J/psi -> gamma-p-anti-p Decays – 169

MASS SPECTROSCOPY
Diagnosis of Exposure to Chemical Warfare Agents – 134

MASS
ALS Equivalent System Mass Guidelines Document – 137

MATHEMATICAL MODELS
A Flight Dynamics Model for a Small Glider in Ambient Winds – 2

A Self-Contained Mapping Closure Approximation for Scalar Mixing – 71

Aerodynamic Design Study of an Advanced Active Twist Rotor – 7

Atomistic Simulation of Dislocation-Defet Interactions in Cu – 44

Broadband Trailing Edge Noise Predictions in the Time Domain – 180

Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications – 132

Computational Study of Axisymmetric Off-Design Nozzle Flows – 2

Conformations of Macro Molecules – 36

Enhancements of Systems Based on Bayesian Networks and Structural Equation Models for Command and Control Support – 167

Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Investigation of Explosively Driven Fragmentation of Metals-Two=Dimensional Fracture and Fragmentation of Metal Shells: Progress Report II – 175

Laser-Material Interaction of Powerful Ultrashort Laser Pulses – 26

Measurement of the Branching Fraction for D(S) -> phi pi- – 171

Modeling of Building Scale Flow and Disperson – 76

Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

NLC Gamma-Gamma Beam Dump Face Calculations – 168

Numerical Modeling of Pulse Detonation Rocket Engine Gasdynamics and Performance – 10

On the Cause of the 1930s Dust Bowl – 113

On the Computation of Space-Time Correlations by Large-Eddy Simulation – 70

Outbursts in Symbiotic Binaries – 217

Pulsed Inductive Thruster (PIT): Modeling and Validation Using the MACH2 Code – 22

Running Performance as an Indicator of VO(2max): A Replication of Distance Effects – 134

Sensitivity Studies for Space-based Measurements of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight – 108

Significance of Strain in Formulation in Theory of Solid Mechanics – 90

Simulation of Inviscid Compressible Multi-Phase Flow with Condensation – 72

Small Signal Modelling and Control of the Hydrogen Mixer for Facility E1 – 61

Software Engineering Improvement Activities/Plan – 145

Structural Integrity of a Wind Tunnel Balance – 91

Tensor Fields for Use in Fractional-Order Viscoelasticity – 161

Theoretical and Experimental Investigation of the Stability of an Evaporating Constrained Vapor Bubble – 72

Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

Unfolding of Proteins: Thermal and Mechanical Unfolding – 71

MATHEMATICAL PROGRAMMING
From Materials to Missions. Assess-Predict- Optimize: A Computational Approach to Adaptive Design – 165

MATRICES (MATHEMATICS)
Recent Advances in Optical Switches Using Silica-based PLC Technology – 189

MEASUREMENT
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Black Carbon Measurements in SOLVE-2 – 78

MEASURING INSTRUMENTS
Conformations of Macro Molecules – 36

Measurement of Peroxyacetyl Nitrate (PAN), Peroxypropionyl Nitrate (PPN) and Peroxymethacryloyl Nitrate (MPAN) during TRACE-P – 30

MECHANICAL DRIVES
Mechanical Components Branch Test Facilities and Capabilities – 86

Modeling and Control of the ARCP in Power and Drive Systems – 66

MECHANICAL ENGINEERING
Advanced Control Surface Seal Development for Future Space Vehicles – 86

Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

MECHANICAL IMPEDANCE
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

MECHANICAL PROPERTIES
3D Computations and Experiments – 194

Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

Durability Assessment of Gamma TiAl – 47

Mechanical Properties of Heat-treated Carbon Fibers – 89

ParaDyn A Parallel Nonlinear, Explicit, Three-Dimensional Finite-Element Code for Solid and Structural Mechanics User Manual – 88

Significance of Strain in Formulation in Theory of Solid Mechanics – 90

Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

MECHANIZATION
Biologically Inspired Micro-Flight Research – 9

MEDICAL PERSONNEL
Defense Healthcare Information Assurance Program (DHIAP) Phase III – 202

MEDICAL SCIENCE
International Hypoxia Symposium (13th) for the Publishing of the Conference Proceedings for 2003 Conference – 125

MELTING
Compaction of Space Mission Wastes – 137

MENTAL PERFORMANCE
Training Effectiveness Evaluation of the Full Spectrum Command Game – 148

MESH
Nanotechnology Infrared Optics for Astronomy Missions – 207

MESOSCALE PHENOMENA
Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

MESOSPHERE
Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

METABOLISM
The Effects of Gender on Receovery Times Following General Anesthesia with Propofol and Sevoflurane – 131

METABOLITES
Diagnosis of Exposure to Chemical Warfare Agents – 134

METAL SHELLS
Investigation of Explosively Driven Fragmentation of Metals-Two=Dimensional Fracture and Fragmentation of Metal Shells: Progress Report II – 175

METAL WORKING
Microstructure and Fracture Behavior of Tungsten Heavy Alloys – 45

METALLIC HYDROGEN
High Dynamic Pressures and Modest Temperatures: A Broad Perspective and Bridging the Gap – 32

METALLICITY
Environmental Effects on the Metallicities of Early-Type Galaxies – 215

METALS
Atomistic Simulation of Dislocation-Defet Interactions in Cu – 44

Black Carbon Measurements in SOLVE-2 – 78

Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

Testing of the Joining Rubber Metal of Ultrasound Silencing Devices – 91

METEORITES
Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 214

METEORITIC COMPOSITION
Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 214

METEOROLOGICAL PARAMETERS
A Flight Dynamics Model for a Small Glider in Ambient Winds – 2

Accessing and Understanding MODIS Data – 120

Discoveries about Tropical Ozone from Satellite and SHADOZ (Southern Hemisphere ADditional Ozonesondes) – 114

METEOROLOGICAL RADAR
Preliminary Analysis of X-Band and Ka-Band Radar for Use in the Detection of Icing Conditions Aloft – 5

Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

Wind Sounding with Laser Radar: A Pre-Study – 109

METEOROLOGY
Orbit Optimization for the Geospace Electrodynamics Connections (GEC) Mission – 92

METHOD OF MOMENTS
Near-Field Magnetic Dipole Moment Analysis – 103

METHODOLOGY
Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

Temporal Characterization of Aircraft Noise Sources – 178

METROLOGY
A Precision Metrology System for the Hubble Space Telescope Wide Field Camera 3 Instrument – 77

Highlights of the ASPE 2004 Winter Topical Meeting on Free-Form Optics: Design, Fabrication, Metrology, Assembly – 190

MICROBIOLOGY
Corrosion Mechanisms of UNS N04400 in Sea Water – 35

Microbiologically-Facilitated Effects on the Surface Composition of Alloy 22, A Candidate Nuclear Waste Packaging Material – 44

Review of Sampling and Analysis Methods for Assessing Airborne Microbiological Contamination on Commerical Aircraft. A Literature Survey and Review – 101

MICROELECTROMECHANICAL SYSTEMS
Biosensors Made from Carbon and Polymer Composite Micro-Electromechanical Systems (MEMS) – 62

Computer Microvision for Microelectromechanical Systems (MEMS) – 65

Development of a Large-scale 3D MEMS Optical Switch Module – 190

Micromachined Precision Inertial Instruments – 87

NTT Technical Review – 188

Recent Progress in Optical Switching Device Technologies in NTT – 189

MICROGRAVITY
Passive Isolators for use on the International Space Station – 17

Strategic Research Directions in Microgravity Materials Science – 221

MICROMECHANICS
Delamination Failure Investigation for Out-of-Plane Loading in Laminates – 28

The Design and Control of Smart Structures – 54

MICROPARTICLES
Optical Levitation of Micro-Scale Particles in Air – 190

MICROPROCESSORS
MONARCH: A Morphable Networked micro-ARCHitecture – 63

MICROSCOPY
Carbon Nanotube Atomic Force Microscopy for Proteomics and Biological Forensics – 51

MICROSTRIP ANTENNAS
Analysis of Curved Microstrip Antennas – 65

MICROSTRUCTURE
Characterization of the Microstructure of Fine Energetic Materials – 173

Microstructure and Fracture Behavior of Tungsten Heavy Alloys – 45

The Design and Control of Smart Structures – 54

Ultra-High Temperature Ceramic Composites for Leading Edges – 29

MICROWAVE RADIOMETERS
Design of an L-Band Microwave Radiometer with Active Mitigation of Interference – 60

MICROWAVE SOUNDING
Current results from AIRS/AMSU/HSB – 120

MICROWAVES
A Workshop on Vacuum Electronics Research for the DoD – 62

Coaxial-Type Resistance Sensor for HPM Applications – 64

MIDDLE ATMOSPHERE
The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

MIGRATION
Migration of a SEDRIS Application for Dismounted Infantry Simulation – 151

MILITARY AVIATION
Flightfax: Army Aviation Risk-Management Information. Volume 31, Number 12, December 2003 – 4

MILITARY OPERATIONS
Computer Generated Forces: Future Needs – 143

Computer Generated Forces: Integration into the Operational Environment – 143

Human Behavior Representation: Recent Developments – 160

Human Behaviour Representation: Application Areas – 225

Human Behaviour Representation: Definition – 136

Military Operational Requirements for Computer Assisted eXercises (CAX) in NATO – 154

Quality of Service Routing in Tactical Mobile Ad Hoc Networks – 56

Risk-Based Decision-Making and the Use of Operational Risk Management in Developing a Course of Action (COA) for the Joint Task Force (JTF) – 57

Simulation of and for Military Decision Making – 142

The Increasing Need for the Representation of Decision Making and Human Behaviour in Simulations Used for Computer Assisted Exercises in NATO – 198

Virtual Space Logistics Readiness Center (VSLRC): Concept of Operations – 14

MILITARY SPACECRAFT
Multi-h CPM Synchronization in Military Channels Phase 2: A Simulation Framework – 58

MILITARY TECHNOLOGY
Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications – 132

Micromachined Precision Inertial Instruments – 87

Technical Design for the TTA Component of the 120mm HE C2 Mortar Ammunition – 153

MILKY WAY GALAXY
Cosmic Ray Propagation and Acceleration – 223

MILLIMETER WAVES
A Workshop on Vacuum Electronics Research for the DoD – 62

Symmetric Waveguide Orthomode Junctions – 213

MIMO (CONTROL SYSTEMS)
On the Implementation of Iterative Detection in Real-World MIMO Wireless Systems – 173

MINE DETECTORS
Multidisciplinary Research in Mine Detection and Neutralization Systems: Missouri-Led Muri – 81

MINIATURIZATION
Technology Development of Miniaturized Far-Infrared Sources for Biomolecular Spectroscopy – 35

MIRRORS
Long Focal Length Large Mirror Fabrication System – 188

Status Report and Lessons Learned from the Univ. of Arizona NMSD – 187

Wavefront Control for Extreme Adaptive Optics – 183

MISSILE SYSTEMS
USAF Training Extract, AFSC 2MOX2 - Active Duty, Missile & Space Systems Maintenance, Active Duty, OSSN 2522 – 14

MISSION PLANNING
ALS Equivalent System Mass Guidelines Document – 137

Mission Steering Profiles of Outer Planetary Orbiters Using Radioisotope Electric Propulsion – 15

MISSIONS
The Constellation-X Observatory – 182

MISSISSIPPI DELTA (LA)
Practical Remote Sensing Application for Agriculture – 95

MISSISSIPPI RIVER (US)
Nutrients in the Upper Mississippi River: Scientific Information to Support Management Decisions. The Upper Mississippi River - Values and Vulnerability – 179

MIXERS
Modeling and Validation of a Propellant Mixer for Controller Design – 24

MIXING RATIOS
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

MIXING
Numerical Simulations of Shock-Induced Mixing and Combustion – 76

MOBILE COMMUNICATION SYSTEMS
Securing Mobile Networks in an Operational Setting – 156

MODELS
A Domain Decomposition Parallelization of the Fast Marching Method – 152

Global Information Enterprise Simulation Laboratory (GIESIM LAB) – 54

Modeling and Control of the ARCP in Power and Drive Systems – 66

MODEMS
Low-Power Direct-Sequence Spread-Spectrum Modem Architecture for Distributed Wireless Sensor Networks – 56

MODULATION
Low-Power Direct-Sequence Spread-Spectrum Modem Architecture for Distributed Wireless Sensor Networks – 56

New Crystalline Materials for Nonlinear Frequency Conversion, Electro-Optic Modulation, and Mid-Infrared Gain Media – 184

MODULATORS
Modern Trends in Induction Accelerator Technology – 175

MODULES
A Library of Parameterized Hardware Modules for Floating Point Arithmetic and Its Use – 150

MOLECULAR CLOUDS
NASA's Far-IR/Submillimeter Roadmap Missions SAFIR and SPECS – 191

MOLECULAR DYNAMICS
Molecular Dynamics Simulations of Coulomb Explosion – 170

Molecular Dynamics Study of Void Growth and Dislocations in Dynamic Fracture of FCC and BCC Metals – 169

Unfolding of Proteins: Thermal and Mechanical Unfolding – 71

MOLECULAR GASES
High Dynamic Pressures and Modest Temperatures: A Broad Perspective and Bridging the Gap – 32

Observations of Distant Clusters – 208

MOLYBDENUM
Investigations on 10-Hz sub-Joule fs-Laser Pumped Neon- and Nickel-like X-ray Lasers – 195

Molybdenum-Copper Composite Material – 28

MOMENTUM
Benefit of Constant Momentum Propulsion for Large Delta V Missions -Applications to Laser Propulsion – 84

MONITORS
Hand-Held Ultrasonic Through-the-Wall Monitoring of Stationary and Moving People – 177

Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

MONOPROPELLANTS
HAN-Based Monopropellant Technology Development – 23

MONTE CARLO METHOD
Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

MOORING
Moored Observations of Internal Solitions in the Northeastern South China Sea – 73

MOUNTAINS
Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

MOVING TARGET INDICATORS

Preliminary Design Review: GMTI Processing for the PCA Integrated Radar-Tracker Application – 58

Preliminary Design Review: PCA Integrated Radar- Tracker Application – 144

MULTIDISCIPLINARY RESEARCH

Multidisciplinary Research in Mine Detection and Neutralization Systems: Missouri-Led Muri – 81

MULTILAYER INSULATION

Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

MULTIPHASE FLOW

Simulation of Inviscid Compressible Multi-Phase Flow with Condensation – 72

MULTIPROCESSING (COMPUTERS)

Embedded High Performance Scalable Computing Systems – 150

MULTISENSOR APPLICATIONS

L-C Measurement Acquisition Method for Aerospace Systems – 81

MULTISPECTRAL BAND SCANNERS

Satellite Hyperspectral Imaging Simulation – 95

MULTISPECTRAL PHOTOGRAPHY

Remote Sensing System Requirements Development: A Simulation-Based Approach – 97

Software for Simulation of Hyperspectral Images – 145

MULTIVARIATE STATISTICAL ANALYSIS

Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

MUTATIONS

Is Breast Tissue from Women Who Carry Germ-Line BRCA1 or BRCA2 Mutations 'Normal'? - An Immuno- Histopathological Study – 130

NANOCOMPOSITES

Highly Ordered Carbon Nanotube Arrays and Nanotube- Polymer Nanocomposite Superlattices for Full-Color Sensing and Coating – 39

NANOTECHNOLOGY

Development and Application of Molecular- Resolution Chemically-Sensitive Nanotube Probes – 36

High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Nanotechnology Infrared Optics for Astronomy Missions – 207

NASA Efforts on Nanotechnology – 60

Optical Levitation of Micro-Scale Particles in Air – 190

NANOTUBES

Highly Ordered Carbon Nanotube Arrays and Nanotube- Polymer Nanocomposite Superlattices for Full-Color Sensing and Coating – 39

NAPHTHALENE

Efficient Synthesis of 4,8-Ditoluoyl-1,5-Dihydroxynaphthalene – 42

NASA PROGRAMS

A Comprehensive Survey of Earth-Moon Libration Orbits: Stationkeeping Strategies And Intra-Orbit Transfers – 15

A NASA SHARP Mentoring Experience Utilizing GP-B – 197

IS0 9000 Implementation and Assessment: A Guide to Developing and Evaluating Quality Management Systems – 225

NASA Efforts on Nanotechnology – 60

NASA Scientific Data Purchase Laboratory Characterization of Positive Systems ADAR 5500 Sensor – 95

NASA's Virtual Product Laboratory: An Overview – 158

Relative Motion of Two Spacecraft Near the Sun-Earth L2 Point – 82

Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development' – 1

The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

NASTRAN

Structural Integrity of a Wind Tunnel Balance – 91

NATIONAL AEROSPACE PLANE PROGRAM

Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

NATIONAL PARKS

Nutrients in the Upper Mississippi River: Scientific Information to Support Management Decisions. The Upper Mississippi River - Values and Vulnerability – 179

NAVY

Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell – 27

NEAR EARTH OBJECTS

Asteroid Search with Advanced Detection Algorithms – 206

NEAR FIELDS

Near-Field Magnetic Dipole Moment Analysis – 103

NEAR INFRARED RADIATION

[Calibration, Analysis, and Interpretation of SERTS and EUNIS Observation] – 192

Spectroscopy and Photometry of Mars Trojans – 208

NEODYMIUM

Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses – 186

NEON

Investigations on 10-Hz sub-Joule fs-Laser Pumped Neon- and Nickel-like X-ray Lasers – 195

NEURAL NETS

Development of Methodologies for IV and V of Neural Networks – 147

Human Behavior Representation: Recent Developments – 160

NEUROTRANSMITTERS

Prostate Cancer Cell Growth: Role of Neurotensin in Mediating Effect of Dietary Fat and Mechanism of Action – 129

NEUTRAL ATMOSPHERES

The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

NEUTRALIZERS

Multidisciplinary Research in Mine Detection and Neutralization Systems: Missouri-Led Muri – 81

NEUTRON STARS

Dying Pulse Trains in Cygnus XR-1: Initial Results of X-Ray Searches – 214

Uncovering the Properties of Young Neutron Stars and their Surrounding Supernova Remnants – 212

NEVADA

Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

NEWTON-RAPHSON METHOD

Path Elongation for UAV Task Assignment – 6

NICKEL ALLOYS

Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation – 46

High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

NICKEL

Determination of Nickel, Nickel Chloride Hexahydrate and Boric Acid in Nickel Sulfamate Plating Solutions by Titration – 39

Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation – 46

NIOBIUM ALLOYS
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

NITRATES
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

Measurement of Peroxyacetyl Nitrate (PAN), Peroxypropionyl Nitrate (PPN) and Peroxymethacryloyl Nitrate (MPAN) during TRACE-P – 30

NITRIC ACID
Analysis of Events Associated with First Charge of Desicooler Material – 26

NITROGEN COMPOUNDS
Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

NITROGEN OXIDES
Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

Real-Time Control of Lean Blowout in a Turbine Engine for Minimizing No(x) Emissions – 21

NITROGEN
Numerical Modeling of Enhanced Nitrogen Dissolution During Gas Tungsten Welding – 45

NOISE PREDICTION (AIRCRAFT)
Broadband Trailing Edge Noise Predictions in the Time Domain – 180

Temporal Characterization of Aircraft Noise Sources – 178

NOISE PROPAGATION
Scene-Based Wave-Front Sensing for Remote Imaging – 183

NOISE REDUCTION
An Analysis of Model Scale Data Transformation to Full Scale Flight Using Chevron Nozzles – 11

NONDESTRUCTIVE TESTS
Theory of Positron Annihilation in Helium-filled Bubbles in Plutonium – 48

NONLINEARITY
Experiment and Theory for Active Control of Nonlinear Dynamics in Compression/Combustion Systems – 69

Linear State-Space Representation of the Dynamics of Relative Motion, Based on Restricted Three Body Dynamics – 18

Nonlinear Internal Waves in the South China Sea During ASIAEX – 165

Nonlinear Observers for Gyro Calibration Coupled with a Nonlinear Control Algorithm – 13

ParaDyn A Parallel Nonlinear, Explicit, Three-Dimensional Finite-Element Code for Solid and Structural Mechanics User Manual – 88

Path Elongation for UAV Task Assignment – 6

The Nonlinear Coupling of Alfven and Lower Hybrid Waves in Space Plasma – 193

NONTHERMAL RADIATION
Uncovering the Properties of Young Neutron Stars and their Surrounding Supernova Remnants – 212

NORTH ATLANTIC TREATY ORGANIZATION (NATO)
NATO Modelling and Simulation (M and S) Orientation Course – 154

NOZZLE FLOW
Computational Study of Axisymmetric Off-Design Nozzle Flows – 2

NOZZLE GEOMETRY
Computing Axisymmetric Jet Screech Tones using Unstructured Grids – 179

NUCLEAR FISSION
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

NUCLEAR INTERACTIONS
NLC Gamma-Gamma Beam Dump Face Calculations – 168

NUCLEAR MAGNETIC RESONANCE
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

NUCLEAR PHYSICS
Space Weather Effects: Decay Phases in Gradual and Impulsive Solar Energetic Particle Events – 215

NUCLEAR POWER PLANTS
Lawrence Livermore National Laboratory Probabilistic Seismic Hazard Codes Validation – 140

NUCLEAR STRUCTURE
Level Densities and Radiative Strength Functions in (170, 171) Yb – 167

NUCLEI (NUCLEAR PHYSICS)
Level Densities and Radiative Strength Functions in (170, 171) Yb – 167

NUMERICAL ANALYSIS
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

New Type of the Interface Evolution in the Richtmyer-Meshkov Instability – 69

Numerical Errors: Reliable Numerical Simulations – 143

Numerical Modeling of Enhanced Nitrogen Dissolution During Gas Tungsten Welding – 45

Numerical Modeling of Pulse Detonation Rocket Engine Gasdynamics and Performance – 10

Power Consumption of Customized Numerical Representations for Audio Signal Processing – 162

Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

Transition in Hypersonic Flows Including High-temperature Gas Effects – 72

NUMERICAL CONTROL
Near-Field Magnetic Dipole Moment Analysis – 103

NUTRITIONAL REQUIREMENTS
Partitioning of Inorganic Elements Consumed by Humans Between the Various Fractions of Human Wastes: A Review and Analysis of Existing Literature – 34

OBJECT-ORIENTED PROGRAMMING
Semantic Metrics for Object Oriented Design – 158

OBSERVATION
Modeling and Observational Study of the Global Atmospheric Impacts of Antarctic Sea Ice Anomalies – 113

Observation of an Excited Charmed Baryon Decaying into xi(c)0 pi+ – 171

Observing the Global Water Cycle from Space – 96

OCEAN BOTTOM
Low-Frequency Shallow Water Reverberation and Bottom Scattering Model – 176

Mid-Frequency Bottom Backscatter, Environmental Measurements, Model/data Comparison, and Implications to Reverberations – 178

OCEAN CURRENTS
Influence of Surface and Bottom Stress in the Coupled Ocean Circulation and Wind-Wave Models – 122

OCEAN DYNAMICS
ASIAEX South China Sea Acoustic Fluctuations (and Physical Oceanography) – 177

OCEAN MODELS
Assessment and Testing of the GODAE Products – 121

OCEANOGRAPHY
ASIAEX South China Sea Acoustic Fluctuations (and Physical Oceanography) – 177

Nonlinear Internal Waves in the South China Sea During ASIAEX – 165

Technical Report on Inversion of the First RUMBLE Sea Trial Data – 122

Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models – 123

OCEANS
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

OILS
Determination of PCB's in Watervliet Arsenal Machine Oils by Gas Chromatography – 38

ONBOARD DATA PROCESSING
Real-Time Data Processing Onboard Remote Sensor Platforms: Annual Review #3 Data Package – 155

OPERATING COSTS
Aircraft Optimization for Minimum Environmental Impact – 8

Practical Remote Sensing Application for Agriculture – 95

OPERATING SYSTEMS (COMPUTERS)

A Java-Based Active Network Operating System (JANOS) – 149

Application of Operating System Concepts to Coordination in Pervasive Sensing and Computing Systems – 155

Scalable Content Delivery Technology – 155

OPTICAL COMMUNICATION

Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 159

OPTICAL EQUIPMENT

Absolute Optical Calibrations Using a Simple Tungsten Bulb: Theory – 204

The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

OPTICAL FIBERS

All Fiber Technology for High-Energy Petawatt Front End Laser Systems – 186

OPTICAL FILTERS

A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 189

OPTICAL MEASUREMENT

Protection Against Microsecond Laser Pulses – 184

OPTICAL PROPERTIES

Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

Electric and Optical Properties of Doped Small Molecular Organic Light-Emitting Devices – 186

Optical Properties of Zitex in the Infrared Submillimeter – 192

OPTICAL RADAR

Combined Svalbard Optical and Radar Observations for Polar Cusp/Cap Research – 105

Laser Obstacle Detection System Flight Testing – 84

OPTICAL SWITCHING

A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 189

Development of a Large-scale 3D MEMS Optical Switch Module – 190

High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 189

NTT Technical Review – 188

Recent Advances in Optical Switches Using Silica-based PLC Technology – 189

Recent Progress in Optical Switching Device Technologies in NTT – 189

OPTICS

Astronomy Applications of Adaptive Optics at Lawrence Livermore National Laboratory – 220

Development of a High-Pressure Gaseous Burner for Calibrating Optical Diagnostic Techniques – 11

Electro Optical Properties of Copolymer Blends – 50

Highlights of the ASPE 2004 Winter Topical Meeting on Free-Form Optics: Design, Fabrication, Metrology, Assembly – 190

National Ignition Facility: The World's Largest Optics and Laser System – 182

Optical Levitation of Micro-Scale Particles in Air – 190

OPTIMIZATION

From Materials to Missions. Assess-Predict- Optimize: A Computational Approach to Adaptive Design – 165

Hyper-X Stage Separation Trajectory Validation Studies – 19

The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters – 10

Tradeoffs in Polarimeter Design – 203

ORGANIC CHEMISTRY

Efficient Synthesis of 4,8-Ditoluoyl-1,5-Dihydroxynaphthalene – 42

ORGANIC COMPOUNDS

Predicted Concentrations in New Relocatable Classrooms of Volatile Organic Compounds Emitted from Standard and Alternate Interior Finish Materials – 100

ORGANIC LASERS

Device Optimization and Transient Electroluminescence Studies of Organic Light Emitting Devices – 185

ORGANIZATIONS

A Workshop on Vacuum Electronics Research for the DoD – 62

Report from the School of Experience: Lessons-Learned on NASA's EOS/ICESat Mission – 197

ORIFICES

Computation of Transverse Injection Into Supersonic Crossflow With Various Injector Orifice Geometries – 10

ORION NEBULA

Tracing the Magnetic Field in Orion A – 217

OSCILLATIONS

Tides and Decadal Variability – 120

OSCILLATOR STRENGTHS

Atomic Data and Spectral Line Intensities for S XI – 219

OXIDATION RESISTANCE

Reevaluation of Tetrahydrophthalic Anhydride as an End Cap for Improved Oxidation Resistance in Addition Polyimides – 42

OXYGEN

A Study of Transrectal Tumor Oxygen Measurements in Patients With Clinically Localized Prostate Cancer – 125

OZONE DEPLETION

Advanced Global Atmospheric Gases Experiment (AGAGE): MIT Contribution – 115

OZONE

Climate Impacts on Tropospheric Ozone and Hydroxyl – 113

Historical Precision of an Ozone Correction Procedure for AMO Solar Cell Calibration – 99

Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals – 117

OZONOSPHERE

Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

PACIFIC OCEAN

Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

PACKAGING

Microbiologically-Facilitated Effects on the Surface Composition of Alloy 22, A Candidate Nuclear Waste Packaging Material – 44

PACKETS (COMMUNICATION)

Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 150

PAINTS

Development of Product Descriptions for Lead- Immobilizing Overcoating Systems – 27

Performance of Low-VOC Paint for Vehicles of the Dutch Army – 51

PANELS

Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

PARALLEL COMPUTERS

CESDIS – 200

PARALLEL PROCESSING (COMPUTERS)

A Domain Decomposition Parallelization of the Fast Marching Method – 152

PARALLEL PROGRAMMING
C++ Infrastructure for Automatic Introduction and Translation of OpenMP Directives – 139

PARAMETERIZATION
Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

PARAMETRIC AMPLIFIERS
Parametric Techniques for Extreme-Contrast, High-Energy Petawatt Pulses – 185

PARTICLE BEAMS
NLC Gamma-Gamma Beam Dump Face Calculations – 168

PARTICLE DECAY
Measurement of B(D0 -> K-pi+ pi0)/B(D0 -> K- pi+) – 171

Measurement of the Branching Fraction for D(S) -> phi pi- – 171

Observation of an Excited Charmed Baryon Decaying into xi(c)0 pi+ – 171

Observation of the Decay Beta(sup 0) approximately Tau(sup 0)Tau(sup 0) – 172

Search for the Lepton Number Violating Decay (tau)(yields)(mu)(gamma) – 168

PARTICLES
Transport Methods Conquering the Seven-Dimensional Mountain – 170

'Hypothetical' Heavy Particles Dynamics in LES of Turbulent Dispersed Two-Phase Channel Flow – 69

PATCH ANTENNAS
Analysis of Curved Microstrip Antennas – 65

PATTERN RECOGNITION
Arctic Shoreline Delineation & Feature Detection Using RADARSAT-1 Interferometry: Case Study Over Alert – 97

PENETRATION
Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

PEPTIDES
Delivering DNA Vaccine by Transdermal Electroporation – 130

PERFORMANCE PREDICTION
Multidimensional Performance Modeling for Advanced Embedded Signal Processors – 151

Numerical Modeling of Pulse Detonation Rocket Engine Gasdynamics and Performance – 10

PERFORMANCE TESTS
K-Means Re-Clustering Algorithmic Options with Quantifiable Performance Comparisons – 141

Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell – 27

Pointing Control System Design and Performance Evaluation for TPF Coronagraph – 221

Test Results for Entry Guidance Methods for Reusable Launch Vehicles – 17

Why are Some e-Government Programs More Successful than Others. The Relevance of Performance Evaluations to Regional e-Government Preparations in Indonesia – 142

Wireless Link Design Using a Patch Antenna – 56

PERSONNEL
Guidance for Ability Group Run Speeds and Distances in Basic Combat Training – 129

PERTURBATION
A Study on the Effects of J2 Perturbations on a Drag-Free Control System for Spacecraft in Low Earth Orbit – 97

PHASE MODULATION
Multi-h CPM Synchronization in Military Channels Phase 2: A Simulation Framework – 58

PHASE TRANSFORMATIONS
Crystal Level Model for Phase Transformation Allowing for Large Volume Changes – 26

Investigations of the Electronic Properties and Surface Structures of Aluminum-Rich Quasicrystalline Alloys – 32

PHASED ARRAYS
Multi-Dimensional Signal Processing for Sparse Radar Arrays – 63

PHOSPHORIC ACID
Laboratory Automatic Titration of Chromium Plating and Electropolishing Solutions – 39

Online Automatic Titration of Chromic Acid in Chromium Plating Solutions and Phosphoric and Sulfuric Acids in Electropolishing Solutions – 41

Utilization of Ion Chromatography and Statistics to Determine Important Acids in Chromium Plating and Electropolishing Solutions – 38

PHOSPHORS
Depth-Penetrating Temperature Measurements of Thermal Barrier Coatings Incorporating Thermographic Phosphors – 42

PHOSPHORUS
Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation – 46

PHOTOCATHODES
RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

PHOTOMETERS
Acquisition and Analysis of NASA Ames Sunphotometer Measurements during SAGE III Validation Campaigns and other Tropospheric and Stratospheric Research Missions – 220

Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Radiant Temperature Nulling Radiometer – 78

SiGe Quantum Well Infrared Photodetectors (QWIPs) for Remote Sensing Applications – 80

PHOTONUCLEAR REACTIONS
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

PHOTOREFRACTIVITY
Mechanisms of Photorefractivity in Polymeric Materials – 50

PHYSICAL EXERCISE
Guidance for Ability Group Run Speeds and Distances in Basic Combat Training – 129

PHYSIOLOGICAL RESPONSES
Stress Fracture Etiology as Dependent on Mechanically Induced Fluid Flow – 126

PILOT PLANTS
Application of Beryllium-7 and Lead-210 Concentration Measurements to Monitoring the Validity of Effluent Air Sampling at the Waste Isolation Pilot Plant – 102

P-I-N JUNCTIONS
High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

PLANETARY EVOLUTION
Studies of Planet Formation Using a Hybrid N-Body + Planetesimal Code – 221

PLASMA JETS
Experimental Study of Arcing on High-Voltage Solar Arrays – 19

Solar Array in Simulated LEO Plasma Environment – 195

PLASMA OSCILLATIONS
The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters – 10

PLASMA PHYSICS
Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

National Ignition Facility: The World's Largest Optics and Laser System – 182

PLASMA RESONANCE
Confined Plasma Resonance Antenna and Plasma Resonance Antenna Array – 67

PLASMAS (PHYSICS)
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

Magneto-Optically Guided and Fully Ionized Metal/Carbon Arc Plasma Source for Thin Film Coatings to Control, Wear, and Fretting – 27

Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels – 174

PLASTIC COATINGS

Recent Advances in Matting Technology for Military Runways – 14

PLASTIC PROPERTIES

Experimental Assessment of Gradient Plasticity – 88

PLASTICIZERS

Thermal Decomposition of New and Aged LX-04 and PBX 9501 – 25

PLASTICS

Compaction of Space Mission Wastes – 137

PLATING

Automatic Coulometric Titration of Sulfuric Acid in Chromium Plating Solutions – 40

Determination of Copper Cyanide Plating Solutions and Cadmium in Cadmium Cyanide Plating Solutions by Atomic Absorption Spectrometry – 38

Determination of Wastewater Acids from Chromium Plating and Electropolishing Solutions – 41

Laboratory Automatic Titration of Chromium Plating and Electropolishing Solutions – 39

Online Automatic Titration of Chromic Acid in Chromium Plating Solutions and Phosphoric and Sulfuric Acids in Electropolishing Solutions – 41

Utilization of Ion Chromatography and Statistics to Determine Important Acids in Chromium Plating and Electropolishing Solutions – 38

PLUMES

Ion Species Fractions in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

Proposal for Testing and Validation of Vacuum Ultra-Violet Atomic Laser-Induced Fluorescence as a Method to Analyze Carbon Grid Erosion in Ion Thrusters – 25

PLUTONIUM OXIDES

Analysis of Events Associated with First Charge of Desicooler Material – 26

PLUTONIUM

Rationale for Maintaining the Double Containment Requirement for Plutonium Shipments – 102

Recovery of Plutonium from Refractory Residues Using a Sodium Peroxide Pretreatment Process – 33

Theory of Positron Annihilation in Helium-filled Bubbles in Plutonium – 48

POINT SOURCES

Scene-Based Wave-Front Sensing for Remote Imaging – 183

POINTING CONTROL SYSTEMS

Pointing Control System Design and Performance Evaluation for TPF Coronagraph – 221

POLAR CAPS

Combined Svalbard Optical and Radar Observations for Polar Cusp/Cap Research – 105

POLARIZATION

Endoscopic Subsurface Imaging in Tissues – 183

Measurement of B(sup 0) -> D(sub s)(*)+D*- Branching Fractions and B(sup 0) ->D(sup s)*- Polarization with a Partial Reconstruction Technique – 168

The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

POLARIZED LIGHT

Manipulation of Micro Scale Particles in Optical Traps Using Programmable Spatial Light Modulation – 77

POLICIES

Compilation of Theses Abstracts – 203

NASA's Management and Utilization of the Small Business Innovative Research (SBIR) Program – 199

POLISHING

Long Focal Length Large Mirror Fabrication System – 188

POLLUTION

Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation – 46

POLYCHLORINATED BIPHENYLS

Determination of PCB's in Watervliet Arsenal Machine Oils by Gas Chromatography – 38

POLYETHYLENES

Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties – 37

In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols – 180

POLYIMIDES

Reevaluation of Tetrahydrophthalic Anhydride as an End Cap for Improved Oxidation Resistance in Addition Polyimides – 42

POLYMER MATRIX COMPOSITES

High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

POLYMERIC FILMS

Sealed Window Glazing System for Chemical Biological Protected Space Applications – 89

POLYMERIZATION

Preparation of Propellants Adapted for ETC and Polymeric Matrix for ADN-Based Propellants – 52

POLYMERS

Durability of Polymeric Glazing Materials for Solar Applications – 98

Highly Ordered Carbon Nanotube Arrays and Nanotube- Polymer Nanocomposite Superlattices for Full-Color Sensing and Coating – 39

Mechanisms of Photorefractivity in Polymeric Materials – 50

Physics of Combustion of New Oxidizer/Polymer Mixtures – 51

Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels – 174

Water Recycling/Removal Using Temperature-Sensitive Hydrogels – 49

POLYMORPHISM

Differential Expression of DNA Double-Strand Break Repair Proteins in Breast Cells – 132

POLYNOMIALS

Simple Instability Criteria for a Family of Complex-Coefficient Polynomials – 163

POLYNYAS

Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models – 123

POLYURETHANE RESINS

Recent Advances in Matting Technology for Military Runways – 14

POSITION (LOCATION)

Experimental Assessment of Gradient Plasticity – 88

POTENTIOMETERS (INSTRUMENTS)

The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

POWER AMPLIFIERS

PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems – 86

POWER EFFICIENCY

A High Efficiency DC Bus Regulator/RPC for Spacecraft Applications – 65

POWER SERIES

Motions and Initial Conditions in Star-Forming Dense Cores – 216

PRECIPITATION MEASUREMENT

A Physical Validation Program for the GPM Mission – 119

PRECIPITATION (METEOROLOGY)

African Easterly Waves and Their Association with Precipitation – 116

Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

Momentum Transport: 2D and 3D Cloud Resolving Model Simulations – 114

Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

PRECISION

Precision Measurement of the Proton and Deuteron Spin Structure Functions g(sub 2)* – 168

PREDICTION ANALYSIS TECHNIQUES

A Modified Grey Forecasting Model for Long-Term Prediction – 163

Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

PREDICTIONS

Prediction of Active-Region CME Productivity from Magnetograms – 209

PRE-MAIN SEQUENCE STARS

Coronal Activity in Low-Mass Pre-Main Sequence Stars: NGC 2264 – 207

PREPROCESSING

Software for Preprocessing Data From Rocket-Engine Tests – 146

PROBES

The Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) – 210

PROBLEM SOLVING

Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

PROCEDURES

NASA's Management and Utilization of the Small Business Innovative Research (SBIR) Program – 199

PROCESSING

Logistic Fuel Processor Development – 52

PROCUREMENT

Report from the School of Experience: Lessons-Learned on NASA's EOS/ICESat Mission – 197

PRODUCT DEVELOPMENT

Human Behaviour Representation: Relevant Technologies and their Development – 135

Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

X-37 C-Sic CMC Control Surface Components Development [Status of the NASA/Boeing/USAF Orbital Vehicle and Related Efforts] – 49

PRODUCTION ENGINEERING

AF ManTech Highlights, Winter 2003 – 4

PRODUCTIVITY

Prediction of Active-Region CME Productivity from Magnetograms – 209

PROGRAM VERIFICATION (COMPUTERS)

FY 2002 Report on Software Visualization Techniques for IV and V – 145

Integrating Formal Methods and Testing 2002 – 148

NASA Scientific Data Purchase Laboratory Characterization of Positive Systems ADAR 5500 Sensor – 95

Real-Time Embedded Software Verification and Validation 2001 – 22

PROJECT MANAGEMENT

Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

PROJECTILES

Ceramic Armour against Heavy KE-Threats – 49

Suppression of Material Failure Modes in Titanium Armors – 47

PROPAGATION VELOCITY

Cosmic Ray Propagation and Acceleration – 223

PROPAGATION

Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

PROPELLANTS

Stimulation of Propellant Burning by Supplying Electric Energy in the Flame – 51

PROPORTIONAL COUNTERS

The Soft Excess Emission in the Hercules Supercluster Observed with the ROSAT Position Sensitive Proportional Counter – 204

PROPULSION SYSTEM PERFORMANCE

HAN-Based Monopropellant Technology Development – 23

High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

PROPULSION

Benefit of Constant Momentum Propulsion for Large Delta V Missions -Applications to Laser Propulsion – 84

Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

PROSTATE GLAND

Derivation of Double-Targeted Adenovirus Vectors for Gene Therapy of Prostate Cancer – 131

Genetic Variation in the HSD3B2 Gene and Prostate Cancer – 129

Interrogating Androgen Receptor Mediated Gene Expression and Tumor Progression by Molecular Imaging – 128

Prostate Cancer Cell Growth: Role of Neurotensin in Mediating Effect of Dietary Fat and Mechanism of Action – 129

PROTECTION

Protection Against Microsecond Laser Pulses – 184

PROTECTIVE COATINGS

Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell – 27

PROTEINS

Carbon Nanotube Atomic Force Microscopy for Proteomics and Biological Forensics – 51

Unfolding of Proteins: Thermal and Mechanical Unfolding – 71

PROTEUS

PROTEUS: Assessment and Adaptation Through Dynamic Architecture Technology – 151

PROTOCOL (COMPUTERS)

An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Globe Teachers Guide and Photographic Data on the Web – 146

PROTONS

Observation of a Near-Threshold Enhancement in the p-anti-p Mass Spectrum from Radiative J/psi -> gamma-p-anti-p Decays – 169

Precision Measurement of the Proton and Deuteron Spin Structure Functions g(sub 2)* – 168

PROTOPLANETARY DISKS

Studies of Circumstellar Disk Evolution – 212

PROTOPLANETS

Studies of Planet Formation Using a Hybrid N-Body + Planetesimal Code – 221

PROTOSTARS

NASA's Far-IR/Submillimeter Roadmap Missions SAFIR and SPECS – 191

PROTOTYPES

Microrelay – 60

PROVING

Development of Methodologies for IV and V of Neural Networks – 147

Integrating Formal Methods and Testing 2002 – 148

Validation of Ionospheric Models – 105

PULSE COMPRESSION

A Comparison of Two Computational Technologies for Digital Pulse Compression – 63

PULSE DETONATION ENGINES

Numerical Modeling of Pulse Detonation Rocket Engine Gasdynamics and Performance – 10

PULSE DURATION MODULATION

Multi-Random PWM Inverter with Fixed Switching Frequency – 163

PULSE DURATION

PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems – 86

RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

PULSE GENERATORS
Compact High Power Repetitive Pulsed Power Instrumentation – 64

PULSED INDUCTIVE THRUSTERS
Pulsed Inductive Thruster (PIT): Modeling and Validation Using the MACH2 Code – 22

PULSED LASERS
Laser Obstacle Detection System Flight Testing – 84

Protection Against Microsecond Laser Pulses – 184

Transmission Measurements of Femtosecond Laser Pulses Through Aerosols – 83

PULSES
Acoustic Propagation in a Water-Filled Cylindrical Pipe – 176

PURINES
Isolation of Purines and Pyrimidines from the Murchison Meteorite – 125

PYRIMIDINES
Isolation of Purines and Pyrimidines from the Murchison Meteorite – 125

QUALITY CONTROL
Assessment and Testing of the GODAE Products – 121

IS0 9000 Implementation and Assessment: A Guide to Developing and Evaluating Quality Management Systems – 225

Real-Time Embedded Software Verification and Validation 2001 – 22

QUANTITATIVE ANALYSIS
Determination of Sulfuric Acid in Chromium Plating Solutions Using Gravimetric Analysis – 40

QUANTUM CASCADE LASERS
International Workshop on Quantum Cascade Lasers. Meeting Program, Abstract Book & Attendee Roster. January 4-8, 2004, Seville, Spain – 83

QUANTUM MECHANICS
Quantum Dynamics Scattering Study of AB+CDE Reactions: A Seven Dimensional Treatment for the H2+C2H Reaction – 33

QUANTUM THEORY
International Workshop on Quantum Cascade Lasers. Meeting Program, Abstract Book & Attendee Roster. January 4-8, 2004, Seville, Spain – 83

QUANTUM WELLS
SiGe Quantum Well Infrared Photodetectors (QWIPs) for Remote Sensing Applications – 80

QUARTZ
Measurement of Anisotropic Elastic Constitutive Properties at High Temperatures – 196

QUASARS
Seeing Red and Shooting Blanks: A Study of Red Quasars and Blank Field X-Ray Sources – 210

QUERY LANGUAGES
(Sigma)QL: A Decision Support Tool for Target Recognition in a Multisensor Environment – 187

RACES (ANTHROPOLOGY)
Genetic Variation in the HSD3B2 Gene and Prostate Cancer – 129

RADAR IMAGERY
Experimental Investigations on the Distortion of ISAR Images Using Different Radar Waveforms – 57

RADAR MEASUREMENT
Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

RADAR TARGETS
System Level Applications of Adaptive Computing (SLAAC) – 156

RADAR TRACKING
Preliminary Design Review: GMTI Processing for the PCA Integrated Radar-Tracker Application – 58

Preliminary Design Review: Kinematic Tracking for the PCA Integrated Radar-Tracker Application – 155

Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

RADIANCE
Radiant Temperature Nulling Radiometer – 78

RADIATION DOSAGE
Need for Research Programs to Provide Data Applicable to the Estimate of Maximum Permissible Exposure Values for Internally Deposited Radionuclides – 124

RADIATION EFFECTS
Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

RADIATION HAZARDS
Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

RADIATION PROTECTION
Scoping Inventory Calculations for the Rare Isotope Accelerator – 181

RADIATION TRANSPORT
Hydrodynamic Modeing of a Multi-Pulse X-Ray Converter Target for DARHT-II – 174

RADIATION
Finding the Radiation Amplitude Zero in W gamma Production-Is it Unique to the Standard Model – 169

RADIATIVE HEAT TRANSFER
Large-eddy Simulation of Stratocumulus-topped Atmospheric Boundary Layers with Dynamic Subgrid-scale Models – 119

RADIO ASTRONOMY
Design of an L-Band Microwave Radiometer with Active Mitigation of Interference – 60

Discovery of an Obscured Supernova in Arp 299 – 211

Upgrade of the Aerial Guidance system for Automatic High Time and Spectral Resolution Solar Radio Observations at the Astrophysical Institute Potsdam – 216

RADIO EMISSION
Phenomena Associated With EIT Waves – 218

RADIO EQUIPMENT
Algorithmic Advances for Software Radios – 57

RADIO FREQUENCIES
Image Systems Using RFID Tag Positioning Information – 159

RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

RADIO FREQUENCY INTERFERENCE
Design of an L-Band Microwave Radiometer with Active Mitigation of Interference – 60

RADIO OBSERVATION
Upgrade of the Aerial Guidance system for Automatic High Time and Spectral Resolution Solar Radio Observations at the Astrophysical Institute Potsdam – 216

RADIO SIGNALS
A 10-Bit 10 GSPS Optical ADC for Radar Signal Processing – 144

RADIO SOURCES (ASTRONOMY)
Discovery of an Obscured Supernova in Arp 299 – 211

RADIOACTIVE DECAY
Measurement of B(sup 0) -> D(sub s)(*)+D*- Branching Fractions and B(sup 0) ->D(sup s)*- Polarization with a Partial Reconstruction Technique – 168

RADIOACTIVE ISOTOPES
Compact Liquid Waste Evaporator for Cleanup on Hanford's Hot Cells – 100

Savannah River Site Approved Site Treatment Plan, 2003 Annual Update. Volumes I and II – 100

Scoping Inventory Calculations for the Rare Isotope Accelerator – 181

RADIOACTIVE WASTES
Analysis of Events Associated with First Charge of Desicooler Material – 26

Corrosion of Exhaust and Filtration Equipment in a Radioactive Waste Incinerator – 33

Microbiologically-Facilitated Effects on the Surface Composition of Alloy 22, A Candidate Nuclear Waste Packaging Material – 44

Safety Evaluation of the Single-Shell Tanks Modified Sluicing Waste Retrieval System – 100

Savannah River Site Approved Site Treatment Plan, 2003 Annual Update. Volumes I and II – 100

Supercritical Carbon Dioxide-Soluble Ligands for Extracting Actinide Metal Ions from Porous Solids – 31

RADIOMETERS

A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

RADIOTELEPHONES

On the Implementation of Iterative Detection in Real-World MIMO Wireless Systems – 173

RAILGUN ACCELERATORS

A Simple Transverse Motion Detector for Railguns – 80

RAIN

Heating Structures Derived from Satellite – 112

Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

RAMAN SPECTRA

Measurement and Simulation of Spontaneous Raman Scattering Spectra in High-Pressure, Fuel-Rich H2-Air Flames – 43

Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals – 117

RANDOM SAMPLING

FY 2003 Top 200 Users Survey Report – 201

RATINGS

Stream Processing for High-Performance Embedded Systems – 65

RATIONS

Feeding Behaviour and Motivation of Feeding Behaviour of (Experienced) Soldiers of Several Entities Concerning the Fighting Ration – 138

REACTING FLOW

A Novel Strategy for Numerical Simulation of High-speed Turbulent Reacting Flows – 68

Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

REACTION KINETICS

Numerical Simulations of Shock-Induced Mixing and Combustion – 76

REAL TIME OPERATION

An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

Real-Time Control of Lean Blowout in a Turbine Engine for Minimizing No(x) Emissions – 21

Real-Time Data Processing Onboard Remote Sensor Platforms: Annual Review #3 Data Package – 155

Real-Time Embedded Software Verification and Validation 2001 – 22

Real-Time Geo-Registration on High-Performance Computers – 80

RECEPTORS (PHYSIOLOGY)

Interrogating Androgen Receptor Mediated Gene Expression and Tumor Progression by Molecular Imaging – 128

RECOVERY

The Effects of Gender on Receovery Times Following General Anesthesia with Propofol and Sevoflurane – 131

RECTANGULAR PANELS

Thermal Buckling Analysis of Rectangular Panels Subjected to Humped Temperature Profile Heating – 89

RED SHIFT

The Constellation-X Observatory – 182

REENTRY VEHICLES

Advanced Control Surface Seal Development for Future Space Vehicles – 86

REFLECTION NEBULAE

Wavelength Shifts of the 7.7 Micron Emission Band in Reflection Nebulae – 214

REFRACTIVITY

Nanotechnology Infrared Optics for Astronomy Missions – 207

REFRACTORY MATERIALS

High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Recovery of Plutonium from Refractory Residues Using a Sodium Peroxide Pretreatment Process – 33

REGENERATIVE FUEL CELLS

Unitized Regenerative Fuel Cell System Development – 98

REINFORCING MATERIALS

Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

RELATIVISTIC ELECTRON BEAMS

Gas Ionization by Beam Electron Collisions and by Electron Avalanching in the Self Ez Field of a 2 kA Relativistic Electron Beam Focused on a Conducting Target – 172

RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

RELIABILITY ANALYSIS

Numerical Errors: Reliable Numerical Simulations – 143

RELIABILITY

Civilian Power from Space in the Early 21st Century – 98

Test Results for Entry Guidance Methods for Reusable Launch Vehicles – 17

REMOTE CONTROL

A High Efficiency DC Bus Regulator/RPC for Spacecraft Applications – 65

REMOTE SENSING

Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data – 187

Cooperative Mobile Sensing Networks – 6

Highlights: US Commercial Remote Sensing Industry Analysis – 198

NASA Scientific Data Purchase Laboratory Characterization of Positive Systems ADAR 5500 Sensor – 95

NASA's Virtual Product Laboratory: An Overview – 158

Practical Remote Sensing Application for Agriculture – 95

Preliminary Analysis of X-Band and Ka-Band Radar for Use in the Detection of Icing Conditions Aloft – 5

Relative Motion of Two Spacecraft Near the Sun-Earth L2 Point – 82

Remote Sensing System Requirements Development: A Simulation-Based Approach – 97

Scientific Data Purchase Project Overview Presentation – 94

Spacecraft Formation Design Near the Sun-Earth L(sub 2) Point – 18

TerraHertz Free Electron Laser Applications for Satellite Remote Sensing – 83

Wind Sounding with Laser Radar: A Pre-Study – 109

REMOTE SENSORS

Real-Time Data Processing Onboard Remote Sensor Platforms: Annual Review #3 Data Package – 155

REPLICAS

The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

REQUIREMENTS

Remote Sensing System Requirements Development: A Simulation-Based Approach – 97

Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

RESCUE OPERATIONS
Hand-Held Ultrasonic Through-the-Wall Monitoring of Stationary and Moving People – 177

RESEARCH AND DEVELOPMENT
Biologically Inspired Micro-Flight Research – 9

For Further Innovation – 166

NASA Efforts on Nanotechnology – 60

Program Research and Announcement PRDA 04-01-PKT Integrated High Payoff Rocket Propulsion Technology XI (IH-PRPT) – 22

The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

RESEARCH FACILITIES
Hyperspectral Imaging on the International Space Station: An Innovative Approach to Commercial Development of Space – 197

National Space Biomedical Research Institute – 135

RESEARCH PROJECTS
Need for Research Programs to Provide Data Applicable to the Estimate of Maximum Permissible Exposure Values for Internally Deposited Radionuclides – 124

Student Research and Accomplishments: 2001-2002, Multidisciplinary Center for Earthquake Engineering Research – 92

RESEARCH
Compilation of Theses Abstracts – 203

RESISTANCE
Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

RESISTORS
Coaxial-Type Resistance Sensor for HPM Applications – 64

RESONATORS
Investigations of High Pressure Acoustic Waves in Resonators with Seal-like Features – 180

RESOURCES MANAGEMENT
Human Behaviour Representation: Application Areas – 225

RESOURCES
Nutrients in the Upper Mississippi River: Scientific Information to Support Management Decisions. The Upper Mississippi River - Values and Vulnerability – 179

RESPIRATORY DISEASES
The Acute Respiratory Distress Syndrome (ARDS) and Military Relevant Inhalation Injury: A Brief Review – 133

RETICLES
Novel EUV Mask Blank Defect Repair Developments – 181

REUSABLE LAUNCH VEHICLES
Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

Health Monitoring of RLV Airframe Structures – 87

REVERBERATION
Low-Frequency Shallow Water Reverberation and Bottom Scattering Model – 176

Mid-Frequency Bottom Backscatter, Environmental Measurements, Model/data Comparison, and Implications to Reverberations – 178

Preliminary Analysis of Reverberation Data in ASIAEX Experiment – 176

Seabottom Acoustics Parameters from Reverberation Vertical Coherence in Shallow Water – 179

REVERSING
The Geomagnetic Field During a Reversal – 103

REYNOLDS EQUATION
Computation of Transverse Injection Into Supersonic Crossflow With Various Injector Orifice Geometries – 10

RIBONUCLEIC ACIDS
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

RING CURRENTS
Magnetosphere-Ionosphere Coupling and Associated Ring Current Energization Processes – 211

RING LASERS
Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft – 20

RIOMETERS
Ionospheric Sensor Developments for the Year-2000 Solar Maximum – 15

RISK
Flightfax: Army Aviation Risk-Management Information. Volume 31, Number 12, December 2003 – 4

Risk-Based Decision-Making and the Use of Operational Risk Management in Developing a Course of Action (COA) for the Joint Task Force (JTF) – 57

Safety Evaluation of the Single-Shell Tanks Modified Sluicing Waste Retrieval System – 100

ROBOTICS
Cooperative Mobile Sensing Networks – 6

Robot Acquisition of Active Maps Through Teleoperation and Vector Space Analysis – 160

ROBUSTNESS (MATHEMATICS)
Quality of Service Routing in Tactical Mobile Ad Hoc Networks – 56

ROCKET ENGINES
Numerical Modeling of Pulse Detonation Rocket Engine Gasdynamics and Performance – 10

Software for Preprocessing Data From Rocket-Engine Tests – 146

Tests of the Contamination Analysis Unit, Phase 2 – 21

ROCKET THRUST
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

ROCKET VEHICLES
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

ROSAT MISSION
The Soft Excess Emission in the Hercules Supercluster Observed with the ROSAT Position Sensitive Proportional Counter – 204

ROTATING CYLINDERS
Passive Isolators for use on the International Space Station – 17

ROTATIONAL SPECTRA
Measurement and Simulation of Spontaneous Raman Scattering Spectra in High-Pressure, Fuel-Rich H2-Air Flames – 43

ROTOR AERODYNAMICS
Aerodynamic Design Study of an Advanced Active Twist Rotor – 7

ROTOR BLADES (TURBOMACHINERY)
Aerodynamic Design Study of an Advanced Active Twist Rotor – 7

ROTOR DYNAMICS
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

ROTORS
Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

ROUTES
Quality of Service Routing in Tactical Mobile Ad Hoc Networks – 56

ROVING VEHICLES
Evaluation of Candidate Materials for a High-Temperature Stirling Convertor Heater Head – 45

RUBBER
Influence of Rubber Honeycomb on Shock Response – 164

Testing of the Joining Rubber Metal of Ultrasound Silencing Devices – 91

RUNWAYS
Recent Advances in Matting Technology for Military Runways – 14

SABOT PROJECTILES
A Simple Transverse Motion Detector for Railguns – 80

SAFETY
Lawrence Livermore National Laboratory Site Specific Standard for Nonnuclear Safety Analysis – 136
Scoping Inventory Calculations for the Rare Isotope Accelerator – 181

SALINITY
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

SAMPLING
2003 DTIC Customer Satisfaction Survey Report – 202

SATELLITE ATTITUDE CONTROL
Control of the Laser Interferometer Space Antenna – 205

SATELLITE CONSTELLATIONS
Accessing and Understanding MODIS Data – 120

SATELLITE IMAGERY
NASA IKONOS Characterization Methodologies – 94
Satellite Hyperspectral Imaging Simulation – 95

SATELLITE NETWORKS
A CDMA Spotbeam Architecture for the Next Generation Satellite System (NGSS) for the Aeronautical Telecommunications Network (ATN) – 59
Securing Mobile Networks in an Operational Setting – 156

SATELLITE OBSERVATION
TerraHertz Free Electron Laser Applications for Satellite Remote Sensing – 83
Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models – 123

SCALARS
A Self-Contained Mapping Closure Approximation for Scalar Mixing – 71

SCALING LAWS
Fragmentation under the Scaling Symmetry and Turbulent Cascade with Intermittency – 75

SCANNING ELECTRON MICROSCOPY
Construction of a Virtual Scanning Electron Microscope (VSEM) – 191

SCATTERING
Approximating the Helium Wavefunction in Positronium-Helium Scattering – 173
Effect of Scattering on the Combined Reflection and Thermal Radiation Emission of a Typical Semitransparent TBC Material – 161
Quantum Dynamics Scattering Study of AB+CDE Reactions: A Seven Dimensional Treatment for the H2+C2H Reaction – 33

SCATTEROMETERS
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

SCHEDULING
Optimal Scheduling With Flexible Resources – 162

SCIENTIFIC VISUALIZATION
FY 2002 Report on Software Visualization Techniques for IV and V – 145

SCINTILLATION
Polar Cap Dynamics and Formation of High-Latitude Ionospheric Irregularities – 104
Validation of Ionospheric Models – 105

SCREECH TONES
Computing Axisymmetric Jet Screech Tones using Unstructured Grids – 179

SEA ICE
Modeling and Observational Study of the Global Atmospheric Impacts of Antarctic Sea Ice Anomalies – 113

SEA OF OKHOTSK
The Okhotsk Sea Kashevarov Bank Polynya: Its Dependence on Diurnal and Fortnightly Tides and its Initial Formation – 110

SEA SURFACE TEMPERATURE
Accessing and Understanding MODIS Data – 120
On the Cause of the 1930s Dust Bowl – 113

SEALING
Advanced Control Surface Seal Development for Future Space Vehicles – 86

SEALS (STOPPERS)
Investigations of High Pressure Acoustic Waves in Resonators with Seal-like Features – 180

SEAS
Direct Path Fluctuations Due to Shallow Water Volume Variability – 176
Moored Observations of Internal Solitions in the Northeastern South China Sea – 73
The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation – 177

SECURITY
A National MagLev Transportation System – 203
Air Cargo Security, Updated September 11, 2003. CRS Report for Congress – 3
Batteryless Sensor for Intrusion Detection and Assessment of Threats – 79

SEGMENTS
K-Means Re-Clustering Algorithmic Options with Quantifiable Performance Comparisons – 141

SEISMOGRAMS
Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset – 199

SEISMOLOGY
Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska – 93

SEMANTICS
Semantic Metrics for Object Oriented Design – 158

SEMICONDUCTOR LASERS
Low Temperature Alpha Measurement – 84

SEMICONDUCTORS (MATERIALS)
Development and Application of Molecular- Resolution Chemically-Sensitive Nanotube Probes – 36
Ge Semiconductor Devices for High-Performance Cryogenic Power Electronics – 60

SENSITIVITY
Comparative NIR Detector Characterization for NGST – 78
The Soft Excess Emission in the Hercules Supercluster Observed with the ROSAT Position Sensitive Proportional Counter – 204

SENSORS
An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications – 166
Software for Preprocessing Data From Rocket-Engine Tests – 146
The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

SEPARATION
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48
Supercritical Carbon Dioxide-Soluble Ligands for Extracting Actinide Metal Ions from Porous Solids – 31

SHADOWGRAPH PHOTOGRAPHY
Mass Calculations from X-Ray Shadowgraphs Using Image Processing – 81

SHALLOW WATER
Direct Path Fluctuations Due to Shallow Water Volume Variability – 176
Low-Frequency Shallow Water Reverberation and Bottom Scattering Model – 176

SHAPE MEMORY ALLOYS
Preliminary Sizings for an Integrated SME Actuator System for the STAR system – 85

SHAPED CHARGES
Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

SHEAR STRESS
Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

SHELLS (STRUCTURAL FORMS)
Investigation of Explosively Driven Fragmentation of Metals-Two=Dimensional Fracture and Fragmentation of Metal Shells: Progress Report II – 175

SHIELDING
Passive Superconducting Shielding: Experimental Results and Computer Models – 145

SHIP HULLS
Risk Analysis LC-Frigate Shock Trials: Some Preliminary Analyses – 91

SHOCK RESISTANCE
Risk Analysis LC-Frigate Shock Trials: Some Preliminary Analyses – 91

SHOCK TESTS
Risk Analysis LC-Frigate Shock Trials: Some Preliminary Analyses – 91

SHOCK WAVES
Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

Numerical Simulations of Shock-Induced Mixing and Combustion – 76

Risk Analysis LC-Frigate Shock Trials: Some Preliminary Analyses – 91

SIBERIA
Wildfires Dynamics in Mid-Siberian Larch Dominated Communities – 95

SIGNAL DETECTORS
Leak and Pipe Detection Method and System – 59

SIGNAL PROCESSING
A 10-Bit 10 GSPS Optical ADC for Radar Signal Processing – 144

A New Approach to Blind Channel Identification for OFDM Systems – 149

Detection of Randomness in Sparse Data Set of Three Dimensional Time Series Distributions – 161

Improved Air Combat Awareness; with AESA and Next- Generation Signal Processing – 7

Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset – 199

Modern Techniques in Acoustical Signal and Image Processing – 139

Multi-Dimensional Signal Processing for Sparse Radar Arrays – 63

Power Consumption of Customized Numerical Representations for Audio Signal Processing – 162

Short Vector SIMD Code Generation for DSP Algorithms – 162

SIGNAL TRANSMISSION
Small Signal Modelling and Control of the Hydrogen Mixer for Facility E1 – 61

SIGNATURES
Dying Pulse Trains in Cygnus XR-1: Initial Results of X-Ray Searches – 214

SILICON ALLOYS
Process for Producing a Cast Article from a Hypereutectic Aluminum-Silicon Alloy – 44

SILICON CARBIDES
Comparison of Matrix Cracking in Melt-Infiltrated SiC/SiC Composites with 3D and 2D-Woven Orthogonal Architectures – 29

High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

Matrix Cracking in 3D Orthogonal Melt-Infiltrated SiC/SiC Composites with Various Z-Fiber Types – 30

Matrix Cracking in Four Different 2D SiC/SiC Composite Systems – 31

X-37 C-Sic CMC Control Surface Components Development [Status of the NASA/Boeing/USAF Orbital Vehicle and Related Efforts] – 49

SILICON COMPOUNDS
Ge Semiconductor Devices for High-Performance Cryogenic Power Electronics – 60

SiGe Quantum Well Infrared Photodetectors (QWIPs) for Remote Sensing Applications – 80

SILICON DIOXIDE
In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols – 180

Recent Advances in Optical Switches Using Silica-based PLC Technology – 189

SILICON NITRIDES
Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 214

SIMPLIFICATION
Simplifying a Lifted Plan Graph Using Domain Splitting – 142

SIMULATION
Atomistic Simulation of Dislocation-Defet Interactions in Cu – 44

Global Information Enterprise Simulation Laboratory (GIESIM LAB) – 54

Mixed Electromagnetic and circuit Simulations using Higher-Order Elements and Bases – 171

Remote Sensing System Requirements Development: A Simulation-Based Approach – 97

Simulation of Inviscid Compressible Multi-Phase Flow with Condensation – 72

The Role of Haptics in Service Manual Task Validation – 55

Training Effectiveness Evaluation of the Full Spectrum Command Game – 148

SINGLE CRYSTALS
Investigations of the Electronic Properties and Surface Structures of Aluminum-Rich Quasicrystalline Alloys – 32

SIZE (DIMENSIONS)
Preliminary Sizings for an Integrated SME Actuator System for the STAR system – 85

SMALL SATELLITE TECHNOLOGY
HAN-Based Monopropellant Technology Development – 23

SMART MATERIALS
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

SNOW
Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

SODIUM PEROXIDES
Recovery of Plutonium from Refractory Residues Using a Sodium Peroxide Pretreatment Process – 33

SODIUM
Factors Related to Nonadherence of a Low Sodium Diet in Heart Failure Patients – 133

SOFTWARE DEVELOPMENT TOOLS
Embedded High Performance Scalable Computing Systems – 150

SOFTWARE ENGINEERING
Cold Air Data Acquisition System Documentation – 134

FY 2002 Report on Software Visualization Techniques for IV and V – 145

Joint Battlespace Infosphere Repository Prototype – 201

Semantic Metrics for Object Oriented Design – 158

Technical Design for the TTA Component of the 120mm HE C2 Mortar Ammunition – 153

SOFTWARE RELIABILITY
Real-Time Embedded Software Verification and Validation 2001 – 22

SOFTWARE REUSE
PROTEUS: Assessment and Adaptation Through Dynamic Architecture Technology – 151

SOIL MAPPING
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

SOIL MOISTURE
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

SOLAR ARRAYS
Experimental Study of Arcing on High-Voltage Solar Arrays – 19

New NASA SEE LEO Spacecraft Charging Design Guidelines: How to Survive in LEO Rather Than GEO – 18

Solar Array in Simulated LEO Plasma Environment – 195

SOLAR CELLS

Historical Precision of an Ozone Correction Procedure for AMO Solar Cell Calibration – 99

SOLAR COLLECTORS

Durability of Polymeric Glazing Materials for Solar Applications – 98

SOLAR CORONA

Contraints on Solar Wind Plasma Properties Derived from Coordinated Coronal Observations – 223

SOLAR COSMIC RAYS

Space Weather Effects: Decay Phases in Gradual and Impulsive Solar Energetic Particle Events – 215

SOLAR CYCLES

New NASA SEE LEO Spacecraft Charging Design Guidelines: How to Survive in LEO Rather Than GEO – 18

Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21 – 225

The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

SOLAR ENERGY

Civilian Power from Space in the Early 21st Century – 98

SOLAR FLARES

Solar Flares, Type III Radio Bursts, CMEs, and Energetic Particles – 218

Space Weather Effects: Decay Phases in Gradual and Impulsive Solar Energetic Particle Events – 215

SOLAR INSTRUMENTS

Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21 – 225

SOLAR INTERIOR

Local Helioseismology: A New Window into the Sun – 223

SOLAR MAGNETIC FIELD

Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21 – 225

SOLAR PHYSICS

Ionospheric Sensor Developments for the Year-2000 Solar Maximum – 15

SOLAR POWERED AIRCRAFT

Initial Feasibility Assessment of a High Altitude Long Endurance Airship – 6

SOLAR PROTONS

The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

SOLAR SAILS

Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

SOLAR SPECTROMETERS

Upgrade of the Aerial Guidance system for Automatic High Time and Spectral Resolution Solar Radio Observations at the Astrophysical Institute Potsdam – 216

SOLAR WIND

Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

Contraints on Solar Wind Plasma Properties Derived from Coordinated Coronal Observations – 223

Narrow Scale Flow and a Weak Field by the Top of Earth's Core: Evidence from Orsted, Magsat and Secular Variation – 222

SOLID ELECTROLYTES

Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties – 37

SOLID MECHANICS

Significance of Strain in Formulation in Theory of Solid Mechanics – 90

SOLID STATE LASERS

Experimental Operations and Support for LITE – 84

SOLID STATE

Modern Trends in Induction Accelerator Technology – 175

Solid State THz Sources – 66

SOLID WASTES

Compaction of Space Mission Wastes – 137

SONAR

Seabed Attenuation Estimated From Chirp Sonar Data Collected Along Acoustic Propagation Lines During ASIAEX in the South China Sea – 177

Technical Report on Inversion of the First RUMBLE Sea Trial Data – 122

SONOLUMINESCENCE

Sonoluminescence Bubble Measurements using Vision-Based Algorithms – 159

SOOT

Black Carbon Measurements in SOLVE-2 – 78

SOUND WAVES

Design of a System for Active Echo-Cancellation – 56

Investigations of High Pressure Acoustic Waves in Resonators with Seal-like Features – 180

SPACE COMMERCIALIZATION

Highlights: US Commercial Remote Sensing Industry Analysis – 198

Hyperspectral Imaging on the International Space Station: An Innovative Approach to Commercial Development of Space – 197

Scientific Data Purchase Project Overview Presentation – 94

SPACE EXPLORATION

Design Space Exploration and Optimization of Embedded Cache Systems via a Compiler – 149

Meeting NASA's Mission Through Commercial Partnerships – 225

Mission Steering Profiles of Outer Planetary Orbiters Using Radioisotope Electric Propulsion – 15

Strategic Research Directions in Microgravity Materials Science – 221

SPACE INFRARED TELESCOPE FACILITY

Studies of Circumstellar Disk Evolution – 212

SPACE MAINTENANCE

USAF Training Extract, AFSC 2MOX2 - Active Duty, Missile & Space Systems Maintenance, Active Duty, OSSN 2522 – 14

SPACE MISSIONS

Compaction of Space Mission Wastes – 137

Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

Formation Control of the MAXIM L2 Libration Orbit Mission – 205

Spacecraft Formation Design Near the Sun-Earth L(sub 2) Point – 18

SPACE PLASMAS

Experimental Study of Arcing on High-Voltage Solar Arrays – 19

The Nonlinear Coupling of Alfven and Lower Hybrid Waves in Space Plasma – 193

SPACE SHUTTLE BOOSTERS

Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

SPACE SHUTTLES

Evaluation of the Space Shuttle Transatlantic Abort Landing Atmospheric Sounding System – 16

Tests of the Contamination Analysis Unit, Phase 2 – 21

SPACE TRANSPORTATION

High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

SPACE WEATHER

Combined Svalbard Optical and Radar Observations for Polar Cusp/Cap Research – 105

Space Weather Effects: Decay Phases in Gradual and Impulsive Solar Energetic Particle Events – 215

Space Weather Effects on Spacecraft Systems – 204

SPACEBORNE PHOTOGRAPHY

A Precision Metrology System for the Hubble Space Telescope Wide Field Camera 3 Instrument – 77

SPACEBORNE TELESCOPES
NASA's Far-IR/Submillimeter Roadmap Missions SAFIR and SPECS – 191

Twenty Meter Space Telescope Based on Diffractive Fresnel Lens – 205

SPACECRAFT CHARGING
New NASA SEE LEO Spacecraft Charging Design Guidelines: How to Survive in LEO Rather Than GEO – 18

SPACECRAFT CONTROL
A Study on the Effects of J2 Perturbations on a Drag-Free Control System for Spacecraft in Low Earth Orbit – 97

An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft – 20

SPACECRAFT LANDING
Evaluation of the Space Shuttle Transatlantic Abort Landing Atmospheric Sounding System – 16

SPACECRAFT MOTION
Relative Motion of Two Spacecraft Near the Sun-Earth L2 Point – 82

SPACECRAFT ORBITS
Formation Control of the MAXIM L2 Libration Orbit Mission – 205

Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment – 16

SPACECRAFT PROPULSION
Program Research and Announcement PRDA 04-01-PKT Integrated High Payoff Rocket Propulsion Technology XI (IHPRPT) – 22

SPACECRAFT STRUCTURES
Space Weather Effects on Spacecraft Systems – 204

SPACECRAFT TRACKING
A Study on the Effects of J2 Perturbations on a Drag-Free Control System for Spacecraft in Low Earth Orbit – 97

SPACECRAFT TRAJECTORIES
Mission Steering Profiles of Outer Planetary Orbiters Using Radioisotope Electric Propulsion – 15

Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment – 16

SPACE-TIME FUNCTIONS
On the Computation of Space-Time Correlations by Large-Eddy Simulation – 70

SPATIAL DISTRIBUTION
Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections – 224

SPATIAL RESOLUTION
Motions and Initial Conditions in Star-Forming Dense Cores – 216

SPECIFIC IMPULSE
Ion Species Fractions in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters – 10

SPECIFICATIONS
Validation of Ionospheric Models – 106

SPECTRAL BANDS
Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data – 187

Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

SPECTRAL REFLECTANCE
Accessing and Understanding MODIS Data – 120

SPECTRAL RESOLUTION
The Constellation-X Observatory – 182

SPECTRAL SENSITIVITY
Symmetric Waveguide Orthomode Junctions – 213

SPECTRAL SIGNATURES
Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections – 224

SPECTRA
The Tropical Convective Spectrum – 107

SPECTROMETERS
Comparative NIR Detector Characterization for NGST – 78

SPECTROPHOTOMETRY
[Calibration, Analysis, and Interpretation of SERTS and EUNIS Observation] – 192

Spectroscopy and Photometry of Mars Trojans – 208

SPECTROSCOPIC ANALYSIS
Package for Interactive Analysis of Line Emission (Analysis of UV-X-Ray High-Resolution Emission Spectra) – 188

SPECTROSCOPY
8TH International Meeting on Hole Burning Single Molecule and Related Spectroscopies: Science and Applications – 37

Spectroscopy and Photometry of Mars Trojans – 208

Technology Development of Miniaturized Far-Infrared Sources for Biomolecular Spectroscopy – 35

SPECTRUM ANALYSIS
In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols – 180

SPHERICAL COORDINATES
Volume Rendering for Curvilinear and Unstructured Grids – 170

SPHERICAL WAVES
Simulation of a Spherical Wave Experiment in Marble Using a Multidirectional Damage Model – 25

SPIN
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

SPREAD SPECTRUM TRANSMISSION
Low-Power Direct-Sequence Spread-Spectrum Modem Architecture for Distributed Wireless Sensor Networks – 56

STABILITY
CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

Linear State-Space Representation of the Dynamics of Relative Motion, Based on Restricted Three Body Dynamics – 18

New Type of the Interface Evolution in the Richtmyer-Meshkov Instability – 69

Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

Theoretical and Experimental Investigation of the Stability of an Evaporating Constrained Vapor Bubble – 72

STAGE SEPARATION
Hyper-X Stage Separation Trajectory Validation Studies – 19

STANDARD DEVIATION
Observation of the Decay Beta(sup 0) approximately Tau(sup 0)Tau(sup 0) – 172

STANDARDIZATION
Assessment and Testing of the GODAE Products – 121

Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 159

STANDARDS
IS0 9000 Implementation and Assessment: A Guide to Developing and Evaluating Quality Management Systems – 225

STAR CLUSTERS
Coronal Activity in Low-Mass Pre-Main Sequence Stars: NGC 2264 – 207

STAR FORMATION
Motions and Initial Conditions in Star-Forming Dense Cores – 216

NASA's Far-IR/Submillimeter Roadmap Missions SAFIR and SPECS – 191

STARBURST GALAXIES
Discovery of an Obscured Supernova in Arp 299 – 211

STATIONKEEPING

A Comprehensive Survey of Earth-Moon Libration Orbits: Stationkeeping Strategies And Intra-Orbit Transfers – 15

STELLAR CORONAS

Chemical Compositions and Abundance Anomalies in Stellar Coronae ADP 99 – 216

STELLAR EVOLUTION

Coronal Activity in Low-Mass Pre-Main Sequence Stars: NGC 2264 – 207

The Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) – 210

STELLAR MASS

Coronal Activity in Low-Mass Pre-Main Sequence Stars: NGC 2264 – 207

Dying Pulse Trains in Cygnus XR-1: Initial Results of X-Ray Searches – 214

STIRLING CYCLE

Evaluation of Candidate Materials for a High-Temperature Stirling Convertor Heater Head – 45

STORAGE RINGS (PARTICLE ACCELERATORS)

Measurement of B(D0 -> K-pi+ pi0)/B(D0 -> K- pi+) – 171

STRAIN GAGE BALANCES

Structural Integrity of a Wind Tunnel Balance – 91

STRAIN RATE

Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska – 93

STRATOSPHERE

A Wavelet based Suboptimal Kalman Filter for Assimilation of Stratospheric Chemical Tracer Observations – 165

Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

STRESS ANALYSIS

Computation of Transverse Injection Into Supersonic Crossflow With Various Injector Orifice Geometries – 10

Computational Study of Axisymmetric Off-Design Nozzle Flows – 2

STRESS-STRAIN RELATIONSHIPS

Matrix Cracking in Four Different 2D SiC/SiC Composite Systems – 31

STRUCTURAL ANALYSIS

Crystal Level Model for Phase Transformation Allowing for Large Volume Changes – 26

Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications – 7

STRUCTURAL ENGINEERING

Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

STRUCTURAL RELIABILITY

Structural Integrity of a Wind Tunnel Balance – 91

STRUCTURAL STRAIN

Significance of Strain in Formulation in Theory of Solid Mechanics – 90

STRUCTURED GRIDS (MATHEMATICS)

Wind-US Flow Calculations for the M2129 S-Duct Using Structured and Unstructured Grids – 68

SUBASSEMBLIES

Passive Isolators for use on the International Space Station – 17

SUBDUCTION (GEOLOGY)

Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska – 93

SUBMARINES

Elastomeric Ejection System with Acoustically Improved Check Valve – 85

Rotating Feeler Gage – 55

SUBMILLIMETER WAVES

Optical Properties of Zitex in the Infrared Submillimeter – 192

Symmetric Waveguide Orthomode Junctions – 213

The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

The Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) – 210

SUBSTITUTES

The Role of Haptics in Service Manual Task Validation – 55

SUBSTRATES

Proposed Specification of EUVL Mask Substrate Roughness – 67

Wide Band Gap Semiconductor Technology Initiative – 196

SULFATES

Corrosion Mechanisms of UNS N04400 in Sea Water – 35

Determination of Nickel, Nickel Chloride Hexahydrate and Boric Acid in Nickel Sulfamate Plating Solutions by Titration – 39

SULFURIC ACID

Automatic Coulometric Titration of Sulfuric Acid in Chromium Plating Solutions – 40

Determination of Sulfuric Acid in Chromium Plating Solutions Using Gravimetric Analysis – 40

Heterogeneous Interactions of Acetaldehyde and Sulfuric Acid – 33

Utilization of Ion Chromatography and Statistics to Determine Important Acids in Chromium Plating and Electropolishing Solutions – 38

SULFUR

Logistic Fuel Processor Development – 52

Sulfur Mustard Damage to Cornea With Emphasis on Skin: Preventative Studies – 127

X-Ray Fluorescence On-Stream Analysis of Standard Reference Solution Concentrations of Chromium Plating and Polishing Solutions – 40

SUNLIGHT

Sensitivity Studies for Space-based Measurements of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight – 108

SUN

Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

SUPERCONDUCTORS (MATERIALS)

Astro-E2 Magnesium Diboride High Current Leads – 195

Passive Superconducting Shielding: Experimental Results and Computer Models – 145

SUPERCOOLING

Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

SUPERHIGH FREQUENCIES

Preliminary Analysis of X-Band and Ka-Band Radar for Use in the Detection of Icing Conditions Aloft – 5

SUPERLATTICES

Highly Ordered Carbon Nanotube Arrays and Nanotube- Polymer Nanocomposite Superlattices for Full-Color Sensing and Coating – 39

SUPERNOVA REMNANTS

How Can The SN-GRB Time Delay Be Measured? – 218

Uncovering the Properties of Young Neutron Stars and their Surrounding Supernova Remnants – 212

SUPERNOVAE

Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Discovery of an Obscured Supernova in Arp 299 – 211

SUPERSONIC INLETS

Active Control of Integrated Inlet/Compression Systems – 73

SURFACE LAYERS

Investigations of the Electronic Properties and Surface Structures of Aluminum-Rich Quasicrystalline Alloys – 32

SURFACE NAVIGATION

Arctic Shoreline Delineation & Feature Detection Using RADARSAT-1 Interferometry: Case Study Over Alert – 97

SURFACE ROUGHNESS

Proposed Specification of EUVL Mask Substrate Roughness – 67

Rough-Wall Channel Analysis Using Suboptimal Control Theory – 74

SURGES
Phenomena Associated With EIT Waves – 218

SURVEYS
2003 DTIC Customer Satisfaction Survey Report – 202

Conditions of Internet Kiosks in Medan, Makassar, Bandung, Jogja and Jakart Suburban. A Survey Report in Both English and Indonesian – 141

FY 2003 Top 200 Users Survey Report – 201

Highlights: US Commercial Remote Sensing Industry Analysis – 198

Seeing Red and Shooting Blanks: A Study of Red Quasars and Blank Field X-Ray Sources – 210

Uncovering the Properties of Young Neutron Stars and their Surrounding Supernova Remnants – 212

SWITCHING
Monolithically Integrated 64-channel WDM Channel Selector – 63

Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 150

SYMBIOTIC STARS
Outbursts in Symbiotic Binaries – 217

RR Tel: Getting under the Flux Limit - An Observation with FUSE – 216

SYMMETRY
Fragmentation under the Scaling Symmetry and Turbulent Cascade with Intermittency – 75

Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

SYNCHRONISM
Multi-h CPM Synchronization in Military Channels Phase 2: A Simulation Framework – 58

Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 150

SYNTHESIS (CHEMISTRY)
Efficient Synthesis of 4,8-Ditoluoyl-1,5-Dihydroxynaphthalene – 42

SYNTHESIS GAS
Kinetic Understanding of the Syngas-to-DME Reaction System and It's Implications to Process and Economics – 32

SYNTHETIC APERTURE RADAR
Experimental Investigations on the Distortion of ISAR Images Using Different Radar Waveforms – 57

Signal Processing Architectures for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Applications – 80

System Level Applications of Adaptive Computing (SLAAC) – 156

SYSTEM FAILURES
Completing the Loop: Linking Software Features to Failures – 144

SYSTEMS ANALYSIS
Overview of MSI Evaluation Methodology for Systems Development – 136

SYSTEMS ENGINEERING
Image Systems Using RFID Tag Positioning Information – 159

Merlot Design – 139

NASA Scientific Data Purchase Laboratory Characterization of Positive Systems ADAR 5500 Sensor – 95

Overview of MSI Evaluation Methodology for Systems Development – 136

Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

Unitized Regenerative Fuel Cell System Development – 98

SYSTEMS HEALTH MONITORING
Health Monitoring of RLV Airframe Structures – 87

Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

System Modeling and Diagnostics for Liquefying-Fuel Hybrid Rockets – 167

SYSTEMS SIMULATION
Hyper-X Stage Separation Trajectory Validation Studies – 19

T TAURI STARS
Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics – 13

Studies of Circumstellar Disk Evolution – 212

TACTICS
Reference Document for Management of Tactical Infrastructure Networks – 156

TANTALUM
Molecular Dynamics Study of Void Growth and Dislocations in Dynamic Fracture of FCC and BCC Metals – 169

TARGET ACQUISITION
Asteroid Search with Advanced Detection Algorithms – 206

TARGET RECOGNITION
(Sigma)QL: A Decision Support Tool for Target Recognition in a Multisensor Environment – 187

TARGETS
Gas Ionization by Beam Electron Collisions and by Electron Avalanching in the Self Ez Field of a 2 kA Relativistic Electron Beam Focused on a Conducting Target – 172

Preliminary Design Review: Kinematic Tracking for the PCA Integrated Radar-Tracker Application – 155

TAXONOMY
The Role of Haptics in Service Manual Task Validation – 55

The Tropical Convective Spectrum – 107

TECHNOLOGIES
For Further Innovation – 166

TECHNOLOGY ASSESSMENT
All Fiber Technology for High-Energy Petawatt Front End Laser Systems – 186

Alternate Energy Sources for Thermoplastic Binding Agent Consolidation – 172

Computer Generated Forces: Future Needs – 143

Human Behaviour Representation: Relevant Technologies and their Development – 135

IS0 9000 Implementation and Assessment: A Guide to Developing and Evaluating Quality Management Systems – 225

Recent Progress in Optical Switching Device Technologies in NTT – 189

Status Report and Lessons Learned from the Univ. of Arizona NMSD – 187

TECHNOLOGY TRANSFER
Computer Generated Forces: Background, Definition and Basic Technologies – 157

Is Telkom-Flexi the New Telkom-Instan: Can it Level the Playing Field and Bridge the Digital Divide – 141

Why are Some e-Government Programs More Successful than Others. The Relevance of Performance Evaluations to Regional e-Government Preparations in Indonesia – 142

TECHNOLOGY UTILIZATION
A High Efficiency DC Bus Regulator/RPC for Spacecraft Applications – 65

Advanced Control Surface Seal Development for Future Space Vehicles – 86

Biologically Inspired Micro-Flight Research – 9

Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions – 159

Modern Trends in Induction Accelerator Technology – 175

NASA's Management and Utilization of the Small Business Innovative Research (SBIR) Program – 199

Scalable Content Delivery Technology – 155

Technology Development of Miniaturized Far-Infrared Sources for Biomolecular Spectroscopy – 35

TECTONICS
Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska – 93

TELECOMMUNICATION
A New Approach to Blind Channel Identification for OFDM Systems – 149
Is Telkom-Flexi the New Telkom-Instan: Can it Level the Playing Field and Bridge the Digital Divide – 141
Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 159

TELEMETRY
Decision Feedback Equalization Pre-Processor with Turbo Equalizer – 179
Wireless Link Design Using a Patch Antenna – 56

TELEOPERATORS
Robot Acquisition of Active Maps Through Teleoperation and Vector Space Analysis – 160

TELESCOPES
Characterization of Adaptive Optics at Keck Observatory – 220
Control of the Laser Interferometer Space Antenna – 205
Optical Spectra of Extrasolar Giant Planets – 206
Phenomena Associated With EIT Waves – 218
The Beauty and Limitations of 10 Micron Heterodyne Interferometry (ISI) – 208

TEMPERATURE CONTROL
Unitized Regenerative Fuel Cell System Development – 98

TEMPERATURE DEPENDENCE
Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

TEMPERATURE DISTRIBUTION
Unfolding of Proteins: Thermal and Mechanical Unfolding – 71

TEMPERATURE MEASUREMENT
Cold Air Data Acquisition System Documentation – 134
Depth-Penetrating Temperature Measurements of Thermal Barrier Coatings Incorporating Thermographic Phosphors – 42

TEMPERATURE MEASURING INSTRUMENTS
Instrument for Measuring Temperature of Water – 77
Radiant Temperature Nulling Radiometer – 78
Wireless Temperature-Monitoring System – 61

TEMPERATURE SENSORS
Wireless Temperature-Monitoring System – 61

TEMPERATURE
High Dynamic Pressures and Modest Temperatures: A Broad Perspective and Bridging the Gap – 32

TEMPLATES
Monolithic Compiler Experiments Using C++ Expression Templates – 149

TEMPORAL RESOLUTION
Temporal Characterization of Aircraft Noise Sources – 178

TENSILE STRESS
Comparison of Matrix Cracking in Melt-Infiltrated SiC/SiC Composites with 3D and 2D-Woven Orthogonal Architectures – 29

TENSORS
Tensor Fields for Use in Fractional-Order Viscoelasticity – 161

TERRESTRIAL PLANETS
A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy – 222
Spectroscopy and Photometry of Mars Trojans – 208
Studies of Planet Formation Using a Hybrid N-Body + Planetesimal Code – 221

TEST FACILITIES
Fault Tolerant Magnetic Bearing Testing and Conical Magnetic Bearing Development for Extreme Temperature Environments – 86
Mechanical Components Branch Test Facilities and Capabilities – 86
NASA GRC High Power Electromagnetic Thruster Program – 23
Small Signal Modelling and Control of the Hydrogen Mixer for Facility E1 – 61

TEST STANDS
Computer Microvision for Microelectromechanical Systems (MEMS) – 65
Test Stand for Linear Induction Accelerator Optimization – 171

THEMATIC MAPPERS (LANDSAT)
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

THEOREMS
Simple Instability Criteria for a Family of Complex-Coefficient Polynomials – 163

THERMAL BUCKLING
Thermal Buckling Analysis of Rectangular Panels Subjected to Humped Temperature Profile Heating – 89

THERMAL CONDUCTIVITY
Solid State THz Sources – 66
Thermal Conductivity of Alumina-Toughened Zirconia Composites – 30

THERMAL CONTROL COATINGS
Depth-Penetrating Temperature Measurements of Thermal Barrier Coatings Incorporating Thermographic Phosphors – 42
Effect of Scattering on the Combined Reflection and Thermal Radiation Emission of a Typical Semitransparent TBC Material – 161

THERMAL DECOMPOSITION
Thermal Decomposition of New and Aged LX-04 and PBX 9501 – 25

THERMAL ENERGY
The Interaction of Hot and Cold Gas in the Disk and Halo of Galaxies – 212

THERMAL ENVIRONMENTS
Relative Motion of Two Spacecraft Near the Sun-Earth L2 Point – 82

THERMAL EXPANSION
Molybdenum-Copper Composite Material – 28

THERMAL STABILITY
Molecular Dynamics Simulations of Coulomb Explosion – 170

THERMOCAPILLARY MIGRATION
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 189

THERMOCHEMISTRY
Analytic Modeling and Experimental Validation of Intumescent Behavior of Charring Heatshield Materials – 196

THERMODYNAMIC PROPERTIES
Modeling and Validation of a Propellant Mixer for Controller Design – 24

THERMODYNAMICS
Analytic Modeling and Experimental Validation of Intumescent Behavior of Charring Heatshield Materials – 196
Assessment and Testing of the GODAE Products – 121
Simulation of a Spherical Wave Experiment in Marble Using a Multidirectional Damage Model – 25
Ultra-High Temperature Ceramic Composites for Leading Edges – 29

THERMOGRAPHY
Depth-Penetrating Temperature Measurements of Thermal Barrier Coatings Incorporating Thermographic Phosphors – 42

THERMOGRAVIMETRY
Investigation of Exothermic Grinding Sludge Produced from Watervliet Arsenal Gun Steels, Andersol Water- Based Cutting Fluid and Cincinnati Milacron Aluminum Oxide Resin Bond Grinding Wheels – 39

THERMOPLASTICITY
Alternate Energy Sources for Thermoplastic Binding Agent Consolidation – 172
Preparation of Propellants Adapted for ETC and Polymeric Matrix for ADN-Based Propellants – 52

THERMOREGULATION
Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications – 132

THERMOSPHERE
Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107
Validation of Ionospheric Models – 210

THESES
Compilation of Theses Abstracts – 203

THICK PLATES
Recent Advances in the Development of Thick-Section Melt-Infiltrated C/SiC Composites – 29

THIN FILMS
Magneto-Optically Guided and Fully Ionized Metal/Carbon Arc Plasma Source for Thin Film Coatings to Control, Wear, and Fretting – 27

Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

Wide Band Gap Semiconductor Technology Initiative – 196

THREAT EVALUATION
Batteryless Sensor for Intrusion Detection and Assessment of Threats – 79

THREE BODY PROBLEM
Linear State-Space Representation of the Dynamics of Relative Motion, Based on Restricted Three Body Dynamics – 18

THREE DIMENSIONAL FLOW
Wind-US Flow Calculations for the M2129 S-Duct Using Structured and Unstructured Grids – 68

THREE DIMENSIONAL MODELS
3D Computations and Experiments – 194

Grid-Independent Large-Eddy Simulation in Turbulent Channel Flow using Three-Dimensional Explicit Filtering – 70

Modeling Primary Breakup: A Three-Dimensional Eulerian Level Set/Vortex Sheet Method for Two-Phase Interface Dynamics – 75

THRUST BEARINGS
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

THRUSTORS
Multimegawatt Quasi-Steady MPD Thruster Facility – 23

Proposal for Testing and Validation of Vacuum Ultra-Violet Atomic Laser-Induced Fluorescence as a Method to Analyze Carbon Grid Erosion in Ion Thrusters – 25

THYRISTORS
High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

TIDES
Tides and Decadal Variability – 120

TIME DEPENDENCE
Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

TIME DOMAIN ANALYSIS
Broadband Trailing Edge Noise Predictions in the Time Domain – 180

TIME LAG
How Can The SN-GRB Time Delay Be Measured? – 218

TIME MEASUREMENT
Simultaneous X-Ray and Optical Timing Observations of GX 339-4 – 184

TIME SERIES ANALYSIS
Detection of Randomness in Sparse Data Set of Three Dimensional Time Series Distributions – 161

TIME TEMPERATURE PARAMETER
Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

TITANIUM ALLOYS
Durability Assessment of Gamma TiAl – 47

Extrusion Based Processing of Ti Alloys: Feasibility Study – 47

Suppression of Material Failure Modes in Titanium Armors – 47

TITANIUM ALUMINIDES
Durability Assessment of Gamma TiAl – 47

TITANIUM
Engineering Titanium for Improved Biological Response – 43

TITRATION
Laboratory Automatic Titration of Chromium Plating and Electropolishing Solutions – 39

TOOLS
Seal Ring Installation – 85

TOPOGRAPHY
A High Resolution, Three-Dimensional, Computationally Efficient, Diagnostic Wind Model: Initial Development Report – 115

The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters – 10

TOPOLOGY
Robot Acquisition of Active Maps Through Teleoperation and Vector Space Analysis – 160

Securing Mobile Networks in an Operational Setting – 156

TOTAL OZONE MAPPING SPECTROMETER
Discoveries about Tropical Ozone from Satellite and SHADOZ (Southern Hemisphere ADditional Ozonesondes) – 114

TOXIC HAZARDS
Toxic Hazards Tests for Vehicles and Other Equipment – 102

TOXICITY
Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

Sulfur Mustard Damage to Cornea With Emphasis on Skin: Preventative Studies – 127

TRACKING (POSITION)
A Simple Transverse Motion Detector for Railguns – 80

Tracing the Magnetic Field in Orion A – 217

TRADEOFFS
Aircraft Optimization for Minimum Environmental Impact – 8

Tradeoffs in Polarimeter Design – 203

TRAILERS
Computational Simulation of a Heavy Vehicle Trailer Wake – 1

TRAILING EDGES
Broadband Trailing Edge Noise Predictions in the Time Domain – 180

TRAINING ANALYSIS
USAF Training Extract, AFSC 2MOX2 - Active Duty, Missile & Space Systems Maintenance, Active Duty, OSSN 2522 – 14

TRAINING EVALUATION
Training Effectiveness Evaluation of the Full Spectrum Command Game – 148

TRAJECTORIES
Hyper-X Stage Separation Trajectory Validation Studies – 19

TRAJECTORY OPTIMIZATION
Orbit Optimization for the Geospace Electrodynamics Connections (GEC) Mission – 92

TRAJECTORY PLANNING
Path Elongation for UAV Task Assignment – 6

TRANSDUCERS
Measurement of Anisotropic Elastic Constitutive Properties at High Temperatures – 196

TRANSFORMATIONS (MATHEMATICS)
Short Vector SIMD Code Generation for DSP Algorithms – 162

TRANSLATING
Migration of a SEDRIS Application for Dismounted Infantry Simulation – 151

TRANSMISSION LINES
Fast and Accurate Fault Detection/Location Algorthms for Double-Circuit/Three-Terminal Lines using Phasor Measurement Units – 163

TRANSPORT THEORY
Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

TRANSPORTATION
A National MagLev Transportation System – 203

TRAPPED VORTICES
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

TRAPS
Manipulation of Micro Scale Particles in Optical Traps Using Programmable Spatial Light Modulation – 77

TRIBOLOGY
Engineering Titanium for Improved Biological Response – 43

TRMM SATELLITE
Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

TRMM Fire Algorithm, Product and Applications – 93

TROJAN ASTEROIDS
Spectroscopy and Photometry of Mars Trojans – 208

TROPICAL REGIONS
The Tropical Convective Spectrum – 107

Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models – 112

TROPOSPHERE
A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies – 5

Characteristics and Global Impact of Aerosols from Southern Africa and Eastern Asia – 112

Climate Impacts on Tropospheric Ozone and Hydroxyl – 113

Discoveries about Tropical Ozone from Satellite and SHADOZ (Southern Hemisphere ADditional Ozonesondes) – 114

Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

TUMORS
Interrogating Androgen Receptor Mediated Gene Expression and Tumor Progression by Molecular Imaging – 128

TUNDRA
Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data – 187

TUNGSTEN ALLOYS
Microstructure and Fracture Behavior of Tungsten Heavy Alloys – 45

TUNING
Continuous-Wave Tunable Midwave Infrared Generation Near 4.5 micrometers with an Intracavity Optical Parametric Oscillator and Difference Frequency Generation – 38

TURBINE BLADES
Toward a Fast-Response Active Turbine Tip Clearance Control – 12

TURBINE ENGINES
Mechanical Components Branch Test Facilities and Capabilities – 86

TURBOJET ENGINES
An Analysis of Model Scale Data Transformation to Full Scale Flight Using Chevron Nozzles – 11

TURBOMACHINERY
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

TURBULENCE MODELS
Computational Simulation of a Heavy Vehicle Trailer Wake – 1

Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer – 116

Grid-Independent Large-Eddy Simulation in Turbulent Channel Flow using Three-Dimensional Explicit Filtering – 70

TURBULENT FLOW
A Novel Strategy for Numerical Simulation of High-speed Turbulent Reacting Flows – 68

Grid-Independent Large-Eddy Simulation in Turbulent Channel Flow using Three-Dimensional Explicit Filtering – 70

Numerical Simulation of High Drag Reduction in a Turbulent Channel Flow with Polymer Additives – 74

Rough-Wall Channel Analysis Using Suboptimal Control Theory – 74

'Hypothetical' Heavy Particles Dynamics in LES of Turbulent Dispersed Two-Phase Channel Flow – 69

TURBULENT MIXING
A Self-Contained Mapping Closure Approximation for Scalar Mixing – 71

TWISTING
Aerodynamic Design Study of an Advanced Active Twist Rotor – 7

TWO DIMENSIONAL FLOW
New Type of the Interface Evolution in the Richtmyer-Meshkov Instability – 69

TWO PHASE FLOW
A Cartesian Adaptive Level Set Method for Two-Phase Flows – 70

Modeling Primary Breakup: A Three-Dimensional Eulerian Level Set/Vortex Sheet Method for Two-Phase Interface Dynamics – 75

'Hypothetical' Heavy Particles Dynamics in LES of Turbulent Dispersed Two-Phase Channel Flow – 69

TYPE 3 BURSTS
Solar Flares, Type III Radio Bursts, CMEs, and Energetic Particles – 218

ULTRAHIGH FREQUENCIES
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

Design of an L-Band Microwave Radiometer with Active Mitigation of Interference – 60

ULTRASHORT PULSED LASERS
Laser-Material Interaction of Powerful Ultrashort Laser Pulses – 26

ULTRAVIOLET EMISSION
Electric and Optical Properties of Doped Small Molecular Organic Light-Emitting Devices – 186

ULTRAVIOLET RADIATION
Direct Write Laser Lithography System – 152

Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals – 117

UNDERGROUND EXPLOSIONS
Simulations of Underground Structures Subjected to Dynamic Loading using the Distinct Element Method – 88

UNDERGROUND STRUCTURES
Simulations of Underground Structures Subjected to Dynamic Loading using the Distinct Element Method – 88

UNDERWATER ACOUSTICS
Decision Feedback Equalization Pre-Processor with Turbo Equalizer – 179

Elastomeric Ejection System with Acoustically Improved Check Valve – 85

Frequency Dependence of Effective Bottom Attenuation Due to Environmental Variability – 177

Seabottom Acoustics Parameters from Reverberation Vertical Coherence in Shallow Water – 179

UNDERWATER EXPLOSIONS
Preliminary Analysis of Reverberation Data in ASIAEX Experiment – 176

UNITED STATES
A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies – 5

UNSTRUCTURED GRIDS (MATHEMATICS)
Computing Axisymmetric Jet Screech Tones using Unstructured Grids – 179

Volume Rendering for Curvilinear and Unstructured Grids – 170

Wind-US Flow Calculations for the M2129 S-Duct Using Structured and Unstructured Grids – 68

UPSTREAM
Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation – 123

URANIUM OXIDES
Analysis of Events Associated with First Charge of Desicooler Material – 26

URETHANES
Development of Product Descriptions for Lead- Immobilizing Overcoating Systems – 27

USER MANUALS (COMPUTER PROGRAMS)
SafePatch for Windows. Version 1.0 User Manual – 139

User's Guide to GIS-Based Application for Traffic Inputs to MOBILE6 Emissions Factor Model – 101

VACCINES
Delivering DNA Vaccine by Transdermal Electroporation – 130

VALVES
Elastomeric Ejection System with Acoustically Improved Check Valve – 85

VAPOR DEPOSITION
CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

VAPORS
Theoretical and Experimental Investigation of the Stability of an Evaporating Constrained Vapor Bubble – 72

VARIABILITY
Direct Path Fluctuations Due to Shallow Water Volume Variability – 176

Frequency Dependence of Effective Bottom Attenuation Due to Environmental Variability – 177

Simultaneous X-Ray and Optical Timing Observations of GX 339-4 – 184

Tides and Decadal Variability – 120

VARIATIONS
ASIAEX South China Sea Acoustic Fluctuations (and Physical Oceanography) – 177

VECTOR SPACES
Robot Acquisition of Active Maps Through Teleoperation and Vector Space Analysis – 160

VELOCITY DISTRIBUTION
Wind Sounding with Laser Radar: A Pre-Study – 109

VERTICAL DISTRIBUTION
The Tropical Convective Spectrum – 107

VIBRATION ISOLATORS
Passive Isolators for use on the International Space Station – 17

Testing of the Joining Rubber Metal of Ultrasound Silencing Devices – 91

VIBRATIONAL SPECTRA
Measurement and Simulation of Spontaneous Raman Scattering Spectra in High-Pressure, Fuel-Rich H2-Air Flames – 43

VIDEO COMPRESSION
Setting up a Grid: A Guide for Beginners by a Beginner – 124

VIDEO DATA
Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 64

VIRTUAL REALITY
NASA's Virtual Product Laboratory: An Overview – 158

Training Effectiveness Evaluation of the Full Spectrum Command Game – 148

VIRUSES
Review of Sampling and Analysis Methods for Assessing Airborne Microbiological Contamination on Commerical Aircraft. A Literature Survey and Review – 101

VISCOELASTICITY
Tensor Fields for Use in Fractional-Order Viscoelasticity – 161

VISCOUS FLOW
Application of New Algorithms for the Simulation of Multidisciplinary Problems: Fluid Structure Thermal and Control Coupling – 73

GSRP/David Marshall: Fully Automated Cartesian Grid CFD Application for MDO in High Speed Flows – 75

VISION
Adaptive Optics Applications in Vision Science – 185

VOCODERS
Successive Bit-Vector Search Algorithm for CELP Vocoders – 164

VOIDS
Molecular Dynamics Study of Void Growth and Dislocations in Dynamic Fracture of FCC and BCC Metals – 169

Theory of Positron Annihilation in Helium-filled Bubbles in Plutonium – 48

VOLATILE ORGANIC COMPOUNDS
Performance of Low-VOC Paint for Vehicles of the Dutch Army – 51

Volatile Organic Chemical Emissions from Structural Insulated Panel (SIP) Materials and Implications for Indoor Air Quality – 99

VOLTAGE CONVERTERS (DC TO DC)
A High Efficiency DC Bus Regulator/RPC for Spacecraft Applications – 65

Modeling and Control of the ARCP in Power and Drive Systems – 66

VOLTAGE REGULATORS
A High Efficiency DC Bus Regulator/RPC for Spacecraft Applications – 65

Test Stand for Linear Induction Accelerator Optimization – 171

VORTEX SHEETS
Modeling Primary Breakup: A Three-Dimensional Eulerian Level Set/Vortex Sheet Method for Two-Phase Interface Dynamics – 75

WALLS
Rough-Wall Channel Analysis Using Suboptimal Control Theory – 74

Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

WARFARE
Closing the Gaps A Strategy for Gaining the Initiative in the War on Terror – 58

Sealed Window Glazing System for Chemical Biological Protected Space Applications – 89

WASTE DISPOSAL
Compaction of Space Mission Wastes – 137

WASTE TREATMENT
Savannah River Site Approved Site Treatment Plan, 2003 Annual Update. Volumes I and II – 100

WASTE WATER
Determination of Wastewater Acids from Chromium Plating and Electropolishing Solutions – 41

WATER CONSUMPTION
Nutrients in the Upper Mississippi River: Scientific Information to Support Management Decisions. The Upper Mississippi River - Values and Vulnerability – 179

WATER TEMPERATURE
Instrument for Measuring Temperature of Water – 77

WATER VAPOR
TerraHertz Free Electron Laser Applications for Satellite Remote Sensing – 83

WATER
Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

WAVE EXCITATION
Investigations into Gravitational Wave Emission from Compact Body Inspiral Into Massive Black Holes – 209

WAVE FRONTS
A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy – 222

WAVE FUNCTIONS
Approximating the Helium Wavefunction in Positronium-Helium Scattering – 173

WAVE PROPAGATION
Influence of Surface and Bottom Stress in the Coupled Ocean Circulation and Wind-Wave Models – 122

WAVEFORMS
Experimental Investigations on the Distortion of ISAR Images Using Different Radar Waveforms – 57

WAVEGUIDES
Coaxial-Type Resistance Sensor for HPM Applications – 64

Measurement of Anisotropic Elastic Constitutive Properties at High Temperatures – 196

WAVELENGTH DIVISION MULTIPLEXING
Monolithically Integrated 64-channel WDM Channel Selector – 63

Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 150

WAVELET ANALYSIS
A Wavelet based Suboptimal Kalman Filter for Assimilation of Stratospheric Chemical Tracer Observations – 165

African Easterly Waves and Their Association with Precipitation – 116

Multi-Resolution Modeling of Large Scale Scientific Simulation Data – 138

Testing Fractal Methods on Observed and Simulated Solar Magnetograms – 161

WEATHER FORECASTING
A Physical Validation Program for the GPM Mission – 119

The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

WEATHER STATIONS
Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

WEATHER
Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

WHITE NOISE
Detection of Randomness in Sparse Data Set of Three Dimensional Time Series Distributions – 161

WIND MEASUREMENT
Reply to Gopalswamy et al. – 224

WIND (METEOROLOGY)
A Flight Dynamics Model for a Small Glider in Ambient Winds – 2

African Easterly Waves and Their Association with Precipitation – 116

Evaluation of the Space Shuttle Transatlantic Abort Landing Atmospheric Sounding System – 16

WIND SHEAR
Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

WIND TUNNEL APPARATUS
Structural Integrity of a Wind Tunnel Balance – 91

WIND TUNNEL MODELS
Aerodynamic Design Study of an Advanced Active Twist Rotor – 7

WIND TUNNEL TESTS
Biologically Inspired Micro-Flight Research – 9

Modeling of Building Scale Flow and Disperson – 76

UAV Aerial Refueling - Wind Tunnel Results and Comparison with Analytical Predictions – 2

WINTER
Highlights of the ASPE 2004 Winter Topical Meeting on Free-Form Optics: Design, Fabrication, Metrology, Assembly – 190

WIRELESS COMMUNICATION
Low-Power Direct-Sequence Spread-Spectrum Modem Architecture for Distributed Wireless Sensor Networks – 56

On the Implementation of Iterative Detection in Real-World MIMO Wireless Systems – 173

Wireless Link Design Using a Patch Antenna – 56

Wireless Temperature-Monitoring System – 61

X RAY ASTRONOMY
RR Tel: Getting under the Flux Limit - An Observation with FUSE – 216

X RAY ASTROPHYSICS FACILITY
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

X RAY FLUORESCENCE
Investigation of Exothermic Grinding Sludge Produced from Watervliet Arsenal Gun Steels, Andersol Water- Based Cutting Fluid and Cincinnati Milacron Aluminum Oxide Resin Bond Grinding Wheels – 39

X-Ray Fluorescence On-Stream Analysis of Standard Reference Solution Concentrations of Chromium Plating and Polishing Solutions – 40

X RAY IMAGERY
Mass Calculations from X-Ray Shadowgraphs Using Image Processing – 81

X RAY LASERS
Investigations on 10-Hz sub-Joule fs-Laser Pumped Neon- and Nickel-like X-ray Lasers – 195

X RAY OPTICS
Simultaneous X-Ray and Optical Timing Observations of GX 339-4 – 184

X-Ray Optics and Diagnostics for the First Experiments on the Linac Coherent Light Source – 193

X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultrashort X-ray Pulses with Matter – 185

X RAY SCATTERING
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

Mass Calculations from X-Ray Shadowgraphs Using Image Processing – 81

X RAY SOURCES
Seeing Red and Shooting Blanks: A Study of Red Quasars and Blank Field X-Ray Sources – 210

Test Stand for Linear Induction Accelerator Optimization – 171

ULXs, Microblazers, and the Unidentified EGRET Sources – 219

X RAY SPECTRA
Package for Interactive Analysis of Line Emission (Analysis of UV-X-Ray High-Resolution Emission Spectra) – 188

X RAY SPECTROSCOPY
Determination of AISI 4340 and 8640 Steels Used in M9 Beretta Pistol Slides by Emission Spectroscopy and X-Ray Fluorescence Spectroscopy – 41

The Constellation-X Observatory – 182

X RAY TELESCOPES
Development of High Resolution Hard X-Ray Telescope with Multilayer Coatings – 191

X RAYS
Dying Pulse Trains in Cygnus XR-1: Initial Results of X-Ray Searches – 214

Hydrodynamic Modeing of a Multi-Pulse X-Ray Converter Target for DARHT-II – 174

Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

Physics of Galaxy Clusters and How it Affects Cosmological Tests – 215

The Constellation-X Observatory – 182

X-43 VEHICLE
Hyper-X Stage Separation Trajectory Validation Studies – 19

XENON
Ion Species Fractions in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

YTTRIA-STABILIZED ZIRCONIA
Alumina-Reinforced Zirconia Composites – 89

Electrochemical Hydrogen Sensor for Safety Monitoring – 60

Thermal Conductivity of Alumina-Toughened Zirconia Composites – 30

YTTRIUM OXIDES
Predicting the Effect of Defect Distributions in the Bulk and on Surfaces of Ceramic Materials – 50

ZIRCONIUM OXIDES
Alumina-Reinforced Zirconia Composites – 89

Predicting the Effect of Defect Distributions in the Bulk and on Surfaces of Ceramic Materials – 50

Personal Author Index

Abarzhi, S. I.
New Type of the Interface Evolution in the Richtmyer-Meshkov Instability – 69

The Effect of the Density Ratio on the Nonlinear Dynamics of the Unstable Fluid Interface – 75

Abdulla, G.
Multi-Resolution Modeling of Large Scale Scientific Simulation Data – 138

Abe, Hirofumi
Scalable Content Delivery Technology – 155

Abshire, Kevin
The Role of Haptics in Service Manual Task Validation – 55

Ackerman, A. S.
Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer – 116

Adams, J. J.
New Crystalline Materials for Nonlinear Frequency Conversion, Electro-Optic Modulation, and Mid-Infrared Gain Media – 184

Adams, M.
Testing Fractal Methods on Observed and Simulated Solar Magnetograms – 161

Adler, R.
Heating Structures Derived from Satellite – 112

Adler, Robert F.
African Easterly Waves and Their Association with Precipitation – 116

Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

Agarwal, Sanjeev
Multidisciplinary Research in Mine Detection and Neutralization Systems: Missouri-Led Muri – 81

Agvaanluvsan, U.
Level Densities and Radiative Strength Functions in (170, 171) Yb – 167

Ahern, S. D.
Merlot Design – 139

Ahle, L. E.
Scoping Inventory Calculations for the Rare Isotope Accelerator – 181

Ahrens, Christine
Streams-C; Sc2 C-to-FPGA Compiler – 149

Ahsun, U.
Active Control of Integrated Inlet/Compression Systems – 73

Ainslie, M. A.
Technical Report on Inversion of the First RUMBLE Sea Trial Data – 122

Akaka, Daniel K.
Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153

Akiba, Junya
Scalable Content Delivery Technology – 155

Alameda, J.
Design and Performance of Capping Layers for EUV Multilayer Mirrors – 211

Albinsson, P. A.
HFES 2002 Travelreport – 137

Alexander, D. E.
Analysis of Events Associated with First Charge of Desicooler Material – 26

Alexander, Dennis R.
Transmission Measurements of Femtosecond Laser Pulses Through Aerosols – 83

Allen, Christine
The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

Allen, J. C.
Multi-h CPM Synchronization in Military Channels Phase 2: A Simulation Framework – 58

Allen, Randy P.
Virtual Space Logistics Readiness Center (VSLRC): Concept of Operations – 14

Allison, Stephen W.
Depth-Penetrating Temperature Measurements of Thermal Barrier Coatings Incorporating Thermographic Phosphors – 42

Allwood, Shari J.
International Workshop on Quantum Cascade Lasers. Meeting Program, Abstract Book & Attendee Roster. January 4-8, 2004, Seville, Spain – 83

Alpert, Lesley
Is Breast Tissue from Women Who Carry Germ-Line BRCA1 or BRCA2 Mutations 'Normal'? - An Immuno- Histopathological Study – 130

Ameyugo, G.
NATO Modelling and Simulation (M and S) Orientation Course – 154

Amitai, E.
Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

Anastas, G.
Rationale for Maintaining the Double Containment Requirement for Plutonium Shipments – 102

Anderson, Carl W.
Differential Expression of DNA Double-Strand Break Repair Proteins in Breast Cells – 132

Anderson, John
The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

Anderson, Mark
Recent Advances in Matting Technology for Military Runways – 14

Sealed Window Glazing System for Chemical Biological Protected Space Applications – 89

Anderson, S. G.
RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

Anderson, Tad
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Anderson, Theodore R.
Confined Plasma Resonance Antenna and Plasma Resonance Antenna Array – 67

Andranova, Natasha
Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

Andreasson, S.
Stimulation of Propellant Burning by Supplying Electric Energy in the Flame – 51

Andrews, Archie
Defense Healthcare Information Assurance Program (DHIAP) Phase III – 202

Anselm, William
Report from the School of Experience: Lessons-Learned on NASA's EOS/ICESat Mission – 197

Antoine, Nicolas
Aircraft Optimization for Minimum Environmental Impact – 8

Antoun, T. H.
Simulation of a Spherical Wave Experiment in Marble Using a Multidirectional Damage Model – 25

Apte, M. G.
Predicted Concentrations in New Relocatable Classrooms of Volatile Organic Compounds Emitted from Standard and Alternate Interior Finish Materials – 100

Ardizzone, Joe
Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

Arimoto, R.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Armstrong, G. W.
Cooperative Mobile Sensing Networks – 6

Armstrong, Richard L.
Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

Arnold, Steven M.
Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

Arthur, J.
X-Ray Optics and Diagnostics for the First Experiments on the Linac Coherent Light Source – 193

Arya, Vinod K.
Durability Assessment of Gamma TiAl – 47

Ashbourn, S. F. M.
Heterogeneous Interactions of Acetaldehyde and Sulfuric Acid – 33

Asoka-Kumar, P.
Atomic-Based Calculations of Two-Detector Doppler-Broadening Spectra – 175

Astaneh, C.
K-Means Re-Clustering Algorithmic Options with Quantifiable Performance Comparisons – 141

Astanovitskiy, A.
Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

Athman, Robert
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

Atlas, Robert M.
Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

Atlas, Robert
Current results from AIRS/AMSU/HSB – 120

Au, Andrew Y.
Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

Aubert, B.
Measurement of B(sup 0) -> D(sub s)(*)+D*- Branching Fractions and B(sup 0) ->D(sup s)*- Polarization with a Partial Reconstruction Technique – 168

Observation of the Decay Beta(sup 0) approximately Tau(sup 0)Tau(sup 0) – 172

Auger, Ludovic
A Wavelet based Suboptimal Kalman Filter for Assimilation of Stratospheric Chemical Tracer Observations – 165

Aurass, Henry
Upgrade of the Aerial Guidance system for Automatic High Time and Spectral Resolution Solar Radio Observations at the Astrophysical Institute Potsdam – 216

Babcock, Jason R.
Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

Recent Advances in the Development of Thick-Section Melt-Infiltrated C/SiC Composites – 29

Bacmeister, Julio T.
On the Cause of the 1930s Dust Bowl – 113

Bada, J. K.
Isolation of Purines and Pyrimidines from the Murchison Meteorite – 125

Badler, Norman
The Role of Haptics in Service Manual Task Validation – 55

Bagchi, Arunabha
Rational Approximations of the Power Spectral Density of Atmospheric Turbulence Arising in Adaptive Optics – 162

Bahadur, Raj
Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

Bahr, Fred
The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation – 177

Bai, J. Z.
Observation of a Near-Threshold Enhancement in the p-anti-p Mass Spectrum from Radiative J/psi -> gamma-p-anti-p Decays – 169

Baillieul, John
The Design and Control of Smart Structures – 54

Baiocchi, Dave
Status Report and Lessons Learned from the Univ. of Arizona NMSD – 187

Bajt, S.
Design and Performance of Capping Layers for EUV Multilayer Mirrors – 211

Bakema, G. H.
Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Bakshi, Amol B.
An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications – 166

Baldwin, C.
Multi-Resolution Modeling of Large Scale Scientific Simulation Data – 138

Ban, Y.
Observation of a Near-Threshold Enhancement in the p-anti-p Mass Spectrum from Radiative J/psi -> gamma-p-anti-p Decays – 169

Bansal, Narottam P.
Alumina-Reinforced Zirconia Composites – 89

Thermal Conductivity of Alumina-Toughened Zirconia Composites – 30

Barate, R.
Measurement of B(sup 0) -> D(sub s)(*)+D*- Branching Fractions and B(sup 0) ->D(sup s)*- Polarization with a Partial Reconstruction Technique – 168

Observation of the Decay Beta(sup 0) approximately Tau(sup 0)Tau(sup 0) – 172

Barbee, T.
X-Ray Optics and Diagnostics for the First Experiments on the Linac Coherent Light Source – 193

Barbier, R. R.
Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Barbieri, Enrique
Modeling and Validation of a Propellant Mixer for Controller Design – 24

Small Signal Modelling and Control of the Hydrogen Mixer for Facility E1 – 61

Bar-Itzhack, Itzhack
Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment – 16

Barker, John L.
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

Barker, William P.
Elastomeric Ejection System with Acoustically Improved Check Valve – 85

Barnet, Christopher
Current results from AIRS/AMSU/HSB – 120

Barney, M. M.
Experimental Assessment of Gradient Plasticity – 88

Barnum, Douglas J.
Joint Battlespace Infosphere Repository Prototype – 201

Baron, R.
Twenty Meter Space Telescope Based on Diffractive Fresnel Lens – 205

Barrett, C. A.
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

Barrow, J. A.
Investigations of the Electronic Properties and Surface Structures of Aluminum-Rich Quasicrystalline Alloys – 32

Barsi, Julia A.
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

Bartels, Robert E.
Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

Barth, Janet L.
Space Weather Effects on Spacecraft Systems – 204

Barton, N. R.
Crystal Level Model for Phase Transformation Allowing for Large Volume Changes – 26

Barty, A.
Novel EUV Mask Blank Defect Repair Developments – 181

Barty, C. P. J.
Parametric Techniques for Extreme-Contrast, High-Energy Petawatt Pulses – 185

Baseer, Mohammed
Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications – 7

Bastien, Pierre
Tracing the Magnetic Field in Orion A – 217

Bates, T. S.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Batie, S.
Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

Bauer, B.
Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

Bauman, B. J.
Astronomy Applications of Adaptive Optics at Lawrence Livermore National Laboratory – 220

Baumgardner, Darrel R.
Black Carbon Measurements in SOLVE-2 – 78

Bayne, Stephen B.
High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

Bayramian, A.
Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

Beach, D. R.
Lawrence Livermore National Laboratory Site Specific Standard for Nonnuclear Safety Analysis – 136

Beach, R.
All Fiber Technology for High-Energy Petawatt Front End Laser Systems – 186

Beal, Scott A.
Training Effectiveness Evaluation of the Full Spectrum Command Game – 148

Bearinger, J.
Engineering Titanium for Improved Biological Response – 43

Becker, J. A.
Level Densities and Radiative Strength Functions in (170, 171) Yb – 167

Becker, R.
Crystal Level Model for Phase Transformation Allowing for Large Volume Changes – 26

Beeler, Scott C.
A Flight Dynamics Model for a Small Glider in Ambient Winds – 2

Beijk, A. F.
Reference Document for Management of Tactical Infrastructure Networks – 156

Belak, J.
Molecular Dynamics Study of Void Growth and Dislocations in Dynamic Fracture of FCC and BCC Metals – 169

Belanovic, Pavle
A Library of Parameterized Hardware Modules for Floating Point Arithmetic and Its Use – 150

Bell, J.
Numerical Simulations of Shock-Induced Mixing and Combustion – 76

Bell, Mike
Assessment and Testing of the GODAE Products – 121

Bell, N.
Climate Impacts on Tropospheric Ozone and Hydroxyl – 113

Bell, Terry L.
Securing Mobile Networks in an Operational Setting – 156

Bemm, E.
Preparation of Propellants Adapted for ETC and Polymeric Matrix for ADN-Based Propellants – 52

Stimulation of Propellant Burning by Supplying Electric Energy in the Flame – 51

Bencic, Timothy J..
Depth-Penetrating Temperature Measurements of Thermal Barrier Coatings Incorporating Thermographic Phosphors – 42

Benford, Dominic J.
Optical Properties of Zitex in the Infrared Submillimeter – 192

Benford, Dominic
The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

Bennett, H. E.
Long Focal Length Large Mirror Fabrication System – 188

Benson, D. J.
Crystal Level Model for Phase Transformation Allowing for Large Volume Changes – 26

Bentley, Brooke
Factors Related to Nonadherence of a Low Sodium Diet in Heart Failure Patients – 133

Berdichevsky, Daniel B.
Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

Berglund, Larry G.
Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications – 132

Bernhardt, A.
Microrelay – 60

Bernstein, L. A.
Level Densities and Radiative Strength Functions in (170, 171) Yb – 167

Bernstein, Lawrence S.
Software for Simulation of Hyperspectral Images – 145

Beshears, David L.
Depth-Penetrating Temperature Measurements of Thermal Barrier Coatings Incorporating Thermographic Phosphors – 42

Bhartia, P. K.
Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals – 117

Bhat, C. R.
GIS-Integrated Traffic Input Models for Mobile-Source Emissions Analysis – 102

User's Guide to GIS-Based Application for Traffic Inputs to MOBILE6 Emissions Factor Model – 101

Bhatia, A. K.
Atomic Data and Spectral Line Intensities for S XI – 219

Bian, J. G.
Observation of a Near-Threshold Enhancement in the p-anti-p Mass Spectrum from Radiative J/psi -> gamma-p-anti-p Decays – 169

Biedron, Robert T.
Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

Biesecker, D. A.
Phenomena Associated With EIT Waves – 218

Bilbrough, Larry
Wisconsin Earth and Space Science Education – 200

Binzel, R. P.
Spectroscopy and Photometry of Mars Trojans – 208

Bionta, R.
X-Ray Optics and Diagnostics for the First Experiments on the Linac Coherent Light Source – 193

Bionta, W. M.
X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultrashort X-ray Pulses with Matter – 185

Birchenough, Arthur G.
A High Efficiency DC Bus Regulator/RPC for Spacecraft Applications – 65

PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems – 86

Blackmon, Fletcher A.
Decision Feedback Equalization Pre-Processor with Turbo Equalizer – 179

Blade, L. M.
Survey Report: Evaluation of an Air Shower for Reducing Exposure to Carbon Monoxide at USA Port of Entry, Calexico, California – 101

Blaisdell, Jon
Current results from AIRS/AMSU/HSB – 120

Blake, William B.
UAV Aerial Refueling - Wind Tunnel Results and Comparison with Analytical Predictions – 2

Blancard, C.
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

Blanchard, Laurie A.
Cold Air Data Acquisition System Documentation – 134

Blanchard, Robert C.
Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

Blandford, R.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Blaurock, Carl
Pointing Control System Design and Performance Evaluation for TPF Coronagraph – 221

Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer – 191

Blehm, Z.
Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21 – 225

Bless, Stephan
A Simple Transverse Motion Detector for Railguns – 80

Blevins, John A.
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures – 52

Blonski, Slavomir
Remote Sensing System Requirements Development: A Simulation-Based Approach – 97

Blonski, Slawomir
NASA Scientific Data Purchase Laboratory Characterization of Positive Systems ADAR 5500 Sensor – 95

NASA's Virtual Product Laboratory: An Overview – 158

Satellite Hyperspectral Imaging Simulation – 95

Bloomfield, Aaron
The Role of Haptics in Service Manual Task Validation – 55

Boccippio, Dennis J.
The Tropical Convective Spectrum – 107

Boek, W.
Technical Report on Inversion of the First RUMBLE Sea Trial Data – 122

Boetz, H. E. R.
Exploratory Measurements of the Effect of Electro Magnetic Interference on EO/IR Sensors and Several Mitigation Options – 82

Bokkers, W. C.
Technical Design for the TTA Component of the 120mm HE C2 Mortar Ammunition – 153

Boles, J. L.
Scoping Inventory Calculations for the Rare Isotope Accelerator – 181

Bolognese, Jeff
Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer – 191

Boltjes, B.
Reference Document for Management of Tactical Infrastructure Networks – 156

Bolvin, David T.
Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

Bonamente, Massimiliana
The Soft Excess Emission in the Hercules Supercluster Observed with the ROSAT Position Sensitive Proportional Counter – 204

Bonato, Michael J.
A Comparison of Two Computational Technologies for Digital Pulse Compression – 63

Bond, Robert
Monolithic Compiler Experiments Using C++ Expression Templates – 149

Bonnell, J. T.
How Can The SN-GRB Time Delay Be Measured? – 218

Bonner, M. P.
Simulations of Underground Structures Subjected to Dynamic Loading using the Distinct Element Method – 88

Borong, M.
Preparation of Propellants Adapted for ETC and Polymeric Matrix for ADN-Based Propellants – 52

Borovikov, Anna
Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

Bos, Brent
The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

Bose, David M.
Hyper-X Stage Separation Trajectory Validation Studies – 19

Bosilovich, Michael G.
Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Boudreau, Michael W.
Reduction of Total Ownership Cost – 151

Boutigny, D.
Measurement of B(sup 0) -> D(sub s)(*)+D*- Branching Fractions and B(sup 0) ->D(sup s)*- Polarization with a Partial Reconstruction Technique – 168

Observation of the Decay Beta(sup 0) approximately Tau(sup 0)Tau(sup 0) – 172

Bowers, Charles W.
A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy – 222

Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics – 13

Bowers, Michael T.
Conformations of Macro Molecules – 36

Bowman, Cheryl L.
Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

Bowman, Malcolm J.
Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation – 123

Bowman, Randy
Evaluation of Candidate Materials for a High-Temperature Stirling Convertor Heater Head – 45

Braddom, S.
Active Control of Integrated Inlet/Compression Systems – 73

Bradshaw, T.
The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

Bradshaw, Tom
Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

Brage, A.
Design of a System for Active Echo-Cancellation – 56

Brankovic, A.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Brear, M. J.
Active Control of Integrated Inlet/Compression Systems – 73

Bregman, Jesse
Wavelength Shifts of the 7.7 Micron Emission Band in Reflection Nebulae – 214

Brennecke, J. F.
Supercritical Carbon Dioxide-Soluble Ligands for Extracting Actinide Metal Ions from Porous Solids – 31

Brereton, S.
Lawrence Livermore National Laboratory Site Specific Standard for Nonnuclear Safety Analysis – 136

Bri, Genia
Current results from AIRS/AMSU/HSB – 120

Bridges, James
An Analysis of Model Scale Data Transformation to Full Scale Flight Using Chevron Nozzles – 11

Bringa, E. M.
Molecular Dynamics Simulations of Coulomb Explosion – 170

Brinton, John C.
Development of High Resolution Hard X-Ray Telescope with Multilayer Coatings – 191

Brockett, Roger W.
The Design and Control of Smart Structures – 54

Bromwich, David H.
Modeling and Observational Study of the Global Atmospheric Impacts of Antarctic Sea Ice Anomalies – 113

Bronstein, Lyudmila M.
Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties – 37

Brooks, Peter
Computer Assisted Exercises: Background – 154

Computer Generated Forces: Future Needs – 143

Computer Generated Forces: Layout and Architecture – 143

Human Behaviour Representation: Relevant Technologies and their Development – 135

Brown, C.
Search for the Lepton Number Violating Decay (tau)(yields)(mu)(gamma) – 168

Brown, Clifford
An Analysis of Model Scale Data Transformation to Full Scale Flight Using Chevron Nozzles – 11

Brown, Gerald V.
Magnetic Bearing Controller Improvements for High Speed Flywheel System – 21

Brown, R. K.
Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses – 186

Brown, Randall W.
Recent Advances in Matting Technology for Military Runways – 14

Brozena, John M.
An Analysis of Airship Acceleration Dynamics for Airborne Gravimetry – 105

Bruchey, William J.
Suppression of Material Failure Modes in Titanium Armors – 47

Brune, William H.
TRACE-P OH and HO2 Measurements with the Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) on the DC-8 – 115

Brunold, S.
Durability of Polymeric Glazing Materials for Solar Applications – 98

Bryanston-Cross, P. J.
Active Control of Integrated Inlet/Compression Systems – 73

Bulatov, V. V.
Atomistic Simulation of Dislocation-Defet Interactions in Cu – 44

Buller, Mark J.
Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications – 132

Burcham, Frank W., Jr.
Manual Manipulation of Engine Throttles for Emergency Flight Control – 13

Burge, Jim
Status Report and Lessons Learned from the Univ. of Arizona NMSD – 187

Burke, Kenneth A.
Unitized Regenerative Fuel Cell System Development – 98

Burke, Monica
Real-Time Geo-Registration on High-Performance Computers – 80

Burks, Jason
Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

Burns, Richard
An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Burrows, Adam
Optical Spectra of Extrasolar Giant Planets – 206

Burrows, G.
NATO Modelling and Simulation (M and S) Orientation Course – 154

Burrus, D. L.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Burum, Niksa
Analysis of Curved Microstrip Antennas – 65

Bus, S. J.
Spectroscopy and Photometry of Mars Trojans – 208

Butt, Y. M.
ULXs, Microblazers, and the Unidentified EGRET Sources – 219

Cable, D. R. M.
Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Cable, P. G.
Frequency and Angular Dependence of Low Frequency East China Sea Bottom Scattering Strengths – 178

Cai, X.
Observation of a Near-Threshold Enhancement in the p-anti-p Mass Spectrum from Radiative J/psi -> gamma-p-anti-p Decays – 169

Cain, Lee R.
Batteryless Sensor for Intrusion Detection and Assessment of Threats – 79

Calhoun, R. J.
Modeling of Building Scale Flow and Disperson – 76

Callahan, D. A.
Target Designs for an Inertial Fusion Energy Power Plant Driven by Heavy Ions – 193

Calle, Luz-Marina
The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

Callis, Lin B.
Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

Campbell, G. H.
Experimental Assessment of Gradient Plasticity – 88

Campbell, J. H.
National Ignition Facility: The World's Largest Optics and Laser System – 182

Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses – 186

Campbell, James R.
Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

Campbell, Sandi G.
High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Campbell, Timothy
Logistic Fuel Processor Development – 52

Candy, J. V.
Acoustic Propagation in a Water-Filled Cylindrical Pipe – 176

Modern Techniques in Acoustical Signal and Image Processing – 139

Cane, H. V.
Reply to Gopalswamy et al. – 224

Solar Flares, Type III Radio Bursts, CMEs, and Energetic Particles – 218

Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections – 224

Canfield, Dennis V.
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

Canfield, R. C.
Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21 – 225

Cantu-Paz, E.
Retrieval of Similar Objects in Simulation Data Using Machine Learning Techniques – 140

Cao, Chang-Yong
NASA's Virtual Product Laboratory: An Overview – 158

Cao, Changyong
Satellite Hyperspectral Imaging Simulation – 95

Caporaso, G. J.
Modern Trends in Induction Accelerator Technology – 175

Carey, Michael F.
Interrogating Androgen Receptor Mediated Gene Expression and Tumor Progression by Molecular Imaging – 128

Carleberg, P.
Mixed Reality in Military Applications. A Pilot Study with Certain Focus on Integration of Gaze-Tracker and Head Mounted Displays – 140

Carlson, K.
Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses – 186

Carlsson, B.
Durability of Polymeric Glazing Materials for Solar Applications – 98

Carraway, Robert E.
Prostate Cancer Cell Growth: Role of Neurotensin in Mediating Effect of Dietary Fat and Mechanism of Action – 129

Carter, Gregory A.
Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

Cary, Everett
An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Casper, Jay
Broadband Trailing Edge Noise Predictions in the Time Domain – 180

Casper, T. A.
Electron Cyclotron Heating and Current Drive for Maintaining Minimum q in Negative Central Shear Discharges – 175

Castillo, S.
Multimegawatt Quasi-Steady MPD Thruster Facility – 23

Cecil, Daniel J.
The Tropical Convective Spectrum – 107

Centolanze, Louis
Laser Obstacle Detection System Flight Testing – 84

Chamberlain, Roger
Power Consumption of Customized Numerical Representations for Audio Signal Processing – 162

Champagne, N. J.
Mixed Electromagnetic and circuit Simulations using Higher-Order Elements and Bases – 171

Chan, C.
Scene-Based Wave-Front Sensing for Remote Imaging – 183

Chan, Louise
The MER/CIP Portal for Ground Operations – 199

Chan, S. T.
Modeling of Building Scale Flow and Disperson – 76

Chandler, Phillip R.
Path Elongation for UAV Task Assignment – 6

Chang, J. F.
Observation of a Near-Threshold Enhancement in the p-anti-p Mass Spectrum from Radiative J/psi -> gamma-p-anti-p Decays – 169

Chang, Sam
A High Resolution, Three-Dimensional, Computationally Efficient, Diagnostic Wind Model: Initial Development Report – 115

Channell, J. K.
Rationale for Maintaining the Double Containment Requirement for Plutonium Shipments – 102

Chao, Alan
Real-Time Geo-Registration on High-Performance Computers – 80

Chapman, H. N.
Design and Performance of Capping Layers for EUV Multilayer Mirrors – 211

Chassignet, Eric
Assessment and Testing of the GODAE Products – 121

Chaturvedi, Arvind K.
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

Chen, Chia-Yon
A Modified Grey Forecasting Model for Long-Term Prediction – 163

Chen, Ching-Shan
Fast and Accurate Fault Detection/Location Algorthms for Double-Circuit/Three-Terminal Lines using Phasor Measurement Units – 163

Chen, Da Wun
Continuous-Wave Tunable Midwave Infrared Generation Near 4.5 micrometers with an Intracavity Optical Parametric Oscillator and Difference Frequency Generation – 38

Chen, Jiann-Fuh
Multi-Random PWM Inverter with Fixed Switching Frequency – 163

Chen, Jun
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

Chen, Ken
Interactive Software Fault Analysis Tool for Operational Anomaly Resolution – 148

Chen, P.
Might Dark Matter be Actually Black – 213

Chen, Po-Shou
Process for Producing a Cast Article from a Hypereutectic Aluminum-Silicon Alloy – 44

Chen, Victor L.
X-37 C-Sic CMC Control Surface Components Development [Status of the NASA/Boeing/USAF Orbital Vehicle and Related Efforts] – 49

Chen, Y. J.
Hydrodynamic Modeing of a Multi-Pulse X-Ray Converter Target for DARHT-II – 174

Cheng, Chiu-Fu
Software for Preprocessing Data From Rocket-Engine Tests – 146

Cheon, K. O.
Electric and Optical Properties of Doped Small Molecular Organic Light-Emitting Devices – 186

Chern, Jiundar
Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Cheung, S. C.
Retrieval of Similar Objects in Simulation Data Using Machine Learning Techniques – 140

Chew, Yen H.
Power Consumption of Customized Numerical Representations for Audio Signal Processing – 162

Chianese, Silvio
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures – 52

Chiang, Cheng-Ta
Design and Implementation for the Prototype of a Microstimulator – 62

Chiang, Fu-Pen
Investigating the Effect of Interfacial Strength on Deformation and Failure Mechanisms in Bond Systems – 26

Chien, C.
Low-Power Direct-Sequence Spread-Spectrum Modem Architecture for Distributed Wireless Sensor Networks – 56

Chin, Mian
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Characteristics and Global Impact of Aerosols from Southern Africa and Eastern Asia – 112

Chiu, Ching-Sang
The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation – 177

Chiu, Ching-Santg
Moored Observations of Internal Solitions in the Northeastern South China Sea – 73

Choi, Sung R.
Alumina-Reinforced Zirconia Composites – 89

Chou, Shu-Hsien
Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

Christ, Richard E.
Training Effectiveness Evaluation of the Full Spectrum Command Game – 148

Christensen, D. L.
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

Christensen, R. M.
Delamination Failure Investigation for Out-of-Plane Loading in Laminates – 28

Chtab, A.
'Hypothetical' Heavy Particles Dynamics in LES of Turbulent Dispersed Two-Phase Channel Flow – 69

Chuang, Kathy C.
High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Ciccarelli, Steven M.
Batteryless Sensor for Intrusion Detection and Assessment of Threats – 79

Cico, Luke
Real-Time Geo-Registration on High-Performance Computers – 80

Clark, Daniel
Fault Tolerant Magnetic Bearing Testing and Conical Magnetic Bearing Development for Extreme Temperature Environments – 86

Cleek, Tammy M.
Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

Click, C. A.
Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses – 186

Clinton, Raymond G.
Strategic Research Directions in Microgravity Materials Science – 221

Coate, W. G.
Preliminary Design Review: Kinematic Tracking for the PCA Integrated Radar-Tracker Application – 155

Cochran, Joe
Extrusion Based Processing of Ti Alloys: Feasibility Study – 47

Coffman, D. J.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Cohen, Martin
Irradiance Calibration of Space-Based Infrared Sensors – 79

Collange, Guillaume
Relative Motion of Two Spacecraft Near the Sun-Earth L2 Point – 82

Spacecraft Formation Design Near the Sun-Earth L(sub 2) Point – 18

Colozza, Anthony
Initial Feasibility Assessment of a High Altitude Long Endurance Airship – 6

Conoor, S. S.
GIS-Integrated Traffic Input Models for Mobile-Source Emissions Analysis – 102

Contreras, Jim
The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

Cook, Beth
Strategic Research Directions in Microgravity Materials Science – 221

Cook, R.
Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels – 174

Volume Rendering for Curvilinear and Unstructured Grids – 170

Cook, Sid
Real-Time Data Processing Onboard Remote Sensor Platforms: Annual Review #3 Data Package – 155

Cooper, G.
Microrelay – 60

Coppieters, D.
Military Operational Requirements for Computer Assisted eXercises (CAX) in NATO – 154

Practical Examples and Future Needs for Computer Assisted Exercises at the Operational Level of Military Decision Making – 157

The Increasing Need for the Representation of Decision Making and Human Behaviour in Simulations Used for Computer Assisted Exercises in NATO – 198

Coroneos, Rula M.
Significance of Strain in Formulation in Theory of Solid Mechanics – 90

Cosman, Felicia
Determinants of Stress Fracture and Bone Mass in Elite Military Cadets – 128

Costulis, Kay P.
A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies – 5

Couch, R.
3D Computations and Experiments – 194

Covert, D. S.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Cowan, T. E.
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

Cox, David E.
A Flight Dynamics Model for a Small Glider in Ambient Winds – 2

Crane, J. K.
RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

Criss, James
High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Critchlow, T.
Multi-Resolution Modeling of Large Scale Scientific Simulation Data – 138

Cukic, Bojan
Integrating Formal Methods and Testing 2002 – 148

Culick, F. E. C.
Experiment and Theory for Active Control of Nonlinear Dynamics in Compression/Combustion Systems – 69

Cummings, Jim
Assessment and Testing of the GODAE Products – 121

Cuneo, Jaques
Mechanical Properties of Heat-treated Carbon Fibers – 89

Cunningham, C. T.
Cooperative Mobile Sensing Networks – 6

Cunningham, Gary
AF ManTech Highlights, Winter 2003 – 4

Curry, Matt
Biosensors Made from Carbon and Polymer Composite Micro-Electromechanical Systems (MEMS) – 62

Curtin, Neal P.
Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153

Curtis, Scott
African Easterly Waves and Their Association with Precipitation – 116

Daggett, David L.
Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

Dahl, Peter H.
Direct Path Fluctuations Due to Shallow Water Volume Variability – 176

Dahmani, Rachid
In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols – 180

DalBello, Teryn
Computational Study of Axisymmetric Off-Design Nozzle Flows – 2

Daley, P.
Tests of the Contamination Analysis Unit, Phase 2 – 21

Dally, William J.
Stream Processing for High-Performance Embedded Systems – 65

Danchi, William C.
The Beauty and Limitations of 10 Micron Heterodyne Interferometry (ISI) – 208

Danchi, William
Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer – 191

Daniels, Christopher
Investigations of High Pressure Acoustic Waves in Resonators with Seal-like Features – 180

Darakjy, Salima
Guidance for Ability Group Run Speeds and Distances in Basic Combat Training – 129

Darden, Chris
Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

Darrah, Marjorie
Development of Methodologies for IV and V of Neural Networks – 147

Darve, Eric
Unfolding of Proteins: Thermal and Mechanical Unfolding – 71

Davila, Pam
The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

Davis, Bruce
Remote Sensing System Requirements Development: A Simulation-Based Approach – 97

Davis, George
An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Davis, Jesse M.
Application of Operating System Concepts to Coordination in Pervasive Sensing and Computing Systems – 155

Davis, Robert F.
Wide Band Gap Semiconductor Technology Initiative – 196

Davis, Timothy
Laser Obstacle Detection System Flight Testing – 84

Dawson, J. W.
All Fiber Technology for High-Energy Petawatt Front End Laser Systems – 186

Day, M.
Numerical Simulations of Shock-Induced Mixing and Combustion – 76

De Groot, A. J.
ParaDyn A Parallel Nonlinear, Explicit, Three-Dimensional Finite-Element Code for Solid and Structural Mechanics User Manual – 88

De Jong, Marla J.
Factors Related to Nonadherence of a Low Sodium Diet in Heart Failure Patients – 133

DE Jong, Yvo
On the Implementation of Iterative Detection in Real-World MIMO Wireless Systems – 173

de Supinski, B. R.
C++ Infrastructure for Automatic Introduction and Translation of OpenMP Directives – 139

De Yoreo, J. J.
Carbon Nanotube Atomic Force Microscopy for Proteomics and Biological Forensics – 51

DeAlwis, Varuna
Power Consumption of Customized Numerical Representations for Audio Signal Processing – 162

Dean, Derrick
Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications – 7

DeAngelis, Michael V.
Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

Decker, Arthur J.
Manipulation of Micro Scale Particles in Optical Traps Using Programmable Spatial Light Modulation – 77

DeGroh, H. C., III
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

DeHope, B.
Test Stand for Linear Induction Accelerator Optimization – 171

Delire, C.
Evaluating the Carbon Cycle of a Coupled Atmosphere-Biosphere Model – 109

DeMange, J. J.
Advanced Control Surface Seal Development for Future Space Vehicles – 86

Demayo, T. N.
Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

Dembek, Scott
Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

Demos, Chrystoph G.
Mechanical Properties of Heat-treated Carbon Fibers – 89

Demos, S.
Endoscopic Subsurface Imaging in Tissues – 183

Demoz, B.
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

Deniston, William
An Overview of the Medical Data Surveillance System (MDSS) – 200

Desai, Prasun N.
Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

Desai, Sanjay
The MER/CIP Portal for Ground Operations – 199

DeTeresa, S. J.
Delamination Failure Investigation for Out-of-Plane Loading in Laminates – 28

Dever, Timothy P.
Magnetic Bearing Controller Improvements for High Speed Flywheel System – 21

PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems – 86

Diaz de la Rubia, T.
Atomistic Simulation of Dislocation-Defet Interactions in Cu – 44

DiCarlo, James A.
Matrix Cracking in 3D Orthogonal Melt-Infiltrated SiC/SiC Composites with Various Z-Fiber Types – 30

Dickes, Edward G.
UAV Aerial Refueling - Wind Tunnel Results and Comparison with Analytical Predictions – 2

Diethelm, Kai
Tensor Fields for Use in Fractional-Order Viscoelasticity – 161

Dietrich, David E.
Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation – 123

DiGirolamo, P.
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

Dimasi, E.
Engineering Titanium for Improved Biological Response – 43

DiRienzi, Joseph
Approximating the Helium Wavefunction in Positronium-Helium Scattering – 173

Ditmire, T.
RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

Divol, L.
Stimulated Brillouin Scattering from Helium-Hydrogen Plasmas – 194

Dobson, Norm
Biosensors Made from Carbon and Polymer Composite Micro-Electromechanical Systems (MEMS) – 62

Dodge, J.
The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

Doerr, David
Transmission Measurements of Femtosecond Laser Pulses Through Aerosols – 83

Doherty, Patricia H.
Validation of Ionospheric Models – 209

Doherty, Patricia
Validation of Ionospheric Models – 103

Dolan, Joseph F.
Dying Pulse Trains in Cygnus XR-1: Initial Results of X-Ray Searches – 214

Dolce, James
Initial Feasibility Assessment of a High Altitude Long Endurance Airship – 6

Dominguez, Dino R.
The Effects of Gender on Receovery Times Following General Anesthesia with Propofol and Sevoflurane – 131

Dompke, Uwe
CAX System Architecture and Services – 157

Computer Generated Forces: Background, Definition and Basic Technologies – 157

Human Behaviour Representation: Application Areas – 225

Human Behaviour Representation: Definition – 136

Donahue, Megan
Observations of Distant Clusters – 208

Donkor, Eric
A 10-Bit 10 GSPS Optical ADC for Radar Signal Processing – 144

Dorfman, Y.
Frequency and Angular Dependence of Low Frequency East China Sea Bottom Scattering Strengths – 178

DOrtenzio, Matthew
The MER/CIP Portal for Ground Operations – 199

Dotson, Jessie L.
Tracing the Magnetic Field in Orion A – 217

Dover, Dov
Recent Advances in Matting Technology for Military Runways – 14

Sealed Window Glazing System for Chemical Biological Protected Space Applications – 89

Dow, Thomas A.
Highlights of the ASPE 2004 Winter Topical Meeting on Free-Form Optics: Design, Fabrication, Metrology, Assembly – 190

Dowell, C. Darren
Tracing the Magnetic Field in Orion A – 217

Dowell, Darren
The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

Drachman, Richard J.
Approximating the Helium Wavefunction in Positronium-Helium Scattering – 173

Drake, Greg W.
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

Drake, Jeremy
Chemical Compositions and Abundance Anomalies in Stellar Coronae ADP 99 – 216

Draper, Susan L.
Durability Assessment of Gamma TiAl – 47

Drozda, T. G.
A Novel Strategy for Numerical Simulation of High-speed Turbulent Reacting Flows – 68

Drozdz, Susan A.
Development of Product Descriptions for Lead- Immobilizing Overcoating Systems – 27

Drucker, Robert
The Okhotsk Sea Kashevarov Bank Polynya: Its Dependence on Diurnal and Fortnightly Tides and its Initial Formation – 110

Druzdzel, Marek J.
Enhancements of Systems Based on Bayesian Networks and Structural Equation Models for Command and Control Support – 167

Dubief, Yves
Numerical Simulation of High Drag Reduction in a Turbulent Channel Flow with Polymer Additives – 74

Dubovik, Oleg
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Duda, Tim
ASIAEX South China Sea Acoustic Fluctuations (and Physical Oceanography) – 177

Moored Observations of Internal Solitions in the Northeastern South China Sea – 73

The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation – 177

Duff, G.
Experimental Investigations on the Distortion of ISAR Images Using Different Radar Waveforms – 57

Duffy, Kirsten
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

Dumouchel, Lonna
Virtual Space Logistics Readiness Center (VSLRC): Concept of Operations – 14

Duncan, B. S.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Duncan, Bryan
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Dunlap, P. H., Jr.
Advanced Control Surface Seal Development for Future Space Vehicles – 86

Dunn, K.
Survey Report: Evaluation of an Air Shower for Reducing Exposure to Carbon Monoxide at USA Port of Entry, Calexico, California – 101

Dunn, T.
Computational Simulation of a Heavy Vehicle Trailer Wake – 1

Durham, Paul
Biosensors Made from Carbon and Polymer Composite Micro-Electromechanical Systems (MEMS) – 62

Durkin, Arthur F.
Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell – 27

Duvall, Thomas
Local Helioseismology: A New Window into the Sun – 223

Dvinskaya, M. L.
Wildfires Dynamics in Mid-Siberian Larch Dominated Communities – 95

Early, J.
Twenty Meter Space Telescope Based on Diffractive Fresnel Lens – 205

Edmonds, R.
Astro-E2 Magnesium Diboride High Current Leads – 195

Edwards, David
Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

Effinger, Michael R.
Mechanical Properties of Heat-treated Carbon Fibers – 89

Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

Recent Advances in the Development of Thick-Section Melt-Infiltrated C/SiC Composites – 29

Ehrmann, P. R.
Neodymium Fluorescence Quenching by Hydroxyl Groups in Phosphate Laser Glasses – 186

Ekloef, M.
Web-Based HLA Federations and Simulations: Methods and Possibilities – 55

Elam, S. K.
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

Eldridge, Jeffrey I.
Depth-Penetrating Temperature Measurements of Thermal Barrier Coatings Incorporating Thermographic Phosphors – 42

Elgorriaga, I.
Low-Power Direct-Sequence Spread-Spectrum Modem Architecture for Distributed Wireless Sensor Networks – 56

Elias, B.
Air Cargo Security, Updated September 11, 2003. CRS Report for Congress – 3

Ellerby, Donald T.
Ultra-High Temperature Ceramic Composites for Leading Edges – 29

Ellingson, Steven W.
Design of an L-Band Microwave Radiometer with Active Mitigation of Interference – 60

Ellis, D. L.
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

Elsner, F.
Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels – 174

Elvis, Martin
Seeing Red and Shooting Blanks: A Study of Red Quasars and Blank Field X-Ray Sources – 210

Engblom, William A.
Computation of Transverse Injection Into Supersonic Crossflow With Various Injector Orifice Geometries – 10

Engelhaupt, Darell
Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation – 46

Ensign, John
Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153

Erlandson, A. C.
Design of a 50TW/20 J Chirped-Pulse Amplification Laser for High-Energy-Density Plasma Physics Experiments at the Nevada Terawatt Facility of the University of Nevada – 194

Escher, J.
Partial Dynamical Symmetry in Nuclear Systems – 170

Esser, Ruth
Contraints on Solar Wind Plasma Properties Derived from Coordinated Coronal Observations – 223

Estes, Howard
A NASA SHARP Mentoring Experience Utilizing GP-B – 197

Etzkorn, Lethe
Semantic Metrics for Object Oriented Design – 158

Evans, Joseph B.
Application of Operating System Concepts to Coordination in Pervasive Sensing and Computing Systems – 155

Evans, K.
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

Ewy, Benjamin J.
Application of Operating System Concepts to Coordination in Pervasive Sensing and Computing Systems – 155

Faherty, Denis M.
Risk-Based Decision-Making and the Use of Operational Risk Management in Developing a Course of Action (COA) for the Joint Task Force (JTF) – 57

Failor, R.
Lawrence Livermore National Laboratory Site Specific Standard for Nonnuclear Safety Analysis – 136

Falconer, D. A.
Prediction of Active-Region CME Productivity from Magnetograms – 209

Testing Fractal Methods on Observed and Simulated Solar Magnetograms – 161

Faluvegi, G.
Climate Impacts on Tropospheric Ozone and Hydroxyl – 113

Fang, Fang
Generation of Custom DSP Transform IP Cores: Case Study Walsh-Hadamard Transform – 162

Fantini, Jay
Development and Testing of the Phase 0 Autonomous Formation Flight Research System – 53

Farassat, Fereidoun
Broadband Trailing Edge Noise Predictions in the Time Domain – 180

Farr, R. A.
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

Faux, D.
3D Computations and Experiments – 194

Ferguson, Dale C.
New NASA SEE LEO Spacecraft Charging Design Guidelines: How to Survive in LEO Rather Than GEO – 18

Ferguson, Dale
Experimental Study of Arcing on High-Voltage Solar Arrays – 19

Solar Array in Simulated LEO Plasma Environment – 195

Ferrare, Richard A.
Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

Fiehler, Douglas
Mission Steering Profiles of Outer Planetary Orbiters Using Radioisotope Electric Propulsion – 15

Fields, Roger A.
Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

Figer, Donald
Comparative NIR Detector Characterization for NGST – 78

Figueroa, Fernando
Modeling and Validation of a Propellant Mixer for Controller Design – 24

Fikuf, John
Global Information Enterprise Simulation Laboratory (GIESIM LAB) – 54

Fill, E. E.
Investigations on 10-Hz sub-Joule fs-Laser Pumped Neon- and Nickel-like X-ray Lasers – 195

X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultra-short X-ray Pulses with Matter – 185

Filman, Robtert E.
The MER/CIP Portal for Ground Operations – 199

Finkbeiner, Joshua
Investigations of High Pressure Acoustic Waves in Resonators with Seal-like Features – 180

Fisher, John W.
Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

Partitioning of Inorganic Elements Consumed by Humans Between the Various Fractions of Human Wastes: A Review and Analysis of Existing Literature – 34

Fisher, John
Compaction of Space Mission Wastes – 137

Fisk, W. J.
Predicted Concentrations in New Relocatable Classrooms of Volatile Organic Compounds Emitted from Standard and Alternate Interior Finish Materials – 100

Fleming, Eric L.
The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

Fleszar, Mark
Investigation of Exothermic Grinding Sludge Produced from Watervliet Arsenal Gun Steels, Andersol Water- Based Cutting Fluid and Cincinnati Milacron Aluminum Oxide Resin Bond Grinding Wheels – 39

Fletcher, Rose
Scientific Data Purchase Project Overview Presentation – 94

Flocke, Frank
Measurement of Peroxyacetyl Nitrate (PAN), Peroxypropionyl Nitrate (PPN) and Peroxymethacryloyl Nitrate (MPAN) during TRACE-P – 30

Flores, O.
Rough-Wall Channel Analysis Using Suboptimal Control Theory – 74

Foley, J. A.
Evaluating the Carbon Cycle of a Coupled Atmosphere-Biosphere Model – 109

Folkesson, M.
(Sigma)QL: A Decision Support Tool for Target Recognition in a Multisensor Environment – 187

Folta, David
A Comprehensive Survey of Earth-Moon Libration Orbits: Stationkeeping Strategies And Intra-Orbit Transfers – 15

Formation Control of the MAXIM L2 Libration Orbit Mission – 205

Fong, I.-Kong
Sub-Optimal Finite Dimensional Observer-Based Boundary Controller Design for Distributed Parameter Systems on a Planar Domain – 164

Foster, Lancert
Computation of Transverse Injection Into Supersonic Crossflow With Various Injector Orifice Geometries – 10

Fotta, Michael E.
FY 2002 Report on Software Visualization Techniques for IV and V – 145

Foulkes, William D.
Is Breast Tissue from Women Who Carry Germ-Line BRCA1 or BRCA2 Mutations 'Normal'? - An Immuno- Histopathological Study – 130

Fountain, W.
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

Fox, Robert L.
L-C Measurement Acquisition Method for Aerospace Systems – 81

Frame, B. J.
Alternate Energy Sources for Thermoplastic Binding Agent Consolidation – 172

Franchetti, Franz
Short Vector SIMD Code Generation for DSP Algorithms – 162

Frank, Jeremy
Simplifying a Lifted Plan Graph Using Domain Splitting – 142

Fransson, J.
HFES 2002 Travelreport – 137

Freed, Alan D.
Tensor Fields for Use in Fractional-Order Viscoelasticity – 161

Freedman, Marc
Evaluation of Candidate Materials for a High-Temperature Stirling Convertor Heater Head – 45

Freeman, Bruce L.
Diagnostic Instrumentation – 62

Freeman, Dennis M.
Computer Microvision for Microelectromechanical Systems (MEMS) – 65

Frei, Allan
Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

Fremouw, E. J.
Ionospheric Sensor Developments for the Year-2000 Solar Maximum – 15

Fremouw, Edward J.
Investigations of the Nature and Behavior of Plasma Density Disturbances That May Impact GPS and Other Transionospheric Systems – 104

French, George
Wisconsin Earth and Space Science Education – 200

French, Matt
System Level Applications of Adaptive Computing (SLAAC) – 156

Fried, Glenn
Construction of a Virtual Scanning Electron Microscope (VSEM) – 191

Friedman, Doug
Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

Frigo, Janette
Streams-C; Sc2 C-to-FPGA Compiler – 149

Frigo, Matthew
Algorithmic Advances for Software Radios – 57

Frimer, Aryeh A.
Reevaluation of Tetrahydrophthalic Anhydride as an End Cap for Improved Oxidation Resistance in Addition Polyimides – 42

Frogel, Jay
Nanotechnology Infrared Optics for Astronomy Missions – 207

FROM
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

Froula, D. H.
Stimulated Brillouin Scattering from Helium-Hydrogen Plasmas – 194

Fukumori, Ichiro
Assessment and Testing of the GODAE Products – 121

Fullerton, C. Gordon
Manual Manipulation of Engine Throttles for Emergency Flight Control – 13

Gaidis, Michael C.
Optical Properties of Zitex in the Infrared Submillimeter – 192

Gaillard, J. M.
Observation of the Decay Beta(sup 0) approximately Tau(sup 0)Tau(sup 0) – 172

Gallagher, J. R.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Gallant, David J.
Experimental Operations and Support for LITE – 84

Low Temperature Alpha Measurement – 84

Gallimore, Alec D.
Ion Species Fractions in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

Gallop, Lloyd
Arctic Shoreline Delineation & Feature Detection Using RADARSAT-1 Interferometry: Case Study Over Alert – 97

Galofaro, Joel
Experimental Study of Arcing on High-Voltage Solar Arrays – 19

Solar Array in Simulated LEO Plasma Environment – 195

Games, Richard
Trends in HPC and HPEC Convergence – 155

Gann, Robert
Joint Battlespace Infosphere Repository Prototype – 201

Garber, Donald P.
A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies – 5

Garcia, D. L.
Student Research and Accomplishments: 2001-2002, Multidisciplinary Center for Earthquake Engineering Research – 92

Garland, Cedric F.
Health Surveillance in the U.S. Navy: Asthma – 125

Garrett, Charles
Streaming and Dynamic Compilers for High Performance Embedded Computing – 149

Garvey, Dennis M.
A High Resolution, Three-Dimensional, Computationally Efficient, Diagnostic Wind Model: Initial Development Report – 115

Gary, G. A.
Prediction of Active-Region CME Productivity from Magnetograms – 209

Gasch, Matthew J.
Ultra-High Temperature Ceramic Composites for Leading Edges – 29

Gasser, Gerald
Remote Sensing System Requirements Development: A Simulation-Based Approach – 97

Gasser, Jerry
NASA's Virtual Product Laboratory: An Overview – 158

Satellite Hyperspectral Imaging Simulation – 95

Gattis, Christy
Passive Isolators for use on the International Space Station – 17

Gavel, D. T.
Astronomy Applications of Adaptive Optics at Lawrence Livermore National Laboratory – 220

Gayda, J.
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

High Temperature Burst Testing of a Superalloy Disk With a Dual Grain Structure – 46

Geil, Bruce
High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

Geiselhart, Karl A.
Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

Gentry, B.
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

Georgiadis, Nicholas
Computational Study of Axisymmetric Off-Design Nozzle Flows – 2

Germann, Joe
Signal Processing Architectures for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Applications – 80

Getty, David J.
An Evaluation of Stereoscopic Digital Mammography for Earlier Detection of Breast Cancer and Reduced Rate of Recall – 131

Ghogho, Mounir
A New Approach to Blind Channel Identification for OFDM Systems – 149

Ghosn, J.
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

Giedd, Ryan
Biosensors Made from Carbon and Polymer Composite Micro-Electromechanical Systems (MEMS) – 62

Giedt, W. H.
Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

Gilbert, J.
Engineering Titanium for Improved Biological Response – 43

Ginoux, Paul
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Givi, P.
A Novel Strategy for Numerical Simulation of High-speed Turbulent Reacting Flows – 68

Glass, R. S.
Electrochemical Hydrogen Sensor for Safety Monitoring – 60

Glavin, D. P.
Isolation of Purines and Pyrimidines from the Murchison Meteorite – 125

Glenn, L. A.
Simulations of Underground Structures Subjected to Dynamic Loading using the Distinct Element Method – 88

Glenzer, S. H.
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

Glickman, J.
Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

Goerz, D.
Test Stand for Linear Induction Accelerator Optimization – 171

Goh, Takashi
Recent Advances in Optical Switches Using Silica-based PLC Technology – 189

Gokhale, Maya
Streams-C; Sc2 C-to-FPGA Compiler – 149

Golden, Keith
Simplifying a Lifted Plan Graph Using Domain Splitting – 142

Goodman, S. J.
The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

Gopalswamy, N.
Phenomena Associated With EIT Waves – 218

Gorenstein, Paul
Development of High Resolution Hard X-Ray Telescope with Multilayer Coatings – 191

Gorokhovski, M.
Fragmentation under the Scaling Symmetry and Turbulent Cascade with Intermittency – 75

'Hypothetical' Heavy Particles Dynamics in LES of Turbulent Dispersed Two-Phase Channel Flow – 69

Gosling, J. T.
Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections – 224

Gostowski, Rudy
An Experimental Investigation of Hypergolic Ignition Delay of Hydrogen Peroxide with Fuel Mixtures – 52

Goto, D.
3D Computations and Experiments – 194

Gowda, Sanjay
Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

Grady, Carol A.
Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics – 13

Grady, D.
Investigation of Explosively Driven Fragmentation of Metals-Two=Dimensional Fracture and Fragmentation of Metal Shells: Progress Report II – 175

Grammer, W.
Symmetric Waveguide Orthomode Junctions – 213

Granacki, John
MONARCH: A Morphable Networked micro-ARCHitecture – 63

Gray, A.
Astro-E2 Magnesium Diboride High Current Leads – 195

Gray, D. H.
Application of Beryllium-7 and Lead-210 Concentration Measurements to Monitoring the Validity of Effluent Air Sampling at the Waste Isolation Pilot Plant – 102

Gray, Perry
Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

Graziani, F. R.
Transport Methods Conquering the Seven-Dimensional Mountain – 170

Greenbauer-Seng, L. A.
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

Greenhouse, Matthew
Comparative NIR Detector Characterization for NGST – 78

Greenwell, Dr. D. I.
Pitfalls in the Interpretation of Delta Wing Flow Visualisation – 9

Gregori, G.
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

Stimulated Brillouin Scattering from Helium-Hydrogen Plasmas – 194

Grier, J. A.
Spectroscopy and Photometry of Mars Trojans – 208

Griffen, K.
Test Stand for Linear Induction Accelerator Optimization – 171

Griffin, Timothy
High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

Grimes, Robin W.
Predicting the Effect of Defect Distributions in the Bulk and on Surfaces of Ceramic Materials – 50

Grimm, Barry
IS0 9000 Implementation and Assessment: A Guide to Developing and Evaluating Quality Management Systems – 225

Grisso, Benjamin
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

Groenwall, C.
(Sigma)QL: A Decision Support Tool for Target Recognition in a Multisensor Environment – 187

Grosser, Benjamin
Construction of a Virtual Scanning Electron Microscope (VSEM) – 191

Grosveld, Ferdinand W.
Temporal Characterization of Aircraft Noise Sources – 178

Gu, Guo-Jun
African Easterly Waves and Their Association with Precipitation – 116

Gulczinaki, Frank
Program Research and Announcement PRDA 04-01-PKT Integrated High Payoff Rocket Propulsion Technology XI (IH-PRPT) – 22

Gullbrand, Jessica
Grid-Independent Large-Eddy Simulation in Turbulent Channel Flow using Three-Dimensional Explicit Filtering – 70

Gullikson, E.
Proposed Specification of EUVL Mask Substrate Roughness – 67

Gundersen, Martin A.
Compact High Power Repetitive Pulsed Power Instrumentation – 64

Gunderson, E. K.
Health Surveillance in the U.S. Navy: Asthma – 125

Gunning, Donna T.
The Effects of Gender on Receovery Times Following General Anesthesia with Propofol and Sevoflurane – 131

Gupta, R. M.
Water Recycling/Removal Using Temperature-Sensitive Hydrogels – 49

Gural, Peter S.
Asteroid Search with Advanced Detection Algorithms – 206

Gurton, Kristan P.
In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols – 180

Guruswamy, Guru P.
Advances in High Performance Computational Methods for Large Scale Fluid/Structure Interaction – 68

Gustafsson, T.
Mixed Reality in Military Applications. A Pilot Study with Certain Focus on Integration of Gaze-Tracker and Head Mounted Displays – 140

Guttormsen, M.
Level Densities and Radiative Strength Functions in (170, 171) Yb – 167

Haas, James M.
Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

Hackett, Peter
International Hypoxia Symposium (13th) for the Publishing of the Conference Proceedings for 2003 Conference – 125

Haddad, Z.
Heating Structures Derived from Satellite – 112

Hagyard, M. J.
Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21 – 225

Hale, Joseph P.
Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

Hall, E.
Wireless Link Design Using a Patch Antenna – 56

Hall, Leslie
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

Hall, Nancy R.
Sonoluminescence Bubble Measurements using Vision-Based Algorithms – 159

Hallahan, Francis
An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Ham, F.
A Cartesian Adaptive Level Set Method for Two-Phase Flows – 70

Hammond, D. R.
Survey Report: Evaluation of an Air Shower for Reducing Exposure to Carbon Monoxide at USA Port of Entry, Calexico, California – 101

Hampson, G. A.
Design of an L-Band Microwave Radiometer with Active Mitigation of Interference – 60

Hanano, Shinya
Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 64

Handhyala, V.
Mixed Electromagnetic and circuit Simulations using Higher-Order Elements and Bases – 171

Haney, Robert L.
Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation – 123

Hansen, James R.
The Wind and Beyond: A Documentary Journey into the History of Aerodynamics in America – 3

Hanson, John M.
Test Results for Entry Guidance Methods for Reusable Launch Vehicles – 17

Harang, O.
Absolute Optical Calibrations Using a Simple Tungsten Bulb: Theory – 204

Harder, Hartwig
TRACE-P OH and HO2 Measurements with the Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) on the DC-8 – 115

Hardro, Peter J.
Molybdenum-Copper Composite Material – 28

Harman, Rick
Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment – 16

Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft – 20

Harris, Patrick K.
Near-Field Magnetic Dipole Moment Analysis – 103

Harrison, Paul
SiGe Quantum Well Infrared Photodetectors (QWIPs) for Remote Sensing Applications – 80

Harsanyi, Joe
Real-Time Data Processing Onboard Remote Sensor Platforms: Annual Review #3 Data Package – 155

Harte, J.
Hydrodynamic Modeing of a Multi-Pulse X-Ray Converter Target for DARHT-II – 174

Hartman, Kate
Formation Control of the MAXIM L2 Libration Orbit Mission – 205

Hartmann, Lee W.
Studies of Circumstellar Disk Evolution – 212

Hashmall, J.
Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

Hauk, T. F.
Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset – 199

Hauret, Keith G.
Guidance for Ability Group Run Speeds and Distances in Basic Combat Training – 129

Hau-Riege, S. P.
Novel EUV Mask Blank Defect Repair Developments – 181

Hawkins, Tommy
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

He, Guo-Wei
A Self-Contained Mapping Closure Approximation for Scalar Mixing – 71

On the Computation of Space-Time Correlations by Large-Eddy Simulation – 70

Heap, Sara R.
Optical Spectra of Extrasolar Giant Planets – 206

Heaps, William S.
TerraHertz Free Electron Laser Applications for Satellite Remote Sensing – 83

Heck, M.
Durability of Polymeric Glazing Materials for Solar Applications – 98

Hedge, Kavita
Sulfur Mustard Damage to Cornea With Emphasis on Skin: Preventative Studies – 127

Hefley, Joel
Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153

Heher, Dennis M.
The MER/CIP Portal for Ground Operations – 199

Hein, Carl
Multidimensional Performance Modeling for Advanced Embedded Signal Processors – 151

Heirtzler, James R.
The Geomagnetic Field During a Reversal – 103

Helder, Dennis L.
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

Hemmeter, Eric
Power Consumption of Customized Numerical Representations for Audio Signal Processing – 162

Hendricks, J. A.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Hendricks, R. C.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Henein, Medhat
Sulfur Mustard Damage to Cornea With Emphasis on Skin: Preventative Studies – 127

Hernandez, M.
Review of Sampling and Analysis Methods for Assessing Airborne Microbiological Contamination on Commerical Aircraft. A Literature Survey and Review – 101

Herrmann, M.
A Domain Decomposition Parallelization of the Fast Marching Method – 152

Modeling Primary Breakup: A Three-Dimensional Eulerian Level Set/Vortex Sheet Method for Two-Phase Interface Dynamics – 75

New Type of the Interface Evolution in the Richtmyer-Meshkov Instability – 69

Herrmann, Michael J.
Characterization of the Microstructure of Fine Energetic Materials – 173

Heuze, F. E.
Simulations of Underground Structures Subjected to Dynamic Loading using the Distinct Element Method – 88

Hicheur, A.
Observation of the Decay Beta(sup 0) approximately Tau(sup 0)Tau(sup 0) – 172

Hicks, G. D.
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

Higinbotham, John
An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Hildebrand, Peter H.
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

Observing the Global Water Cycle from Space – 96

Hildebrand, Roger H.
Tracing the Magnetic Field in Orion A – 217

Hildrum, J. S.
Lawrence Livermore National Laboratory Site Specific Standard for Nonnuclear Safety Analysis – 136

Hill, T. S.
NLC Gamma-Gamma Beam Dump Face Calculations – 168

Hillard, G. Barry
New NASA SEE LEO Spacecraft Charging Design Guidelines: How to Survive in LEO Rather Than GEO – 18

Hilliard, Laurence
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

Hines, Keith M.
Modeling and Observational Study of the Global Atmospheric Impacts of Antarctic Sea Ice Anomalies – 113

Ho, D. D. M.
Barrier Foil Heating Simulations Using LASNEX – 174

Hydrodynamic Modeing of a Multi-Pulse X-Ray Converter Target for DARHT-II – 174

Ho, David
Successive Bit-Vector Search Algorithm for CELP Vocoders – 164

Hobart, R. L.
Compact Liquid Waste Evaporator for Cleanup on Hanford's Hot Cells – 100

Hobbs, Gurnie
The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

Hodgson, A. T.
Predicted Concentrations in New Relocatable Classrooms of Volatile Organic Compounds Emitted from Standard and Alternate Interior Finish Materials – 100

Volatile Organic Chemical Emissions from Structural Insulated Panel (SIP) Materials and Implications for Indoor Air Quality – 99

Hoe, James C.
Generation of Custom DSP Transform IP Cores: Case Study Walsh-Hadamard Transform – 162

Hoeflaak, M.
Performance of Low-VOC Paint for Vehicles of the Dutch Army – 51

Hofer, Richard R.
Ion Species Fractions in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

Ion Voltage Diagnostics in the Far-Field Plume of a High-Specific Impulse Hall Thruster – 24

The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters – 10

Hofmann, Heath
Modeling and Control of the ARCP in Power and Drive Systems – 66

Hogie, Keith
An Internet Protocol-Based Software System for Real-Time, Closed-Loop, Multi-Spacecraft Mission Simulation Applications – 147

Holben, Brent
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Holekamp, Kara
Scientific Data Purchase Project Overview Presentation – 94

Hollerman, William
Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

Honn, Kenneth V.
Bioactive Lipids: Role in Prostate Cancer Angiogenesis – 127

Hoover, C. G.
ParaDyn A Parallel Nonlinear, Explicit, Three-Dimensional Finite-Element Code for Solid and Structural Mechanics User Manual – 88

Hopkins, Dale A.
Significance of Strain in Formulation in Theory of Solid Mechanics – 90

Horn, J. M.
Microbiologically-Facilitated Effects on the Surface Composition of Alloy 22, A Candidate Nuclear Waste Packaging Material – 44

Horney, T.
(Sigma)QL: A Decision Support Tool for Target Recognition in a Multisensor Environment – 187

Horowitz, Mark A.
The Light Field Video Camera – 79

Hou, A.
Heating Structures Derived from Satellite – 112

Houser, Paul
Observing the Global Water Cycle from Space – 96

Houston, Janice
Passive Isolators for use on the International Space Station – 17

Houtsma, Adrianus J.
Nonspeech Audio in Helicopter Aviation – 8

Hovater, Mary
Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

Howard, Joseph
Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer – 191

Howell, E. S.
Spectroscopy and Photometry of Mars Trojans – 208

Howell, Kathleen
Formation Control of the MAXIM L2 Libration Orbit Mission – 205

Howell, R. H.
Atomic-Based Calculations of Two-Detector Doppler-Broadening Spectra – 175

Hoyt, Reed W.
Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications – 132

Hsu, Che-Chiang
A Modified Grey Forecasting Model for Long-Term Prediction – 163

Hsu, Christina N.
Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

Hubbard, Kim
The MER/CIP Portal for Ground Operations – 199

Hubbs, Whitney
Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

Hubeny, Ivan
Optical Spectra of Extrasolar Giant Planets – 206

Huffman, George J.
African Easterly Waves and Their Association with Precipitation – 116

Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

Huggins, Mark E.
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

Hughes, Scott A.
Investigations into Gravitational Wave Emission from Compact Body Inspiral Into Massive Black Holes – 209

Hui, Sek-Wen
Delivering DNA Vaccine by Transdermal Electroporation – 130

Hunt, A. W.
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

Hunter, Paul
Package for Interactive Analysis of Line Emission (Analysis of UV-X-Ray High-Resolution Emission Spectra) – 188

Hur, Joe S.
Unfolding of Proteins: Thermal and Mechanical Unfolding – 71

Hutchings, Brad
System Level Applications of Adaptive Computing (SLAAC) – 156

Unified Debug Environment for Adaptive Computing Systems – 152

Hyde, R.
Civilian Power from Space in the Early 21st Century – 98

Twenty Meter Space Telescope Based on Diffractive Fresnel Lens – 205

Hyde, T. Tupper
Control of the Laser Interferometer Space Antenna – 205

Hyde, Tristram
Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer – 191

Hylton, Donald
High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Ichikawa, Haruhisa
R and D that can Capture Value – 198

Idar, D. J.
Thermal Decomposition of New and Aged LX-04 and PBX 9501 – 25

Igarza, J. L.
NATO Modelling and Simulation (M and S) Orientation Course – 154

Ikeda, Takashi
Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 63

Ingram, C.
Lawrence Livermore National Laboratory Site Specific Standard for Nonnuclear Safety Analysis – 136

Inman, Daniel J.
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

Iraci, L. T.
Heterogeneous Interactions of Acetaldehyde and Sulfuric Acid – 33

Iredell, Lena
Current results from AIRS/AMSU/HSB – 120

Ishikawa, M.
Civilian Power from Space in the Early 21st Century – 98

Ivancic, William D.
Securing Mobile Networks in an Operational Setting – 156

Iverson, David
System Modeling and Diagnostics for Liquefying-Fuel Hybrid Rockets – 167

Izumi, N.
CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

Jackman, Charles H.
The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

Jacobs, Robert
Computer Assisted Exercises: Background – 154

Computer Generated Forces: Future Needs – 143

Computer Generated Forces: Layout and Architecture – 143

Human Behaviour Representation: Relevant Technologies and their Development – 135

Jameson, L.
Numerical Errors: Reliable Numerical Simulations – 143

Jankovsky, Robert S.
The Influence of Current Density and Magnetic Field Topography in Optimizing the Performance, Divergence, and Plasma Oscillations of High Specific Impulse Hall Thrusters – 10

Jansen, Ralph H.
Magnetic Bearing Controller Improvements for High Speed Flywheel System – 21

Jansen, Ralph
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems – 86

Jardine, A. Peter
Preliminary Sizings for an Integrated SME Actuator System for the STAR system – 85

Jedlovec, G.
The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

Jeelani, Shaik
Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications – 7

Jenkerson, Calli B.
Accessing and Understanding MODIS Data – 120

Jenkins, C. F.
Corrosion of Exhaust and Filtration Equipment in a Radioactive Waste Incinerator – 33

Jenkins, Phillip
Historical Precision of an Ozone Correction Procedure for AMO Solar Cell Calibration – 99

Jessop, C. P.
Measurement of the Branching Fractions of Lambda(C)+ -> P Anti-K N(Pi) – 169

Ji, Yi-Min
TRMM Fire Algorithm, Product and Applications – 93

Jimenez, J.
Rough-Wall Channel Analysis Using Suboptimal Control Theory – 74

Jo, Hanjoong
Molecular Basis of Mechano-Signal Transduction in Vascular Endothelial Cells – 133

Jodha, Siri
Accessing and Understanding MODIS Data – 120

Johan, Sandra
The MER/CIP Portal for Ground Operations – 199

Johnson, Dale L.
Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development' – 1

Johnson, Dexter
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

Johnson, Gregory C.
Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

Johnson, J. E.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Johnson, J. T.
Design of an L-Band Microwave Radiometer with Active Mitigation of Interference – 60

Johnson, J.
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

Johnston, J. Christopher
Reevaluation of Tetrahydrophthalic Anhydride as an End Cap for Improved Oxidation Resistance in Addition Polyimides – 42

Joiner, J.
Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals – 117

Jones, C.
Testing Fractal Methods on Observed and Simulated Solar Magnetograms – 161

Jones, Christine
Environmental Effects on the Metallicities of Early-Type Galaxies – 215

Spectroscopy of the Perseus Cluster – 213

Jones, E. D.
Cooperative Mobile Sensing Networks – 6

Jones, Robert E.
Test Results for Entry Guidance Methods for Reusable Launch Vehicles – 17

Jones-Meehan, J.
Corrosion Mechanisms of UNS N04400 in Sea Water – 35

Jong, R. A.
Electron Cyclotron Heating and Current Drive for Maintaining Minimum q in Negative Central Shear Discharges – 175

Joo, Chan Gyu
Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties – 37

Jorgensen, G.
Durability of Polymeric Glazing Materials for Solar Applications – 98

Jorgenson, Philip C. E.
Computing Axisymmetric Jet Screech Tones using Unstructured Grids – 179

Jovanovic, I.
All Fiber Technology for High-Energy Petawatt Front End Laser Systems – 186

Parametric Techniques for Extreme-Contrast, High-Energy Petawatt Pulses – 185

Jungert, E.
(Sigma)QL: A Decision Support Tool for Target Recognition in a Multisensor Environment – 187

Jurotich, Matthew
The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

Jusem, Juan Carlos
Current results from AIRS/AMSU/HSB – 120

Kaaret, Philip
Simultaneous X-Ray and Optical Timing Observations of GX 339-4 – 184

Kaastra, Jelle
The Soft Excess Emission in the Hercules Supercluster Observed with the ROSAT Position Sensitive Proportional Counter – 204

Kaiser, T. B.
Electron Cyclotron Heating and Current Drive for Maintaining Minimum q in Negative Central Shear Discharges – 175

Kaita, Ed
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

Kakar, R.
Heating Structures Derived from Satellite – 112

Kamath, C.
Retrieval of Similar Objects in Simulation Data Using Machine Learning Techniques – 140

Kamiya, K.
Passive Superconducting Shielding: Experimental Results and Computer Models – 145

Kamstra, M.
Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Kancleris, Zilvinas
Coaxial-Type Resistance Sensor for HPM Applications – 64

Kantzos, P.
High Temperature Burst Testing of a Superalloy Disk With a Dual Grain Structure – 46

Karasz, Frank E.
Electro Optical Properties of Copolymer Blends – 50

Kariis, H.
Protection Against Microsecond Laser Pulses – 184

Karkehabadi, R.
Structural Integrity of a Wind Tunnel Balance – 91

Karlinsey, Robert L.
Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties – 37

Karpi, Stephen
Direct Path Fluctuations Due to Shallow Water Volume Variability – 176

Kascak, Peter E.
Magnetic Bearing Controller Improvements for High Speed Flywheel System – 21

Kashyap, Vinay
Package for Interactive Analysis of Line Emission (Analysis of UV-X-Ray High-Resolution Emission Spectra) – 188

Katagiri, Yoshitada
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 189

Kawa, S. Randolph
Sensitivity Studies for Space-based Measurements of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight – 108

Kawachi, Masao
For Further Innovation – 166

Kawai, Ron
Blended Wing Body Systems Studies: Boundary Layer Ingestion Inlets With Active Flow Control – 9

Keely, Leslie
The MER/CIP Portal for Ground Operations – 199

Keita, Fricky
Current results from AIRS/AMSU/HSB – 120

Keith, Theo G., Jr.
Fault Tolerant Magnetic Bearing Testing and Conical Magnetic Bearing Development for Extreme Temperature Environments – 86

Keith, Theo
Computational Study of Axisymmetric Off-Design Nozzle Flows – 2

Kelleners, Philip
Simulation of Inviscid Compressible Multi-Phase Flow with Condensation – 72

Keller, Vernon W.
Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development' – 1

Kent, C. A.
Cooperative Mobile Sensing Networks – 6

Kenyon, Scott J.
Outbursts in Symbiotic Binaries – 217

RR Tel: Getting under the Flux Limit - An Observation with FUSE – 216

Studies of Planet Formation Using a Hybrid N-Body + Planetesimal Code – 221

Keppenne, Christian
Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

Keyomarsi, Khandan
Cyclin E, a Powerful Predictor of Survival in Breast Cancer - A Prospective Study – 130

Kharuk, V. I.
Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data – 187

Wildfires Dynamics in Mid-Siberian Larch Dominated Communities – 95

Khazanov, G. V.
Magnetosphere-Ionosphere Coupling and Associated Ring Current Energization Processes – 211

Khazanov, George V.
The Nonlinear Coupling of Alfven and Lower Hybrid Waves in Space Plasma – 193

Kihara, R.
Test Stand for Linear Induction Accelerator Optimization – 171

Kikuchi, Nobuhiro
Monolithically Integrated 64-channel WDM Channel Selector – 63

Kimmel, E. C.
The Acute Respiratory Distress Syndrome (ARDS) and Military Relevant Inhalation Injury: A Brief Review – 133

King, Michael D.
Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

Earth Observing System: Global Observations to Study the Earth's Environment – 96

Kinney, Jeremy
The Wind and Beyond: A Documentary Journey into the History of Aerodynamics in America – 3

Kirkpatrick, M. P.
Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer – 116

Kirschman, Randall K.
Ge Semiconductor Devices for High-Performance Cryogenic Power Electronics – 60

Kitagawa, Yukako
Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions – 159

Knapik, Joseph J.
Guidance for Ability Group Run Speeds and Distances in Basic Combat Training – 129

Knecht, Sean D.
Benefit of Constant Momentum Propulsion for Large Delta V Missions -Applications to Laser Propulsion – 84

Knijnenburg, S. G.
Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Knobles, D. P.
Frequency and Angular Dependence of Low Frequency East China Sea Bottom Scattering Strengths – 178

Ko, William I.
Thermal Buckling Analysis of Rectangular Panels Subjected to Humped Temperature Profile Heating – 89

Koch, J. A.
CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

Koenig, George G.
Preliminary Analysis of X-Band and Ka-Band Radar for Use in the Detection of Icing Conditions Aloft – 5

Koenig, John
Mechanical Properties of Heat-treated Carbon Fibers – 89

Kojima, Jun
Development of a High-Pressure Gaseous Burner for Calibrating Optical Diagnostic Techniques – 11

Measurement and Simulation of Spontaneous Raman Scattering Spectra in High-Pressure, Fuel-Rich H2-Air Flames – 43

Kok, Gregory L.
Black Carbon Measurements in SOLVE-2 – 78

Kollmansberg, Ron
High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Kolody, Mark
The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

Komashko, A. M.
Laser-Material Interaction of Powerful Ultrashort Laser Pulses – 26

Kono, Junichiro
Technology Development of Miniaturized Far-Infrared Sources for Biomolecular Spectroscopy – 35

Koou, Jacob W.
Optical Properties of Zitex in the Infrared Submillimeter – 192

Kosch, M. J.
Absolute Optical Calibrations Using a Simple Tungsten Bulb: Theory – 204

Koster, A. J.
Reference Document for Management of Tactical Infrastructure Networks – 156

Koster, Randal D.
On the Cause of the 1930s Dust Bowl – 113

Kouvaris, Louis
Current results from AIRS/AMSU/HSB – 120

Kouveliotou, C.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Kovacs, K.
Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data – 187

Kowal, Dan
Globe Teachers Guide and Photographic Data on the Web – 146

Kozioziemski, B. J.
Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

Krasiewski, Steven
Development and Testing of the Phase 0 Autonomous Formation Flight Research System – 53

Krasnykh, Victor
Derivation of Double-Targeted Adenovirus Vectors for Gene Therapy of Prostate Cancer – 131

Krishnamurti, T. N.
Heating Structures Derived from Satellite – 112

Krishnaprasad, P. S.
The Design and Control of Smart Structures – 54

Kroo, Ilan M.
Aircraft Optimization for Minimum Environmental Impact – 8

Kuba, J.
X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultrashort X-ray Pulses with Matter – 185

Kuhl, A.
Numerical Simulations of Shock-Induced Mixing and Combustion – 76

Kuklo, R. M.
Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

Kumfert, G.
Understanding the CCA Standard Through Decaf – 140

Kummerow, C.
Heating Structures Derived from Satellite – 112

Kurien, Thomas
Real-Time Geo-Registration on High-Performance Computers – 80

Kurkov, Anatole
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

Kurylo, Michael
Advanced Global Atmospheric Gases Experiment (AGAGE): MIT Contribution – 115

Kypuros, Javier A.
Toward a Fast-Response Active Turbine Tip Clearance Control – 12

La Fortune, K.
Scene-Based Wave-Front Sensing for Remote Imaging – 183

Landen, O. L.
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

Landi, E.
Atomic Data and Spectral Line Intensities for S XI – 219

Lang, S.
Heating Structures Derived from Satellite – 112

Lapenta, W.
The NASA Short-term Prediction Research and Transition (SPoRT) Center: A Collaborative Model for Accelerating Research into Operations – 116

Lapenta, William M.
Diabatic Initialization of Mesoscale Models in the Southeastern USA: Can 0 to 12h Warm Season QPF be Improved? – 67

LaPointe, Michael R.
NASA GRC High Power Electromagnetic Thruster Program – 23

Lappe, Joan M.
Efficacy of Calcium and Vitamin D Supplementation for the Prevention of Stress Fractures in Female Naval Recruits – 126

Larsen, Jeffrey
Asteroid Search with Advanced Detection Algorithms – 206

Larson, C. W.
Benefit of Constant Momentum Propulsion for Large Delta V Missions -Applications to Laser Propulsion – 84

Lauer, E.
Gas Ionization by Beam Electron Collisions and by Electron Avalanching in the Self Ez Field of a 2 kA Relativistic Electron Beam Focused on a Conducting Target – 172

Le Provost, Christian
Assessment and Testing of the GODAE Products – 121

Le Sage, G. P.
RF Photoinjector Development for a Short-Pulse, Hard X-Ray Thomson Scattering Source – 183

Leahy, Frank B.
Evaluation of the Space Shuttle Transatlantic Abort Landing Atmospheric Sounding System – 16

Lebak, J. M.
Preliminary Design Review: PCA Integrated Radar- Tracker Application – 144

Lebron, Ramon
PWM Switching Frequency Effects on Eddy Current Sensors for Magnetically Suspended Flywheel Systems – 86

Lee, J. K.
Testing Fractal Methods on Observed and Simulated Solar Magnetograms – 161

Lee, J. Lawrence
The Wind and Beyond: A Documentary Journey into the History of Aerodynamics in America – 3

Lee, Jason S.
Corrosion Mechanisms of UNS N04400 in Sea Water – 35

Lee, Jonathan A.
Process for Producing a Cast Article from a Hypereutectic Aluminum-Silicon Alloy – 44

Lee, Kelin
The Light Field Video Camera – 79

Lee, Kon J.
Extrusion Based Processing of Ti Alloys: Feasibility Study – 47

Lee, R. L.
Modeling of Building Scale Flow and Disperson – 76

Lee, Wen-Hwa
Training Program in the Molecular Basis of Breast Cancer Research – 126

Lee, Yann-Hang
Real-Time Embedded Software Verification and Validation 2001 – 22

Leeser, Miriam
A Library of Parameterized Hardware Modules for Floating Point Arithmetic and Its Use – 150

Leisawitz, David
NASA's Far-IR/Submillimeter Roadmap Missions SAFIR and SPECS – 191

The Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) – 210

Leitner, Jesse
Relative Motion of Two Spacecraft Near the Sun-Earth L2 Point – 82

Spacecraft Formation Design Near the Sun-Earth L(sub 2) Point – 18

Lele, Sanjiva K.
On the Computation of Space-Time Correlations by Large-Eddy Simulation – 70

Lentze-Muller, S. H. E.
Technical Report on Inversion of the First RUMBLE Sea Trial Data – 122

Leone, J.
Modeling of Building Scale Flow and Disperson – 76

Leong, M. Y.
Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

Lepping, Ronald P.
Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

Lepreau, Jay
A Java-Based Active Network Operating System (JANOS) – 149

Lepri, S. T.
Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections – 224

Leptoukh, Gregory
Accessing and Understanding MODIS Data – 120

Lerch, Bradley A.
Durability Assessment of Gamma TiAl – 47

Lerche, R. A.
CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

Letalick, D.
Wind Sounding with Laser Radar: A Pre-Study – 109

Lethin, Richard
Streaming and Dynamic Compilers for High Performance Embedded Computing – 149

Levan, A.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

LeVine, David
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

Levine, Stanley R.
Ultra-High Temperature Ceramic Composites for Leading Edges – 29

Levinson, S. J.
A Simple Transverse Motion Detector for Railguns – 80

Levri, Julie
ALS Equivalent System Mass Guidelines Document – 137

Levy, Mark R.
Predicting the Effect of Defect Distributions in the Bulk and on Surfaces of Ceramic Materials – 50

Li, Fenghua
Low-Frequency Shallow Water Reverberation and Bottom Scattering Model – 176

Preliminary Analysis of Reverberation Data in ASIAEX Experiment – 176

Li, Jianchao
Transmission Measurements of Femtosecond Laser Pulses Through Aerosols – 83

Li, S.
VE-Suite: Coupling Visualization and Computational Environments to Support on-the-fly Engineering Design – 67

Lian, T.
Microbiologically-Facilitated Effects on the Surface Composition of Alloy 22, A Candidate Nuclear Waste Packaging Material – 44

Liang, Qilian
Energy Efficient Wireless Sensor Networks Using Fuzzy Logic – 57

Liang, Robert T.
An Analysis of Airship Acceleration Dynamics for Airborne Gravimetry – 105

Liang, Tsorng-Juu
Multi-Random PWM Inverter with Fixed Switching Frequency – 163

Liao, L.
Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

Liao, Z. M.
All Fiber Technology for High-Energy Petawatt Front End Laser Systems – 186

Lieber, Charles M.
Development and Application of Molecular- Resolution Chemically-Sensitive Nanotube Probes – 36

Liemohn, M. W.
Magnetosphere-Ionosphere Coupling and Associated Ring Current Energization Processes – 211

Lieu, Richard
The Soft Excess Emission in the Hercules Supercluster Observed with the ROSAT Position Sensitive Proportional Counter – 204

Lightsey, Paul
The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

Ligon, David
In Situ Measurement of the Infrared Spectral Extinction for Various Chemical, Biological, and Background Aerosols – 180

Lim, D.
SafePatch for Windows. Version 1.0 User Manual – 139

Lin, Rong-San
Successive Bit-Vector Search Algorithm for CELP Vocoders – 164

Lin, Shian-Jiann
Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Little, Brenda J.
Corrosion Mechanisms of UNS N04400 in Sea Water – 35

Liu, Antony K.
Nonlinear Internal Waves in the South China Sea During ASIAEX – 165

Liu, C. T.
Investigating the Effect of Interfacial Strength on Deformation and Failure Mechanisms in Bond Systems – 26

Liu, Chih-Wen
Fast and Accurate Fault Detection/Location Algorthms for Double-Circuit/Three-Terminal Lines using Phasor Measurement Units – 163

Liu, Jianjun
Low-Frequency Shallow Water Reverberation and Bottom Scattering Model – 176

Preliminary Analysis of Reverberation Data in ASIAEX Experiment – 176

Liu, Kuo-Chia
Pointing Control System Design and Performance Evaluation for TPF Coronagraph – 221

Requirements Formulation and Dynamic Jitter Analysis for Fourier-Kelvin Stellar Interferometer – 191

Liu, N.-S.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Livingston, John M.
Acquisition and Analysis of NASA Ames Sunphotometer Measurements during SAGE III Validation Campaigns and other Tropospheric and Stratospheric Research Missions – 220

Lockwood, John
Power Consumption of Customized Numerical Representations for Audio Signal Processing – 162

LoDestro, L. L.
Electron Cyclotron Heating and Current Drive for Maintaining Minimum q in Negative Central Shear Discharges – 175

Loewenthal, W. S.
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

Loh, Ching Y.
Computing Axisymmetric Jet Screech Tones using Unstructured Grids – 179

Lohner, Rainald
Application of New Algorithms for the Simulation of Multidisciplinary Problems: Fluid Structure Thermal and Control Coupling – 73

Lomov, I. N.
Simulation of a Spherical Wave Experiment in Marble Using a Multidirectional Damage Model – 25

London, J. R.
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

London, R. L.
Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

London, R.
X-Ray Optics and Diagnostics for the First Experiments on the Linac Coherent Light Source – 193

Lopes, C.
Protection Against Microsecond Laser Pulses – 184

Lorincz, Jonathan A.
Ultra-High Temperature Ceramic Composites for Leading Edges – 29

Lowe, Kristine
Corrosion Mechanisms of UNS N04400 in Sea Water – 35

Lu, Shin-Hao
Sub-Optimal Finite Dimensional Observer-Based Boundary Controller Design for Distributed Parameter Systems on a Planar Domain – 164

Luhmann, N. C., Jr
A Workshop on Vacuum Electronics Research for the DoD – 62

Lundberg, P.
Ceramic Armour against Heavy KE-Threats – 49

Luquette,Richard J.
Linear State-Space Representation of the Dynamics of Relative Motion, Based on Restricted Three Body Dynamics – 18

Lynch, James F.
Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS) – 178

Lynch, James
The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation – 177

Lynch, Jim
ASIAEX South China Sea Acoustic Fluctuations (and Physical Oceanography) – 177

Moored Observations of Internal Solitions in the Northeastern South China Sea – 73

Lyon, Richard G.
A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy – 222

Ma, Yuanliang
Broadband Geoacoustic Matched Field Inversion with Multi-step Strategy from ASIAEX 2001 – 178

Macintosh, B. A.
Characterization of Adaptive Optics at Keck Observatory – 220

Mackey, Jeffrey R.
Sonoluminescence Bubble Measurements using Vision-Based Algorithms – 159

Maeda, Yoichi
Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 159

Magadi, G.
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

Magapu, Vish
The MER/CIP Portal for Ground Operations – 199

Maghami, Peiman
Control of the Laser Interferometer Space Antenna – 205

Magnusson, P.
Gun Barrel Erosion and Coating of Gun Barrels: A Literature Review – 49

Mahfuz, Hassan
Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications – 7

Maine, Trindel A.
Manual Manipulation of Engine Throttles for Emergency Flight Control – 13

Mak, Ronald
The MER/CIP Portal for Ground Operations – 199

Makihara, Mitsuhiro
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 189

Malba, V.
Microrelay – 60

Malkin, A. J.
Carbon Nanotube Atomic Force Microscopy for Proteomics and Biological Forensics – 51

Mansour, N. N.
Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer – 116

Mao, Jianping
Sensitivity Studies for Space-based Measurements of Atmospheric Total Column Carbon Dioxide Using Reflected Sunlight – 108

Marchand, Belinda
Formation Control of the MAXIM L2 Libration Orbit Mission – 205

Margasahayam, Ravi N.
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

Maria, S.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Markham, Brian L.
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

Markus, Thorsten
The Okhotsk Sea Kashevarov Bank Polynya: Its Dependence on Diurnal and Fortnightly Tides and its Initial Formation – 110

Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models – 123

Marrero, V.
Astro-E2 Magnesium Diboride High Current Leads – 195

Marshall, Susan
Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models – 112

Martin, John G.
Hyper-X Stage Separation Trajectory Validation Studies – 19

Martin, L. P.
Electrochemical Hydrogen Sensor for Safety Monitoring – 60

Martin, S. I.
Microbiologically-Facilitated Effects on the Surface Composition of Alloy 22, A Candidate Nuclear Waste Packaging Material – 44

Martin, Seelye
The Okhotsk Sea Kashevarov Bank Polynya: Its Dependence on Diurnal and Fortnightly Tides and its Initial Formation – 110

Martinez-Harder, Monica
TRACE-P OH and HO2 Measurements with the Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) on the DC-8 – 115

Maruno, Tohru
Recent Progress in Optical Switching Device Technologies in NTT – 189

Marzwell, Neville
Strategic Research Directions in Microgravity Materials Science – 221

Maswadeh, Waleed M.
Relationship of Ambient Atmosphere and Biological Aerosol Responses from a Fielded Pyrolysis-Gas Chromatography-Ion Mobility Spectrometry Bioanalytical Detector – 132

Matsuo, Shinji
A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 189

Mattar, Karim E.
Arctic Shoreline Delineation & Feature Detection Using RADARSAT-1 Interferometry: Case Study Over Alert – 97

Matthew, William T.
Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications – 132

Mattson, Peter
Streaming and Dynamic Compilers for High Performance Embedded Computing – 149

Matula, Thomas J.
Buoyancy-Driven Instabilities in Single-Bubble Sonoluminescence – 219

Sonoluminescence Bubble Measurements using Vision-Based Algorithms – 159

Max, N.
Volume Rendering for Curvilinear and Unstructured Grids – 170

Mayer, Jeffrey
Modeling and Control of the ARCP in Power and Drive Systems – 66

Mayne, A. W.
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

Mazzella, A. J., Jr.
Ionospheric Sensor Developments for the Year-2000 Solar Maximum – 15

Mazzella, Andrew J., Jr.
Investigations of the Nature and Behavior of Plasma Density Disturbances That May Impact GPS and Other Transionospheric Systems – 104

McCabe, Patrick K.
Joint Battlespace Infosphere Repository Prototype – 201

McCallen, R.
Computational Simulation of a Heavy Vehicle Trailer Wake – 1

McConaghy, C.
Low-Power Direct-Sequence Spread-Spectrum Modem Architecture for Distributed Wireless Sensor Networks – 56

McConnell, Ken
NASA's Virtual Product Laboratory: An Overview – 158

McDowell, Dave
Extrusion Based Processing of Ti Alloys: Feasibility Study – 47

McGinnis, David L.
Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

McMinn, John D.
Hyper-X Stage Separation Trajectory Validation Studies – 19

McPeters, Richard D.
The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

McQuillan, B.
Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels – 174

Mead, Franklin B., Jr
Benefit of Constant Momentum Propulsion for Large Delta V Missions -Applications to Laser Propulsion – 84

Mead, James
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

Meador, Mary Ann B.
Reevaluation of Tetrahydrophthalic Anhydride as an End Cap for Improved Oxidation Resistance in Addition Polyimides – 42

Meador, Michael A.
Efficient Synthesis of 4,8-Ditoluoyl-1,5-Dihydroxynaphthalene – 42

High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Meertens, R. M.
Performance of Low-VOC Paint for Vehicles of the Dutch Army – 51

Mehmed, Oral
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

Mehra, Avichal
Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation – 123

Meier, T.
SafePatch for Windows. Version 1.0 User Manual – 139

Melcher, Kevin J.
Toward a Fast-Response Active Turbine Tip Clearance Control – 12

Meltzer, M.
Tests of the Contamination Analysis Unit, Phase 2 – 21

Meneghini, R.
Heating Structures Derived from Satellite – 112

Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

Mercurio, Jon J.
A High Resolution, Three-Dimensional, Computationally Efficient, Diagnostic Wind Model: Initial Development Report – 115

Mesarch, Michael A.
Orbit Optimization for the Geospace Electrodynamics Connections (GEC) Mission – 92

Mexcur, Winfield Paul
NASA's Management and Utilization of the Small Business Innovative Research (SBIR) Program – 199

Meyer, A. W.
K-Means Re-Clustering Algorithmic Options with Quantifiable Performance Comparisons – 141

Meyer, G. L.
Hybrid QR Factorization Algorithm for High Performance Computing Architectures – 150

Michelsen, R. R.
Heterogeneous Interactions of Acetaldehyde and Sulfuric Acid – 33

Mignerey, Peter C.
Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS) – 178

Mikami, Hirohide
Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 63

Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 64

Mikellides, Pavlos G.
Pulsed Inductive Thruster (PIT): Modeling and Validation Using the MACH2 Code – 22

Miller, D.
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

Miller, T. L.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Milosevic, Michael F.
A Study of Transrectal Tumor Oxygen Measurements in Patients With Clinically Localized Prostate Cancer – 125

Mine, Shinichi
Image Systems Using RFID Tag Positioning Information – 159

Minnis, Patrick
A USA Commercial Flight Track Database for Upper Tropospheric Aircraft Emission Studies – 5

Minton, Timothy K.
Dynamics of Etching at the Gas-Surface Interface – 36

Mintz, Eric
High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Miranda, Felix A.
NASA Efforts on Nanotechnology – 60

Mirkarimi, P.
Novel EUV Mask Blank Defect Repair Developments – 181

Misra, Smarahara
Generation of Custom DSP Transform IP Cores: Case Study Walsh-Hadamard Transform – 162

Mitchell, Robert
Multidisciplinary Research in Mine Detection and Neutralization Systems: Missouri-Led Muri – 81

Mitra, Atindra
Signal Processing Architectures for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Applications – 80

Miura, Norihiro
Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 64

Miyoshi, Kazuhisa
Durability Assessment of Gamma TiAl – 47

Moeller, K.
Durability of Polymeric Glazing Materials for Solar Applications – 98

Moen, Jeran
Polar Cap Dynamics and Formation of High-Latitude Ionospheric Irregularities – 104

Moen, Joran
Combined Svalbard Optical and Radar Observations for Polar Cusp/Cap Research – 105

Moerder, Daniel D.
A Flight Dynamics Model for a Small Glider in Ambient Winds – 2

Moerner, W. E.
Mechanisms of Photorefractivity in Polymeric Materials – 50

Mohamed, Gamaleldin
Innovative Manufacturing and Structural Analysis of Composite Isogrid Structures for Space Applications – 7

Mohler, Stanley R., Jr.
Wind-US Flow Calculations for the M2129 S-Duct Using Structured and Unstructured Grids – 68

Moller, J.
Electron Cyclotron Heating and Current Drive for Maintaining Minimum q in Negative Central Shear Discharges – 175

Molnar, Gyula
Current results from AIRS/AMSU/HSB – 120

Molnia, Bruce F.
Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska – 93

Montague, Gerald
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

Moody, J. D.
Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

Moody, Paul E.
Rotating Feeler Gage – 55

Moon, Todd
Analytic Prediction of Emergent Dynamics for Autonomous Negotiating Team (ANT) Systems – 201

Moore, R. L.
Prediction of Active-Region CME Productivity from Magnetograms – 209

Moradi, F.
Web-Based HLA Federations and Simulations: Methods and Possibilities – 55

Moran, M. J.
CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

Morgan, K. Z.
Need for Research Programs to Provide Data Applicable to the Estimate of Maximum Permissible Exposure Values for Internally Deposited Radionuclides – 124

Morin, E.
Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

Morris, C. I.
Numerical Modeling of Pulse Detonation Rocket Engine Gasdynamics and Performance – 10

Morris, J. P.
Simulations of Underground Structures Subjected to Dynamic Loading using the Distinct Element Method – 88

Morrison, Carlos R.
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

Morscher, Gregory N.
Comparison of Matrix Cracking in Melt-Infiltrated SiC/SiC Composites with 3D and 2D-Woven Orthogonal Architectures – 29

Matrix Cracking in 3D Orthogonal Melt-Infiltrated SiC/SiC Composites with Various Z-Fiber Types – 30

Matrix Cracking in Four Different 2D SiC/SiC Composite Systems – 31

Moseley, Samuel H.
The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

Moser, Debra K.
Factors Related to Nonadherence of a Low Sodium Diet in Heart Failure Patients – 133

Moses, E. I.
National Ignition Facility: The World's Largest Optics and Laser System – 182

Moses, Franklin L.
List of US Army Research Institute Research and Technical Publications – 202

Mosier, Gary
Pointing Control System Design and Performance Evaluation for TPF Coronagraph – 221

Moskalenko, Igor V.
Cosmic Ray Propagation and Acceleration – 223

Moura, Jose
Short Vector SIMD Code Generation for DSP Algorithms – 162

Mullin, Lenore R.
Monolithic Compiler Experiments Using C++ Expression Templates – 149

Murphy, Brian
An Overview of the Medical Data Surveillance System (MDSS) – 200

Murphy, M. J.
Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

Mushotzky, Richard F.
Simultaneous X-Ray and Optical Timing Observations of GX 339-4 – 184

Spectroscopy of the Perseus Cluster – 213

Mustafi, S.
Astro-E2 Magnesium Diboride High Current Leads – 195

Myers, Philip C.
Motions and Initial Conditions in Star-Forming Dense Cores – 216

Naegle, Brad R.
Reduction of Total Ownership Cost – 151

Najafi, Khalil
Micromachined Precision Inertial Instruments – 87

Nakagawa, Shinichi
Image Systems Using RFID Tag Positioning Information – 159

Nall, Mark
Meeting NASA's Mission Through Commercial Partnerships – 225

Natanson, G.
Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

Nathal, M. V.
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

Naus, J. H.
Testing of the Joining Rubber Metal of Ultrasound Silencing Devices – 91

Navarro, Robert J.
ISO 9000 Implementation and Assessment: A Guide to Developing and Evaluating Quality Management Systems – 225

Nebuda, Sharon
Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Neff, Susan
Discovery of an Obscured Supernova in Arp 299 – 211

Nehrbass, John
Signal Processing Architectures for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Applications – 80

Neiderer, Andrew M.
Migration of a SEDRIS Application for Dismounted Infantry Simulation – 151

Nelkin, Eric J.
Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

Nelkin, Eric
Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

Nellis, W. J.
High Dynamic Pressures and Modest Temperatures: A Broad Perspective and Bridging the Gap – 32

Nelson, Brent
Unified Debug Environment for Adaptive Computing Systems – 152

Nerella, S.
GIS-Integrated Traffic Input Models for Mobile-Source Emissions Analysis – 102

User's Guide to GIS-Based Application for Traffic Inputs to MOBILE6 Emissions Factor Model – 101

Neveux, Michael G.
Mechanical Properties of Heat-treated Carbon Fibers – 89

Ngo, David
Embedded High Performance Scalable Computing Systems – 150

Nguyen, Quang-Viet
Development of a High-Pressure Gaseous Burner for Calibrating Optical Diagnostic Techniques – 11

Measurement and Simulation of Spontaneous Raman Scattering Spectra in High-Pressure, Fuel-Rich H2-Air Flames – 43

Nguyen, Xuan-An
Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell – 27

Nickila, James D.
Frequency Dependence of Effective Bottom Attenuation Due to Environmental Variability – 177

Nieves, Jeri
Determinants of Stress Fracture and Bone Mass in Elite Military Cadets – 128

Nikkel, D.
3D Computations and Experiments – 194

Nilsen, J.
Investigations on 10-Hz sub-Joule fs-Laser Pumped Neon- and Nickel-like X-ray Lasers – 195

Nilsson, C.
Protection Against Microsecond Laser Pulses – 184

Nixon, Thomas
Instrument for Measuring Temperature of Water – 77

Nolin, Anne W.
Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

Noort, D.
Diagnosis of Exposure to Chemical Warfare Agents – 134

Norby, Richard J.
Effect of Elevated Atmospheric CO2 and Temperature on Leaf Optical Properties and Chlorophyll Content in Acer saccharum (Marsh.) – 109

Norlin, Ken
Development and Testing of the Phase 0 Autonomous Formation Flight Research System – 53

Norris, J. P.
How Can The SN-GRB Time Delay Be Measured? – 218

Noy, A.
Carbon Nanotube Atomic Force Microscopy for Proteomics and Biological Forensics – 51

Nurdin, Hendra I.
Rational Approximations of the Power Spectral Density of Atmospheric Turbulence Arising in Adaptive Optics – 162

Nuygen, N.
Design and Performance of Capping Layers for EUV Multilayer Mirrors – 211

Nystuen, J. A.
Uniting Space, Ground and Underwater Measurements for Improved Estimates of Rain Rate – 106

O'Boyle, J. L.
Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset – 199

O'Brian, Francis J., Jr
Detection of Randomness in Sparse Data Set of Three Dimensional Time Series Distributions – 161

O'C. Starr, David
Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

O'D. Alexander, Conel
Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 214

O'D.Alexander, Conel
Final Summary of Research Report to the National Aeronautics and Space Administration Cosmochemistry Program – 220

Oglesby, Robert
Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models – 112

Ohiso, Yoshitaka
A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 189

Ohl, Raymond G.
Highlights of the ASPE 2004 Winter Topical Meeting on Free-Form Optics: Design, Fabrication, Metrology, Assembly – 190

Okuno, Masayuki
Recent Advances in Optical Switches Using Silica-based PLC Technology – 189

Oleson, Steven
Mission Steering Profiles of Outer Planetary Orbiters Using Radioisotope Electric Propulsion – 15

Oliversen, Ronald J.
Chemical Compositions and Abundance Anomalies in Stellar Coronae ADP 99 – 216

Environmental Effects on the Metallicities of Early-Type Galaxies – 215

Physics of Galaxy Clusters and How it Affects Cosmological Tests – 215

Seeing Red and Shooting Blanks: A Study of Red Quasars and Blank Field X-Ray Sources – 210

Uncovering the Properties of Young Neutron Stars and their Surrounding Supernova Remnants – 212

Olivier, S. S.
Adaptive Optics Applications in Vision Science – 185

Olson, G. L.
Transport Methods Conquering the Seven-Dimensional Mountain – 170

Olson, W.
Heating Structures Derived from Satellite – 112

Ong, M.
Test Stand for Linear Induction Accelerator Optimization – 171

opdeWeegh, M. J.
Feeding Behaviour and Motivation of Feeding Behaviour of (Experienced) Soldiers of Several Entities Concerning the Fighting Ration – 138

Opila, Elizabeth J.
Ultra-High Temperature Ceramic Composites for Leading Edges – 29

Orme, C.
Engineering Titanium for Improved Biological Response – 43

Orr, Marshall H.
Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS) – 178

Ortega, J. M.
Computational Simulation of a Heavy Vehicle Trailer Wake – 1

Ortiz, Solomon P.
Military Transformation: Progress and Challenges for DOD's Advanced Distributed Learning Programs – 153

Oshman, Yaakov
Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft – 20

Oskarsson, P. A.
Overview of MSI Evaluation Methodology for Systems Development – 136

Oswald, Fred B.
Mechanical Components Branch Test Facilities and Capabilities – 86

Otter, H.
Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Ou, Jeremy
System Modeling and Diagnostics for Liquefying-Fuel Hybrid Rockets – 167

Ou, Jingzhao
An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications – 166

Owuor, Edward D.
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

Paduano, James P.
Active Control of Integrated Inlet/Compression Systems – 73

Page, Kenneth R.
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

Paglieroni, D. W.
K-Means Re-Clustering Algorithmic Options with Quantifiable Performance Comparisons – 141

Pagnutti, Mary
Instrument for Measuring Temperature of Water – 77

NASA IKONOS Characterization Methodologies – 94

Palem, Krishna V.
Design Space Exploration and Optimization of Embedded Cache Systems via a Compiler – 149

Palmer, T. A.
Numerical Modeling of Enhanced Nitrogen Dissolution During Gas Tungsten Welding – 45

Palunas, Povilas
Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics – 13

Panek, J. S.
Astro-E2 Magnesium Diboride High Current Leads – 195

Pang, Wanlin
Simplifying a Lifted Plan Graph Using Domain Splitting – 142

Parker, Robert
System Level Applications of Adaptive Computing (SLAAC) – 156

Pasewark, Bruce H.
Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS) – 178

Pask, J. E.
Theory of Positron Annihilation in Helium-filled Bubbles in Plutonium – 48

Patel, Bhavesh
Mechanical Properties of Heat-treated Carbon Fibers – 89

Patel, S. K.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Patera, Anthony T.
From Materials to Missions. Assess-Predict- Optimize: A Computational Approach to Adaptive Design – 165

Patnaik, Surya N.
Significance of Strain in Formulation in Theory of Solid Mechanics – 90

Patterson-Hine, Ann
System Modeling and Diagnostics for Liquefying-Fuel Hybrid Rockets – 167

Paulsen, Phillip E.
Securing Mobile Networks in an Operational Setting – 156

Pavlidis, Dimitris
Solid State THz Sources – 66

Pawson, Steven
Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

Peairs, Daniel M.
Proof-of-Concept Application of Impedance-Based Health Monitoring on Space Shuttle Ground Structures – 85

Peden, Ann R.
Factors Related to Nonadherence of a Low Sodium Diet in Heart Failure Patients – 133

Pegion, Philip J.
On the Cause of the 1930s Dust Bowl – 113

Pelc, Norbert J.
Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

Peng, Rui-Sheng
Tracing the Magnetic Field in Orion A – 217

Peng, X. D.
Kinetic Understanding of the Syngas-to-DME Reaction System and It's Implications to Process and Economics – 32

Pensil, Eric J.
NASA GRC High Power Electromagnetic Thruster Program – 23

Pereira, J. Michael
Durability Assessment of Gamma TiAl – 47

Perkins, High D.
Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

Perry, M. D.
High Energy Electrons, Positrons and Photonuclear Reactions in Petawatt Laser-Solid Experiments – 183

Persson, K.
Quality of Service Routing in Tactical Mobile Ad Hoc Networks – 56

Peters, K.
Health Monitoring of RLV Airframe Structures – 87

Peters, Mary E.
An Analysis of Airship Acceleration Dynamics for Airborne Gravimetry – 105

Peters, Richard Alan, II
Robot Acquisition of Active Maps Through Teleoperation and Vector Space Analysis – 160

Petersen, Shane
Development and Testing of the Phase 0 Autonomous Formation Flight Research System – 53

Petersen, Walter A.
The Tropical Convective Spectrum – 107

Peterson, Michael L.
Measurement of Anisotropic Elastic Constitutive Properties at High Temperatures – 196

Petko, Jeanne
Ultra-High Temperature Ceramic Composites for Leading Edges – 29

Petrali, John
Sulfur Mustard Damage to Cornea With Emphasis on Skin: Preventative Studies – 127

Petrie, Karen
Simplifying a Lifted Plan Graph Using Domain Splitting – 142

Pevtsov, A. A.
Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21 – 225

Pham, A. Q.
Electrochemical Hydrogen Sensor for Safety Monitoring – 60

Pham, Hung V.
Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell – 27

Phillips, Thomas G.
Tracing the Magnetic Field in Orion A – 217

Phillips, Tom
The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

Pian, E.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Pisharody, Suresh A.
Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

Partitioning of Inorganic Elements Consumed by Humans Between the Various Fractions of Human Wastes: A Review and Analysis of Existing Literature – 34

Pisharody, Suresh
Compaction of Space Mission Wastes – 137

Plawsky, J. L.
Theoretical and Experimental Investigation of the Stability of an Evaporating Constrained Vapor Bubble – 72

Plitzko, J. M.
Experimental Assessment of Gradient Plasticity – 88

Poll, Scott
System Modeling and Diagnostics for Liquefying-Fuel Hybrid Rockets – 167

Polyakov, Igor
The Okhotsk Sea Kashevarov Bank Polynya: Its Dependence on Diurnal and Fortnightly Tides and its Initial Formation – 110

Popkin-Paine, Marc
Streams-C; Sc2 C-to-FPGA Compiler – 149

Powell, James
Analytic Prediction of Emergent Dynamics for Autonomous Negotiating Team (ANT) Systems – 201

Powell, Richard W.
Entry Trajectory and Atmosphere Reconstruction Methodologies for the Mars Exploration Rover Mission – 222

Poyneer, L. A.
Scene-Based Wave-Front Sensing for Remote Imaging – 183

Wavefront Control for Extreme Adaptive Optics – 183

Prasanna, Viktor K.
An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications – 166

Price, D.
Stimulated Brillouin Scattering from Helium-Hydrogen Plasmas – 194

Provenza, Andrew J.
Magnetic Bearing Controller Improvements for High Speed Flywheel System – 21

Provenza, Andrew
Fully Suspended, Five-Axis, Three-Magnetic-Bearing Dynamic Spin Rig With Forced Excitation – 8

Pueschel, Markus
Generation of Custom DSP Transform IP Cores: Case Study Walsh-Hadamard Transform – 162

Short Vector SIMD Code Generation for DSP Algorithms – 162

Pugh, Jamie K.
An Overview of the Medical Data Surveillance System (MDSS) – 200

Pugh, William M.
An Overview of the Medical Data Surveillance System (MDSS) – 200

Punatar, Dilip
AF ManTech Highlights, Winter 2003 – 4

Qin, Yi-Xian
Stress Fracture Etiology as Dependent on Mechanically Induced Fluid Flow – 126

Quenneville, Louise
Is Breast Tissue from Women Who Carry Germ-Line BRCA1 or BRCA2 Mutations 'Normal'? - An Immuno- Histopathological Study – 130

Quinlan, D.
C++ Infrastructure for Automatic Introduction and Translation of OpenMP Directives – 139

Quinn, P. K.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Quinn, Patricia
Aerosol Absorption in the Atmosphere: Perspectives from Global Model, Ground-Based Measurements, and Field Observations – 103

Rabbah, Rodric M.
Design Space Exploration and Optimization of Embedded Cache Systems via a Compiler – 149

Rabin, Ron
Highlights: US Commercial Remote Sensing Industry Analysis – 198

Race, Timothy D.
Development of Product Descriptions for Lead- Immobilizing Overcoating Systems – 27

Radakovich, Jon D.
Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Radhakrishnan, K.
Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

Radousky, H. B.
Endoscopic Subsurface Imaging in Tissues – 183

Raghavan, D.
Next Generation Aerospace Composites Through Nanotechnology – 29

Raghavan, Rajesh S.
A CDMA Spotbeam Architecture for the Next Generation Satellite System (NGSS) for the Aeronautical Telecommunications Network (ATN) – 59

Raj, S. V.
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

Ramachandran, Gautham
Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

Recent Advances in the Development of Thick-Section Melt-Infiltrated C/SiC Composites – 29

Rambur, T. A.
Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

Ramirez-Ruiz, E.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Ramp, Steve R.
Nonlinear Internal Waves in the South China Sea During ASIAEX – 165

Ramp, Steve
Direct Path Fluctuations Due to Shallow Water Volume Variability – 176

Ramp, Steven R.
Moored Observations of Internal Solitions in the Northeastern South China Sea – 73

The Shelf-Edge Environment in the Central East China Sea and Its Impact on Low Frequency Acoustic Propagation – 177

Ramsey, Brian
Electrodeposition of High Quality Nickel Phosphorous Alloys for Pollution Reduction and Energy Conservation – 46

Randers-Pehrson, G.
Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

Raney, David L.
Biologically Inspired Micro-Flight Research – 9

Ranson, K. J.
Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data – 187

Ranson. K. J.
Wildfires Dynamics in Mid-Siberian Larch Dominated Communities – 95

Rao, G. S.
Ionospheric Sensor Developments for the Year-2000 Solar Maximum – 15

Rao, Guan-Shu
Investigations of the Nature and Behavior of Plasma Density Disturbances That May Impact GPS and Other Transionospheric Systems – 104

Rasmussen, Steven J.
Path Elongation for UAV Task Assignment – 6

Ray, Richard D.
Tides and Decadal Variability – 120

Ray, Richard I.
Corrosion Mechanisms of UNS N04400 in Sea Water – 35

Reames, Donald V.
Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

Reed, Brian
HAN-Based Monopropellant Technology Development – 23

Reehorst, Andrew L.
Preliminary Analysis of X-Band and Ka-Band Radar for Use in the Detection of Icing Conditions Aloft – 5

Reichardt, Juergen
Genetic Variation in the HSD3B2 Gene and Prostate Cancer – 129

Reinisch, Bodo
Measuring Electrodynamics of the Ionosphere by Digital Ionosondes and Other HF Techniques – 104

Reuther, A. I.
Preliminary Design Review: GMTI Processing for the PCA Integrated Radar-Tracker Application – 58

Rhew, R. D.
Structural Integrity of a Wind Tunnel Balance – 91

Riall, S.
Astro-E2 Magnesium Diboride High Current Leads – 195

Richards, W. Lance
Combined Loads Test Fixture for Thermal-Structural Testing Aerospace Vehicle Panel Concepts – 91

Richardson, I. G.
Reply to Gopalswamy et al. – 224

Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections – 224

Richter, Hanz
Modeling and Validation of a Propellant Mixer for Controller Design – 24

Richtsmeier, Steven C.
Software for Simulation of Hyperspectral Images – 145

Riegel, Anna T.
Role of a Novel Splice Variant of the Steroid Receptor Coactivator AIB1 in Breast Cancer – 128

Rienecker, Michele M.
Multivariate Error Covariance Estimates by Monte-Carlo Simulation for Assimilation Studies in the Pacific Ocean – 122

Riley, Ronald
System Level Applications of Adaptive Computing (SLAAC) – 156

Rincon, Rafael
A Radar/Radiometer Instrument for Mapping Soil Moisture and Ocean Salinity – 121

Riseborough, E.
Experimental Investigations on the Distortion of ISAR Images Using Different Radar Waveforms – 57

Ritter, Kyle
Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties – 37

Ritzert, Frank
Evaluation of Candidate Materials for a High-Temperature Stirling Convertor Heater Head – 45

Rivers, H. Kevin
X-37 C-Sic CMC Control Surface Components Development [Status of the NASA/Boeing/USAF Orbital Vehicle and Related Efforts] – 49

Rivkin, A. S.
Spectroscopy and Photometry of Mars Trojans – 208

Rizzi, Stephen A.
Temporal Characterization of Aircraft Noise Sources – 178

Roach, Robert
International Hypoxia Symposium (13th) for the Publishing of the Conference Proceedings for 2003 Conference – 125

Roads, John
Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models – 112

Roberts, R. S.
Cooperative Mobile Sensing Networks – 6

Robertson, Franklin R.
Tropical Diabatic Heating and the Role of Convective Processes as Represented in Several Contemporary Climate Models – 112

Robinson, David A.
Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

Robinson, J. C.
Design and Performance of Capping Layers for EUV Multilayer Mirrors – 211

Robinson, Scott B.
Cold Air Data Acquisition System Documentation – 134

Roble, Raymond G.
The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

Rock, S.
Precision Measurement of the Proton and Deuteron Spin Structure Functions g(sub 2)* – 168

Rockway, J. D.
Mixed Electromagnetic and circuit Simulations using Higher-Order Elements and Bases – 171

Rodin, W. A.
Thermal Decomposition of New and Aged LX-04 and PBX 9501 – 25

Rogers, Eric
Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

Rogers, F. J.
Electronic Structure Measurement of Solid Density Plasmas using X-Ray Scattering – 194

Romero, G. E.
ULXs, Microblazers, and the Unidentified EGRET Sources – 219

Rood, Richard B.
Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

Roquernore, W. M.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Ross, Gerald F.
Batteryless Sensor for Intrusion Detection and Assessment of Threats – 79

Rozanov, Eugene V.
Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

Rubingh, C. M.
Feeding Behaviour and Motivation of Feeding Behaviour of (Experienced) Soldiers of Several Entities Concerning the Fighting Ration – 138

Rudd, R. E.
Molecular Dynamics Study of Void Growth and Dislocations in Dynamic Fracture of FCC and BCC Metals – 169

Rudisill, T. S.
Recovery of Plutonium from Refractory Residues Using a Sodium Peroxide Pretreatment Process – 33

Ruffing, Jamie
Determinants of Stress Fracture and Bone Mass in Elite Military Cadets – 128

Rumsey, Christopher L.
Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

Russell, Gerald W.
Analytic Modeling and Experimental Validation of Intumescent Behavior of Charring Heatshield Materials – 196

Russell, James M.
The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

Russell, L.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Rutledge, Edward
Monolithic Compiler Experiments Using C++ Expression Templates – 149

Ryall, F.
Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset – 199

Ryan, James
NASA Scientific Data Purchase Laboratory Characterization of Positive Systems ADAR 5500 Sensor – 95

Ryan, Robert
Instrument for Measuring Temperature of Water – 77

NASA's Virtual Product Laboratory: An Overview – 158

Remote Sensing System Requirements Development: A Simulation-Based Approach – 97

Satellite Hyperspectral Imaging Simulation – 95

Ryder, R. C.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Saito, Hiroshi
Image Systems Using RFID Tag Positioning Information – 159

Sakata, Tomomi
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 189

Salamon, Michael
The Interaction of Hot and Cold Gas in the Disk and Halo of Galaxies – 212

Salari, K.
Computational Simulation of a Heavy Vehicle Trailer Wake – 1

Salas, Andrea O.
Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

Salavani, Reza
Logistic Fuel Processor Development – 52

Sales, Gary
Measuring Electrodynamics of the Ionosphere by Digital Ionosondes and Other HF Techniques – 104

Samuel, M. A.
Finding the Radiation Amplitude Zero in W gamma Production-Is it Unique to the Standard Model – 169

Samuelsen, G. S.
Assessing Jet-Induced Spatial Mixing in a Rich, Reacting Crossflow – 12

Sanchez, J. J.
Modeling the Effects of IR Heating on the Fuel Layer Symetry in a Cryogenic NIF Ignotion Target – 193

Sanderfer, Dwight
System Modeling and Diagnostics for Liquefying-Fuel Hybrid Rockets – 167

Sanders, Larry M.
Application of Operating System Concepts to Coordination in Pervasive Sensing and Computing Systems – 155

Sanders, T. M.
The 2003 Goddard Rocket Replica Project: A Reconstruction of the World's First Functional Liquid Rocket System – 17

Sannasiraj, S. A.
Influence of Surface and Bottom Stress in the Coupled Ocean Circulation and Wind-Wave Models – 122

Sanner, Robert M.
Linear State-Space Representation of the Dynamics of Relative Motion, Based on Restricted Three Body Dynamics – 18

Nonlinear Observers for Gyro Calibration Coupled with a Nonlinear Control Algorithm – 13

SauberRosenberg, Jeanne M.
Glacier Ice Mass Fluctuations and Fault Instability in Tectonically Active Southern Alaska – 93

Savy, J. B.
Lawrence Livermore National Laboratory Probabilistic Seismic Hazard Codes Validation – 140

Sawada, Renshi
Development of a Large-scale 3D MEMS Optical Switch Module – 190

Sawyer, Mikel
Logistic Fuel Processor Development – 52

Scheiman, David
Historical Precision of an Ozone Correction Procedure for AMO Solar Cell Calibration – 99

Scheimann, Daniel A.
High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Scherer, Axel
Direct Write Laser Lithography System – 152

Schiller, A.
Level Densities and Radiative Strength Functions in (170, 171) Yb – 167

Schlesinger, Michael E.
Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

Schlosser, C. Adam
Observing the Global Water Cycle from Space – 96

Schmid, G. J.
CVD Diamond Detector Stability Issues for Operation at the National Ignition Facility – 172

Schmidt, Walter H. P.
Automated Command and Control Information Systems (ACCIS) and CAX – 157

Schneider, Steven
Pulsed Inductive Thruster (PIT): Modeling and Validation Using the MACH2 Code – 22

Schock, S. G.
Seabed Attenuation Estimated From Chirp Sonar Data Collected Along Acoustic Propagation Lines During ASIAEX in the South China Sea – 177

Schordan, M.
C++ Infrastructure for Automatic Introduction and Translation of OpenMP Directives – 139

Schott, Brian
System Level Applications of Adaptive Computing (SLAAC) – 156

Schubert, Siegfried D.
On the Cause of the 1930s Dust Bowl – 113

Schumacher, Corey
Path Elongation for UAV Task Assignment – 6

Schwartz, A. J.
Experimental Assessment of Gradient Plasticity – 88

Schwemmer, G.
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

Schwenn, Rainer W.
Connecting Shock Parameters to the Radiation Hazard from Energetic Particles – 219

Schwerting, P. B. W.
Exploratory Measurements of the Effect of Electro Magnetic Interference on EO/IR Sensors and Several Mitigation Options – 82

Scott, Shawn J.
Guidance for Ability Group Run Speeds and Distances in Basic Combat Training – 129

Scozzie, Charles J.
High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

Sedlak, J.
Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

Segawa, Toru
A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 189

Seibel, Robin E.
Manipulation of Micro Scale Particles in Optical Traps Using Programmable Spatial Light Modulation – 77

Sekula, Martin K.
Aerodynamic Design Study of an Advanced Active Twist Rotor – 7

Semmes, Ed
Strategic Research Directions in Microgravity Materials Science – 221

Senick, John
Investigation of Exothermic Grinding Sludge Produced from Watervliet Arsenal Gun Steels, Andersol Water- Based Cutting Fluid and Cincinnati Milacron Aluminum Oxide Resin Bond Grinding Wheels – 39

Senocak, Inane
Large-eddy Simulation of Stratocumulus-topped Atmospheric Boundary Layers with Dynamic Subgrid-scale Models – 119

Seppala, E. T.
Molecular Dynamics Study of Void Growth and Dislocations in Dynamic Fracture of FCC and BCC Metals – 169

Serreze, Mark C.
Investigating Downscaling Methods and Evaluating Climate Models for Use in Estimating Regional Water Resources in Mountainous Regions under Changing Climatic Conditions – 110

Shaaban, Aly H.
Logistic Fuel Processor Development – 52

Shamma, Mohammed A.
A CDMA Spotbeam Architecture for the Next Generation Satellite System (NGSS) for the Aeronautical Telecommunications Network (ATN) – 59

Shams, Qamar A.
L-C Measurement Acquisition Method for Aerospace Systems – 81

Sharp, Marilyn A.
Guidance for Ability Group Run Speeds and Distances in Basic Combat Training – 129

Sheikhi, M. R. H.
A Novel Strategy for Numerical Simulation of High-speed Turbulent Reacting Flows – 68

Shell, Dan
Securing Mobile Networks in an Operational Setting – 156

Shen, Bo-Wen
Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Shendell, D. G.
Predicted Concentrations in New Relocatable Classrooms of Volatile Organic Compounds Emitted from Standard and Alternate Interior Finish Materials – 100

Shepherd, R.
X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultrashort X-ray Pulses with Matter – 185

Sherwood, R. J.
ParaDyn A Parallel Nonlinear, Explicit, Three-Dimensional Finite-Element Code for Solid and Structural Mechanics User Manual – 88

Shi, Leyuan
Optimal Scheduling With Flexible Resources – 162

Shibata, Tomohiro
Recent Advances in Optical Switches Using Silica-based PLC Technology – 189

Shibata, Yasuo
Monolithically Integrated 64-channel WDM Channel Selector – 63

Shie, Chung-Lin
Version 2 Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF2) – 110

Shimokawa, Fusao
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 189

Shindell, Drew T.
Climate Impacts on Tropospheric Ozone and Hydroxyl – 113

Shouse, D. T.
Experimental and Computational Study of Trapped Vortex Combustor Sector Rig With Tri-Pass Diffuser – 11

Shulman, S. A.
Survey Report: Evaluation of an Air Shower for Reducing Exposure to Carbon Monoxide at USA Port of Entry, Calexico, California – 101

Shyu, Juei-Lung
Multi-Random PWM Inverter with Fixed Switching Frequency – 163

Siegel, Jay S.
Mechanisms of Photorefractivity in Polymeric Materials – 50

Siegwarth, James D.
Cryogenic Transfer Line Chilldown – 53

Silva, C.
Volume Rendering for Curvilinear and Unstructured Grids – 170

Silverberg, Robert
The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

Silvervarg, K.
(Sigma)QL: A Decision Support Tool for Target Recognition in a Multisensor Environment – 187

Simons, D. G.
Technical Report on Inversion of the First RUMBLE Sea Trial Data – 122

Simutis, Zita M.
List of US Army Research Institute Research and Technical Publications – 202

Singer-Berk, Alexander
Software for Simulation of Hyperspectral Images – 145

Singh, Mrityunjay
Ultra-High Temperature Ceramic Composites for Leading Edges – 29

Sipus, Zvonimir
Analysis of Curved Microstrip Antennas – 65

Skoglund, M.
Stimulation of Propellant Burning by Supplying Electric Energy in the Flame – 51

Slane, Patrick O.
Uncovering the Properties of Young Neutron Stars and their Surrounding Supernova Remnants – 212

Slavin, Jonathan
The Interaction of Hot and Cold Gas in the Disk and Halo of Galaxies – 212

Slunga, R.
Design of a System for Active Echo-Cancellation – 56

Smeenk, B. J. E.
Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Smith, Eric A.
A Physical Validation Program for the GPM Mission – 119

Smith, Howard A.
Nanotechnology Infrared Optics for Astronomy Missions – 207

Smith, J. E.
Observed Helicity of Active Region Magnetic Fields in Solar Cycle 21 – 225

Smith, K. D.
Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset – 199

Smith, Kevin B.
Direct Path Fluctuations Due to Shallow Water Volume Variability – 176

Frequency Dependence of Effective Bottom Attenuation Due to Environmental Variability – 177

Smith, R. D.
Safety Evaluation of the Single-Shell Tanks Modified Sluicing Waste Retrieval System – 100

Smulski, Michal
The Light Field Video Camera – 79

Snyder, A. P.
Relationship of Ambient Atmosphere and Biological Aerosol Responses from a Fielded Pyrolysis-Gas Chromatography-Ion Mobility Spectrometry Bioanalytical Detector – 132

Snyder, David B.
Historical Precision of an Ozone Correction Procedure for AMO Solar Cell Calibration – 99

Sode, Miki
Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

Soh, Kenichiro
Image Systems Using RFID Tag Positioning Information – 159

Sohma, Shunichi
Recent Advances in Optical Switches Using Silica-based PLC Technology – 189

Sohn, alex
Highlights of the ASPE 2004 Winter Topical Meeting on Free-Form Optics: Design, Fabrication, Metrology, Assembly – 190

Sokoloski, Jennifer L.
RR Tel: Getting under the Flux Limit - An Observation with FUSE – 216

Solano, Wanda
Wireless Temperature-Monitoring System – 61

Sonneborn, George
Outbursts in Symbiotic Binaries – 217

Sonnenborn, George
RR Tel: Getting under the Flux Limit - An Observation with FUSE – 216

Sopok, Samuel
Automatic Coulometric Titration of Sulfuric Acid in Chromium Plating Solutions – 40

Chemistry Laboratory Operations Manual – 203

Determination of AISI 4340 and 8640 Steels Used in M9 Beretta Pistol Slides by Emission Spectroscopy and X-Ray Fluorescence Spectroscopy – 41

Determination of Copper Cadmium and Iron in Metal Cyanide Waste Solutions by Atomic Absorption Spectroscopy – 37

Determination of Copper Cyanide Plating Solutions and Cadmium in Cadmium Cyanide Plating Solutions by Atomic Absorption Spectrometry – 38

Determination of Nickel, Nickel Chloride Hexahydrate and Boric Acid in Nickel Sulfamate Plating Solutions by Titration – 39

Determination of PCB's in Watervliet Arsenal Machine Oils by Gas Chromatography – 38

Determination of Sulfuric Acid in Chromium Plating Solutions Using Gravimetric Analysis – 40

Determination of Wastewater Acids from Chromium Plating and Electropolishing Solutions – 41

Investigation of Exothermic Grinding Sludge Produced from Watervliet Arsenal Gun Steels, Andersol Water- Based Cutting Fluid and Cincinnati Milacron Aluminum Oxide Resin Bond Grinding Wheels – 39

Laboratory Automatic Titration of Chromium Plating and Electropolishing Solutions – 39

Online Automatic Titration of Chromic Acid in Chromium Plating Solutions and Phosphoric and Sulfuric Acids in Electropolishing Solutions – 41

Utilization of Ion Chromatography and Statistics to Determine Important Acids in Chromium Plating and Electropolishing Solutions – 38

X-Ray Fluorescence On-Stream Analysis of Standard Reference Solution Concentrations of Chromium Plating and Polishing Solutions – 40

Spinhirne, James D.
Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

Springer, Jonathan
Streaming and Dynamic Compilers for High Performance Embedded Computing – 149

Spuckler, Charles M.
Effect of Scattering on the Combined Reflection and Thermal Radiation Emission of a Typical Semitransparent TBC Material – 161

Stafleu, A.
Feeding Behaviour and Motivation of Feeding Behaviour of (Experienced) Soldiers of Several Entities Concerning the Fighting Ration – 138

Staggs, M.
Endoscopic Subsurface Imaging in Tissues – 183

Staguhn, Johannes
The Design and Performance of the 384: Element Submillimeter Detector Array for SHARC II – 77

Stahlsten, T.
Design of a System for Active Echo-Cancellation – 56

Stajner, Ivanka
Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

Stanley, Tom
Satellite Hyperspectral Imaging Simulation – 95

Starin, Scott R.
A Study on the Effects of J2 Perturbations on a Drag-Free Control System for Spacecraft in Low Earth Orbit – 97

Starr, D.
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

Stebnisky, Michael
Multidimensional Performance Modeling for Advanced Embedded Signal Processors – 151

Stein, Barry
Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties – 37

Steinetz, B. M.
Advanced Control Surface Seal Development for Future Space Vehicles – 86

Steinetz, Bruce
Investigations of High Pressure Acoustic Waves in Resonators with Seal-like Features – 180

Stemmer, Christian
Transition in Hypersonic Flows Including High-temperature Gas Effects – 72

Stephens, R.
Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels – 174

Sterne, P. A.
Atomic-Based Calculations of Two-Detector Doppler-Broadening Spectra – 175

Theory of Positron Annihilation in Helium-filled Bubbles in Plutonium – 48

Stevens, D. E.
Dynamic Turbulence Modelling in Large-eddy Simulations of the Cloud-topped Atmospheric Boundary Layer – 116

Modeling of Building Scale Flow and Disperson – 76

Stevens, Richard
Proposal for Testing and Validation of Vacuum Ultra-Violet Atomic Laser-Induced Fluorescence as a Method to Analyze Carbon Grid Erosion in Ion Thrusters – 25

Stewart, David H.
Securing Mobile Networks in an Operational Setting – 156

Stewart, Eric C.
Description of a Normal-Force In-Situ Turbulence Algorithm for Airplanes – 4

Stiles, James M.
Multi-Dimensional Signal Processing for Sparse Radar Arrays – 63

Still, K. R.
The Acute Respiratory Distress Syndrome (ARDS) and Military Relevant Inhalation Injury: A Brief Review – 133

Stocker, Erich
Analysis of TRMM 3-Hourly Multi-Satellite Precipitation Estimates Computed in Both Real and Post-Real Time – 111

TRMM Fire Algorithm, Product and Applications – 93

Stoelken, J. S.
Experimental Assessment of Gradient Plasticity – 88

Stoessel, Achim
Using Satellite-derived Ice Concentration to Represent Antarctic Coastal Polynyas in Ocean Climate Models – 123

Stolpovskii, Vladislav G.
Space Weather Effects: Decay Phases in Gradual and Impulsive Solar Energetic Particle Events – 215

Stolz, C. J.
National Ignition Facility: The World's Largest Optics and Laser System – 182

Stone, Janice M.
Streams-C; Sc2 C-to-FPGA Compiler – 149

Strait, Sean A.
The Effects of Gender on Receovery Times Following General Anesthesia with Propofol and Sevoflurane – 131

Strelnytskly, Volodymyr
Magneto-Optically Guided and Fully Ionized Metal/Carbon Arc Plasma Source for Thin Film Coatings to Control, Wear, and Fretting – 27

Strovers, Brian K.
Hyper-X Stage Separation Trajectory Validation Studies – 19

Suarez, Max J.
On the Cause of the 1930s Dust Bowl – 113

Sudarsky, David
Optical Spectra of Extrasolar Giant Planets – 206

Sulaiman, I. F.
Conditions of Internet Kiosks in Medan, Makassar, Bandung, Jogja and Jakart Suburban. A Survey Report in Both English and Indonesian – 141

Is Telkom-Flexi the New Telkom-Instan: Can it Level the Playing Field and Bridge the Digital Divide – 141

New Ways to Empower Indonesia with the Internet and ICTs – 141

Why are Some e-Government Programs More Successful than Others. The Relevance of Performance Evaluations to Regional e-Government Preparations in Indonesia – 142

Sullivan, Brenda M.
Temporal Characterization of Aircraft Noise Sources – 178

Sullivan, E. J.
Acoustic Propagation in a Water-Filled Cylindrical Pipe – 176

Sun, G.
Assessing the Tundra-taiga Boundary with Multi-Sensor Satellite Data – 187

Sun, Wen-Yih
Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

Sun, Yeong-Jeu
Simple Instability Criteria for a Family of Complex-Coefficient Polynomials – 163

Sunwoo, A.
Microstructure and Fracture Behavior of Tungsten Heavy Alloys – 45

Susskind, Joel
Current results from AIRS/AMSU/HSB – 120

Sutton, A. M.
Overview of the Air Force ESEX Flight Experiment – 22

Svensson, S.
Protection Against Microsecond Laser Pulses – 184

Switzer, L. L.
Experiments and Simulations of Penetration into Granite by an Aluminum Shaped Charge – 48

Tabak, M.
Target Designs for an Inertial Fusion Energy Power Plant Driven by Heavy Ions – 193

Takagi, M.
Preparation of NIF Scale Poly(a-Methylstyrene) Mandrels – 174

Takahashi, Ryo
Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 150

Tamaki, Motonori
Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions – 159

Tang, Dajun
Mid-Frequency Bottom Backscatter, Environmental Measurements, Model/data Comparison, and Implications to Reverberations – 178

Tang, David T.
Nonlinear Internal Waves in the South China Sea During ASIAEX – 165

Tang, David
Moored Observations of Internal Solitions in the Northeastern South China Sea – 73

Tangborn, Andrew
A Wavelet based Suboptimal Kalman Filter for Assimilation of Stratospheric Chemical Tracer Observations – 165

Tanikawa, Masaki
Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 63

Tao, Wei-Kuo
Momentum Transport: 2D and 3D Cloud Resolving Model Simulations – 114

Tao, W.-K.
Heating Structures Derived from Satellite – 112

Tark, N. G. Keong
Influence of Surface and Bottom Stress in the Coupled Ocean Circulation and Wind-Wave Models – 122

Tartabini, Paul V.
Hyper-X Stage Separation Trajectory Validation Studies – 19

Tarver, C.
Thermal Decomposition of New and Aged LX-04 and PBX 9501 – 25

Tatsuta, Tsutomu
Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 159

Taylor, B. Douglas
L-C Measurement Acquisition Method for Aerospace Systems – 81

Taylor, Brian
Development of Methodologies for IV and V of Neural Networks – 147

Taylor, D. Bryan
The Wind and Beyond: A Documentary Journey into the History of Aerodynamics in America – 3

Taylor, T.
Proposed Specification of EUVL Mask Substrate Roughness – 67

Teas, Jane
Do the Effects of Exercise on Breast Cancer Prevention Vary With Environment – 127

Tebbe, Heidi J.
Coronal Activity in Low-Mass Pre-Main Sequence Stars: NGC 2264 – 207

Temi, Pasquale
Wavelength Shifts of the 7.7 Micron Emission Band in Reflection Nebulae – 214

Teng, Stacy
Discovery of an Obscured Supernova in Arp 299 – 211

Tennant, A.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Tenpleton, J.
Rough-Wall Channel Analysis Using Suboptimal Control Theory – 74

Tewari, S. N.
Effect of Crucible Diameter Reduction on the Convection, Macrosegregation, and Dendritic Morphology during Directional Solidification of Pb-2.2 Wt Pct Sb Alloy – 48

Theisen, John
Development and Testing of the Phase 0 Autonomous Formation Flight Research System – 53

Thesken, John C.
Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

Thienel, Julie
Nonlinear Observers for Gyro Calibration Coupled with a Nonlinear Control Algorithm – 13

Results of the Magnetometer Navigation (MAGNAV) Inflight Experiment – 16

Testing of Gyroless Estimation Algorithms for the FUSE Spacecraft – 20

Thomas-Ogbuji, L. U.
High Conductivity Materials for High Heat Flux Applications in Space Propulsion Systems – 45

Thome, Kurtis J.
Landsat-7 ETM+ On-Orbit Reflective-Band Radiometric Stability and Absolute Calibration – 20

Thompson, Anne M.
Discoveries about Tropical Ozone from Satellite and SHADOZ (Southern Hemisphere ADditional Ozonesondes) – 114

Thompson, B. J.
Phenomena Associated With EIT Waves – 218

Thompson, Richard C.
Time-Temperature Dependent Response of Filament Wound Composites for Flywheel Rotors – 90

Thompson, S.
Evaluating the Carbon Cycle of a Coupled Atmosphere-Biosphere Model – 109

Thurman, Chuck
Wireless Temperature-Monitoring System – 61

Tilley, D.
Multimegawatt Quasi-Steady MPD Thruster Facility – 23

Tipton, C. W.
High-Temperature, 400 W, DC-to-AC Inverter Using Silicon Carbide Gate Turn-Off Thyristors and p-i-n Diodes – 66

Tohmori, Yuichi
Monolithically Integrated 64-channel WDM Channel Selector – 63

Toland, Ronald W.
A Precision Metrology System for the Hubble Space Telescope Wide Field Camera 3 Instrument – 77

Tolk, Andreas
Computer Generated Forces: Integration into the Operational Environment – 143

Human Behavior Representation: Recent Developments – 160

Tollison, Kerri
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

Tommasini, R.
Investigations on 10-Hz sub-Joule fs-Laser Pumped Neon- and Nickel-like X-ray Lasers – 195

Torres, D. F.
ULXs, Microblazers, and the Unidentified EGRET Sources – 219

Tracewell, D.
Earth Observing System (EOS) Aqua Launch and Early Mission Attitude Support Experiences – 93

Tran, T. D.
Thermal Decomposition of New and Aged LX-04 and PBX 9501 – 25

Tremblay, Gilles
Is Breast Tissue from Women Who Carry Germ-Line BRCA1 or BRCA2 Mutations 'Normal'? - An Immuno- Histopathological Study – 130

Tripathi, Ashish
Relationship of Ambient Atmosphere and Biological Aerosol Responses from a Fielded Pyrolysis-Gas Chromatography-Ion Mobility Spectrometry Bioanalytical Detector – 132

Trotta, Richard
Logistic Fuel Processor Development – 52

Trouwborst, W.
Risk Analysis LC-Frigate Shock Trials: Some Preliminary Analyses – 91

Tsay, Si-Chee
Biomass-burning Aerosols in South East-Asia: Smoke Impact Assessment (BASE-ASIA) – 107

Tseng, Yu-Heng
Nonlinear Gulf Stream Interaction with the Deep Western Boundary Current System: Observations and a Numerical Simulation – 123

Tsotsis, Tom
High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Tucker, Paul G.
Transport Equation Based Wall Distance Computations Aimed at Flows With Time-Dependent Geometry – 3

Tuegel, Eric J.
Investigation of the Effect of Corrosion Pitting on Fatigue Life of Aluminum Structure – 46

Tuttle, J. G.
Astro-E2 Magnesium Diboride High Current Leads – 195

Tyo, J. S.
Tradeoffs in Polarimeter Design – 203

Tyson, Daniel S.
Efficient Synthesis of 4,8-Ditoluoyl-1,5-Dihydroxynaphthalene – 42

Ueberhuber, Christoph
Short Vector SIMD Code Generation for DSP Algorithms – 162

Uenishi, Yuji
Development of a Large-scale 3D MEMS Optical Switch Module – 190

Ulriksson, J.
Web-Based HLA Federations and Simulations: Methods and Possibilities – 55

Ulvstad, James
Discovery of an Obscured Supernova in Arp 299 – 211

Ushijima, Shigehiko
Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 63

Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 64

Utoyo, K. B.
Conditions of Internet Kiosks in Medan, Makassar, Bandung, Jogja and Jakart Suburban. A Survey Report in Both English and Indonesian – 141

Vahey, Mike
MONARCH: A Morphable Networked micro-ARCHitecture – 63

Vaillancourt, John E.
Tracing the Magnetic Field in Orion A – 217

Valentine, Peter G
X-37 C-Sic CMC Control Surface Components Development [Status of the NASA/Boeing/USAF Orbital Vehicle and Related Efforts] – 49

van Dam, M. A.
Characterization of Adaptive Optics at Keck Observatory – 220

vanAken-Schneijder, P.
Feeding Behaviour and Motivation of Feeding Behaviour of (Experienced) Soldiers of Several Entities Concerning the Fighting Ration – 138

vandenEikhoff, J.
Influence of Rubber Honeycomb on Shock Response – 164

Risk Analysis LC-Frigate Shock Trials: Some Preliminary Analyses – 91

vanderWulp, C. J. M.
Mass Calculations from X-Ray Shadowgraphs Using Image Processing – 81

VanDresar, Neil T.
Cryogenic Transfer Line Chilldown – 53

vanErp-Baart, A. M. J.
Feeding Behaviour and Motivation of Feeding Behaviour of (Experienced) Soldiers of Several Entities Concerning the Fighting Ration – 138

vanSon-de-Waard, E. N.
Case study results of the Operational Value of a New Command and Control Component for Dismounted Infantry Operations – 153

Varma, Shambhu D.
Sulfur Mustard Damage to Cornea With Emphasis on Skin: Preventative Studies – 127

Vasilkov, A. P.
Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals – 117

Vaughan, William W.
Status on Updated NASA Standard: 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development' – 1

Vaughn, Frank
A Comprehensive Survey of Earth-Moon Libration Orbits: Stationkeeping Strategies And Intra-Orbit Transfers – 15

Vayner, Boris
Experimental Study of Arcing on High-Voltage Solar Arrays – 19

Solar Array in Simulated LEO Plasma Environment – 195

Veazie, David
High Temperature Polymeric Materials for Space Transportation Propulsion Applications – 28

Venkataramana, Raju D.
Adaptive Framework for Automated Mapping and Architecture Trades for Embedded Heterogeneous Systems – 160

Vess, Melissa Fleck
A Study on the Effects of J2 Perturbations on a Drag-Free Control System for Spacecraft in Low Earth Orbit – 97

Vickers, Richard N.
Sealed Window Glazing System for Chemical Biological Protected Space Applications – 89

Vickers, Ross R., Jr
Running Performance as an Indicator of VO(2max): A Replication of Distance Effects – 134

Vij, Ashwani
1-Alkyl-4-Amino-1.2.4-Triazolium Salts, New Families of Ionic Liquids – 35

Vikhlinin, Alexey
Physics of Galaxy Clusters and How it Affects Cosmological Tests – 215

Vincent, Patrick J.
The Role of Haptics in Service Manual Task Validation – 55

vonKonig, Miriam
The Influence of Solar Proton Events in Solar Cycle 23 on the Neutral Middle Atmosphere – 224

Voorhies, Coerte V.
Narrow Scale Flow and a Weak Field by the Top of Earth's Core: Evidence from Orsted, Magsat and Secular Variation – 222

Vouras, Peter
Hybrid QR Factorization Algorithm for High Performance Computing Architectures – 150

Vu, Nicole T.
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

Wagner, Peter
International Hypoxia Symposium (13th) for the Publishing of the Conference Proceedings for 2003 Conference – 125

Wagner, William
Contraints on Solar Wind Plasma Properties Derived from Coordinated Coronal Observations – 223

Wahlen, B. E.
Multi-h CPM Synchronization in Military Channels Phase 2: A Simulation Framework – 58

Walker, David
Path Elongation for UAV Task Assignment – 6

Walker, Russell G.
Irradiance Calibration of Space-Based Infrared Sensors – 79

Walter, W. R.
Improving the Fundamental Understanding of Regional Seismic Signal Processing with a Unique Western U.S. Dataset – 199

Walton, C.
Proposed Specification of EUVL Mask Substrate Roughness – 67

Wampler, Jeffrey L.
The Role of Haptics in Service Manual Task Validation – 55

Wang, Dunyou
Quantum Dynamics Scattering Study of AB+CDE Reactions: A Seven Dimensional Treatment for the H2+C2H Reaction – 33

Wang, Guiling
Implementation of the NCAR Community Land Model (CLM) in the NASA/NCAR finite-volume Global Climate Model (fvGCM) – 111

Wang, Meng
On the Computation of Space-Time Correlations by Large-Eddy Simulation – 70

Wang, Shang-Ming
New High-Speed Low-Power Current-Mode CMOS Sense Amplifier – 64

Wang, Yansen
A High Resolution, Three-Dimensional, Computationally Efficient, Diagnostic Wind Model: Initial Development Report – 115

Wang, Z.
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

Wanhatalo, M.
Preparation of Propellants Adapted for ETC and Polymeric Matrix for ADN-Based Propellants – 52

Ward, Rufus R.
Ge Semiconductor Devices for High-Performance Cryogenic Power Electronics – 60

Wargo, Michael J.
Strategic Research Directions in Microgravity Materials Science – 221

Warner, B. A.
Passive Superconducting Shielding: Experimental Results and Computer Models – 145

Wassell, Edward J.
Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics – 13

Waszak, Martin R.
Biologically Inspired Micro-Flight Research – 9

Watson, Daniel
Analytic Prediction of Emergent Dynamics for Autonomous Negotiating Team (ANT) Systems – 201

Wattellier, B.
All Fiber Technology for High-Energy Petawatt Front End Laser Systems – 186

Parametric Techniques for Extreme-Contrast, High-Energy Petawatt Pulses – 185

Wayner, P. C., Jr.
Theoretical and Experimental Investigation of the Stability of an Evaporating Constrained Vapor Bubble – 72

Weaver, Kimberly
The Constellation-X Observatory – 182

Weiland, Kenneth E.
Optical Levitation of Micro-Scale Particles in Air – 190

Weinheimer, Andrew J.
Measurement of Peroxyacetyl Nitrate (PAN), Peroxypropionyl Nitrate (PPN) and Peroxymethacryloyl Nitrate (MPAN) during TRACE-P – 30

Weisskopf, M. C.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Welch, Clara
Setting up a Grid: A Guide for Beginners by a Beginner – 124

Welker, Jean E.
Long-Term Climatic Variations in the Almati Oblast in Central Asian Kazakhstan: Correlations between National Centers for Environmental Prediction (NCEP) Reanalysis II Results and Oblast Meteorological Station Data from 1949 to the Present – 118

Welton, E. J.
Aerosol Optical Properties Measured Onboard the Ronald H. Brown During ACE Asia as a Function of Aerosol Chemical Composition and Source Region – 117

Welton, Ellsworth J.
Ice-Crystal Fallstreaks from Supercooled Liquid Water Parent Clouds – 106

Wertz, George
Characterization of Candidate Solar Sail Material Exposed to Space Environmental Effects – 20

Westenbrink, S.
Feeding Behaviour and Motivation of Feeding Behaviour of (Experienced) Soldiers of Several Entities Concerning the Fighting Ration – 138

Whalen, Robert T.
Noninvasive Investigation of Bone Adaptation in Humans Cumulative Daily Mechanical Loading – 137

Whinnery, James E.
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

White, Vicky L.
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

Whiteman, D.
Moisture, Wind, and Boundary Layer Evolution During a Dryline in IHOP-2002: May 22, 2002 – 108

Whitman, Tony
The James Webb Telescope Instrument Suite Layout: Optical System Engineering Considerations for a Large, Deployable Space Telescope – 182

Wignarajah, K.
Compaction of Space Mission Wastes – 137

Development of Metal-impregnated Single Walled Carbon Nanotubes for Toxic Gas Contaminant Control in Advanced Life Support Systems – 34

Partitioning of Inorganic Elements Consumed by Humans Between the Various Fractions of Human Wastes: A Review and Analysis of Existing Literature – 34

Wijers, R. A. M. J.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Wilbur, Matthew L.
Aerodynamic Design Study of an Advanced Active Twist Rotor – 7

Wilburn, Bennett
The Light Field Video Camera – 79

Wild, Norbert
Hand-Held Ultrasonic Through-the-Wall Monitoring of Stationary and Moving People – 177

Wilde, Doran
Unified Debug Environment for Adaptive Computing Systems – 152

Williams, Brian E.
Multilayer Fiber Interfaces for Improved Environmental Resistance and Slip in Carbon Fiber Reinforced Composites – 30

Recent Advances in the Development of Thick-Section Melt-Infiltrated C/SiC Composites – 29

Williams, E. A.
Stimulated Brillouin Scattering from Helium-Hydrogen Plasmas – 194

Williams, Frederick W.
Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell – 27

Williams, P.
Volume Rendering for Curvilinear and Unstructured Grids – 170

Williamson, Chatt C.
A High Resolution, Three-Dimensional, Computationally Efficient, Diagnostic Wind Model: Initial Development Report – 115

Wilson, Barry W.
Improving Blood Monitoring of Enzymes as Biomarkers of Risk Form Anticholinergic Pesticides and Chemical Warfare Agents – 127

Winslow, Nathan
Monitoring of Observation Errors in the Assimilation of Satellite Ozone Data – 118

Wirth, B. D.
Atomistic Simulation of Dislocation-Defet Interactions in Cu – 44

Wirthlin, Mike
Unified Debug Environment for Adaptive Computing Systems – 152

Wisniewski, Charles F.
Spatially Resolved Sub-Doppler Overtone Gain Measurements in a Small Scale Supersonic HF Laser – 35

Witzeman, F.
Magneto-Aerodynamic Hypersonics – 173

Wolf, Stephen N.
Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS) – 178

Wollack, E. J.
Symmetric Waveguide Orthomode Junctions – 213

Wong, Harris
Theoretical and Experimental Investigation of the Stability of an Evaporating Constrained Vapor Bubble – 72

Wong, Jennifer T.
Performance of Fire Protective Coatings Subjected to DC-ARM Wartime Scenario Fires Aboard Ex-USS Shadwell – 27

Wong, S.
Experimental Investigations on the Distortion of ISAR Images Using Different Radar Waveforms – 57

Wood, L.
Civilian Power from Space in the Early 21st Century – 98

Woodard, Stanley E.
L-C Measurement Acquisition Method for Aerospace Systems – 81

Woodgate, Bruce E.
A Novel Method of High Accuracy, Wavefront Phase and Amplitude Correction for Coronagraphy – 222

Detecting protostellar jets with the Goddard Fabry-Perot coronagraph, and modification for adaptive optics – 13

Woosley, S. E.
Chandra Observations of the X-ray Environs of SN 1998bw/GRB 980425 – 206

Wootton, A.
X-Ray Optics and Diagnostics for the First Experiments on the Linac Coherent Light Source – 193

X-ray Optics Research for Linac Coherent Light Source: Interaction of Ultrashort X-ray Pulses with Matter – 185

Wrbanek, Susan Y.
Optical Levitation of Micro-Scale Particles in Air – 190

Wright, Michael R.
A National MagLev Transportation System – 203

Wu, Ching-Yuan
New High-Speed Low-Power Current-Mode CMOS Sense Amplifier – 64

Wu, Lixin
ASIAEX South China Sea Acoustic Fluctuations (and Physical Oceanography) – 177

Wuest, C. R.
National Ignition Facility: The World's Largest Optics and Laser System – 182

Xu, Jimmy
Highly Ordered Carbon Nanotube Arrays and Nanotube- Polymer Nanocomposite Superlattices for Full-Color Sensing and Coating – 39

Yamaguchi, Johji
Development of a Large-scale 3D MEMS Optical Switch Module – 190

Yamamoto, Tsuyoshi
Development of a Large-scale 3D MEMS Optical Switch Module – 190

Yang, Chi
Application of New Algorithms for the Simulation of Multidisciplinary Problems: Fluid Structure Thermal and Control Coupling – 73

Yang, Fanglin
Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

Yang, Jar-Ferr
Successive Bit-Vector Search Algorithm for CELP Vocoders – 164

Yang, K.
Using Cloud Top Pressures Derived from Raman Scattering in the UV for the OMI Total Column Ozone Retrievals – 117

Yang, Kunde
Broadband Geoacoustic Matched Field Inversion with Multi-step Strategy from ASIAEX 2001 – 178

Yeager, William T., Jr.
Aerodynamic Design Study of an Advanced Active Twist Rotor – 7

Yi, Q.
C++ Infrastructure for Automatic Introduction and Translation of OpenMP Directives – 139

Yoder, Dennis
Computational Study of Axisymmetric Off-Design Nozzle Flows – 2

Yokota, Miyo
Characterization of Uncertainties in a Thermal Strain Prediction Model for Military Applications – 132

Yoshida, Yukihiro
Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 159

Young, D.
Hydrodynamic Modeing of a Multi-Pulse X-Ray Converter Target for DARHT-II – 174

Young, Y.-N.
A Cartesian Adaptive Level Set Method for Two-Phase Flows – 70

Youngquist, Robert C.
Leak and Pipe Detection Method and System – 59

Yuan, F. G.
Health Monitoring of RLV Airframe Structures – 87

Yudichak, T. W.
Frequency and Angular Dependence of Low Frequency East China Sea Bottom Scattering Strengths – 178

Yun, Hee Mann
Matrix Cracking in 3D Orthogonal Melt-Infiltrated SiC/SiC Composites with Various Z-Fiber Types – 30

Yungster, S.
Structure and Stability of One-Dimensional Detonations in Ethylene-Air Mixtures – 72

Zanoni, Vicki
Instrument for Measuring Temperature of Water – 77

NASA's Virtual Product Laboratory: An Overview – 158

Remote Sensing System Requirements Development: A Simulation-Based Approach – 97

Satellite Hyperspectral Imaging Simulation – 95

Zeitlin, Nancy P.
The Feasibility of Using a Galvanic Cell Array for Corrosion Detection and Solution Monitoring – 59

Zenin, Anatoli A.
Physics of Combustion of New Oxidizer/Polymer Mixtures – 51

Zentner, Radovan
Analysis of Curved Microstrip Antennas – 65

Zhang, Haifeng
Transmission Measurements of Femtosecond Laser Pulses Through Aerosols – 83

Zhang, Hong
Influence of Surface and Bottom Stress in the Coupled Ocean Circulation and Wind-Wave Models – 122

Zhang, Renhe
Low-Frequency Shallow Water Reverberation and Bottom Scattering Model – 176

Preliminary Analysis of Reverberation Data in ASIAEX Experiment – 176

Zhang, Xue-Zhen
Seabottom Acoustics Parameters from Reverberation Vertical Coherence in Shallow Water – 179

Zhang, Zi-Fan
A Self-Contained Mapping Closure Approximation for Scalar Mixing – 71

Zhou, Jin-Xun
Seabottom Acoustics Parameters from Reverberation Vertical Coherence in Shallow Water – 179

Zhou, Jixun
Low-Frequency Shallow Water Reverberation and Bottom Scattering Model – 176

Preliminary Analysis of Reverberation Data in ASIAEX Experiment – 176

Zhu, Dong-Ming
Thermal Conductivity of Alumina-Toughened Zirconia Composites – 30

Zhu, Hua
Isolation of RNA From Peripheral Blood Cells: A Validation Study for Molecular Diagnostics by Microarray and Kinetic RT-PCR Assays - Application in Aerospace Medicine – 135

Zhuang, Wyman
Durability Assessment of Gamma TiAl – 47

Zinn, Ben
Real-Time Control of Lean Blowout in a Turbine Engine for Minimizing No(x) Emissions – 21

Zook, Keith
Requirements Development for the NASA Advanced Engineering Environment (AEE) – 54

Zou, L.

Device Optimization and Transient Electroluminescence Studies of Organic Light Emitting Devices – 185

Zubov, Vladimir A.

Sensitivity of Middle Atmospheric Temperature and Circulation in the UIUC Mesosphere-Stratosphere-Troposphere GCM to the Treatment of Subgrid-Scale Gravity-Wave Breaking – 107

Zurbuchen, T. H.

Spatial Relationship of Signatures of Interplanetary Coronal Mass Ejections – 224

Zwanziger, Josef W.

Desgin of Hybrid Solid Polymer Electrolytes: Structure and Properties – 37