

**Fiscal Year 2011 Department of Defense
Authorization and Appropriations Requests
Senator Carl Levin
(Alphabetical Order by Recommended Recipient)**

Item Name: Electro-Kinetic Wind Energy

Request: \$1,900,000

Recipient: Accio Energy

Location: Ann Arbor, MI

Project Description: This project would support DoD requirements for renewable energy generation at both fixed facilities and deployed operations by maintaining or enhancing operational effectiveness while reducing fossil fuel consumption. Electro-kinetic wind energy systems use wind energy to act against an electrostatic field, separating positively charged water droplets from negatively charged sources. As this occurs, the wind's kinetic energy is converted to high voltage. The feasibility of electro-kinetic wind energy conversion was demonstrated in the 1970s by the Department of Energy. However, initial efficiencies were low and government investment was not continued at that time. Since then, advances in enabling technologies have produced the potential for orders of magnitude increases in the efficiency of electro-kinetic wind energy converters that could make such systems attractive for military applications.

Item Name: Diminishing Manufacturing Sources and Material Shortages

Request: \$5,000,000

Recipient: Automation Alley

Location: Troy, MI

Project Description: The U.S. Army U.S. Army Tank-Automotive and Armaments Command (TACOM LCMC) is responsible for sustaining more than 3,500 weapons systems through all phases of the life cycle. Many of these systems are 30 or more years old, yet require parts and materials for recapitalization or frequent repairs. As the systems age, often the parts and assemblies are no longer being manufactured. Finding alternative sources for mechanical parts can be problematic, especially if the quantity required is too low for a major tier-one supplier to continue to produce at a profit. This funding would continue work by the Diminishing Manufacturing Sources and Material Shortages (DMSMS) Case Resolution Program to reduce TACOM LCMC total ownership costs for weapons systems sustainment by researching of DMSMS cases, designing engineering solutions, and testing alternatives for obsolete parts and higher-level assemblies.

Item Name: Hydraulic Hybrid Vehicles for the Tactical Wheeled Fleet

Request: \$2,700,000

Recipient: Bosch Rexroth

Location: Rochester Hills, MI

Project Description: Bosch Rexroth Corporation has been working with the Army for several years on the development of an advanced hydraulic hybrid technology for military ground vehicles. The heart of this hydraulic hybrid system is a new line of advanced, highly efficient, hydraulic pump and motor products which will replace the conventional automatic transmission and significantly improve overall vehicle drivetrain efficiency in vehicles. This technology could improve fuel economy by up to 60 percent as compared to conventional drivetrain configuration,

reduce the required logistics support footprint for vehicles, reduce maintenance and replacement costs of brakes, and improve acceleration.

Item Name: Highly Integrated Optical Interconnect for Military Avionics

Request: \$5,000,000

Recipient: Calumet Electronics Corporation

Location: Calumet, MI

Project Description: The Department of Defense continues to demand increasing data processing, communication, and system control capabilities. The next generation data and communication management systems needed for weapons platforms will depend upon tightly integrated optical fiber solutions, also known as optical interconnect. This solution provides space optimization while also achieving high bandwidth, decreased weight, immunity to electromagnetic interference, resistance to corrosion, and improved safety and security. The Navy has several requirements for next generation optical interconnect technology for use in several aircraft platforms including the F/A-18G, P-8A, and F-35. It is also anticipated that this technology could be transitioned to other Navy surface and sub-surface platforms in the future. Calumet Electronics Corporation of Calumet, Michigan has expertise in the manufacturing of the printed circuit boards needed for this technology.

Item Name: Advanced Materials Research for Alternative Energy and Transportation

Request: \$1,500,000

Recipient: Central Michigan University

Location: Mount Pleasant, MI

Project Description: This project is intended to provide the basis for new applied technologies that can be adopted by the Army and the commercial sector to provide a multifaceted solution to the nation's needs for sustainable domestic energy generation and storage. For example, current research at Central Michigan University (CMU) is focused on the use of nanotechnology to the design of novel energy storage systems. In addition, the use of polymer foams, commonly called ferroelectrets, to convert mechanical vibrations into electrical energy is also being studied. CMU scientists are also developing sophisticated computational tools to model complex catalytic reactions involved in a range of energy-related processes including: the efficient conversion of chemical into electrical energy, the improvement of existing catalysts for hydrocarbon combustion, the creation of more efficient gas separation technologies, and the development of reliable gas sensors.

Item Name: Biofuels Program

Request: \$4,000,000

Recipient: Defense Logistics Agency

Location: Fort Belvoir, VA

Project Description: This funding would continue this merit-based program carried out by the Defense Logistics Agency (DLA) to develop biofuels and associated technologies that could have benefits for the Department of Defense (DoD). Interest in biofuels is driven by high oil prices, environmental concerns, as well as national security concerns. Aggressive efforts are required to develop advanced biofuels such as cellulosic ethanol and butanol, high yield biodiesel, and wood-derived bio-oil, all of which have significant potential to be utilized by DoD. This program focuses on the following goals – improving the technology and equipment

for cellulosic biomass pretreatment, developing enzymes optimized to produce sugars from the pretreated biomass and microorganisms, investigating genetic modification of bio-based fuel crops with the goal of maximizing fuel yield, and assessing the utility of various bio-based fuels for electricity production.

Item Name: Vehicle Fuel Cell and Hydrogen Logistics Program

Request: \$8,000,000

Recipient: Defense Logistics Agency

Location: Fort Belvoir, VA

Project Description: This funding would continue development of fuel cell technologies for use in Department of Defense (DoD) vehicles, development of the hydrogen infrastructure to support use of those vehicles, and evaluation of hydrogen storage systems. This Defense Logistics Agency-managed merit-based program continues development of fuel cell auxiliary power units and vehicle propulsion technologies as well as pilot demonstration of such technologies. Critical components of this program include development of a comprehensive and integrated strategy for the appropriate use of hydrogen to meet DoD requirements for the future and making appropriate investments now to meet those requirements. This program also evaluates hydrogen storage systems that would weigh less and take up less volume, allowing vehicles to safely carry more hydrogen onboard, increasing driving range, and reducing refueling frequency and cost. Issues being addressed in hydrogen storage include development of materials to maximize storage potential, improving the ability to charge and recharge the solid storage systems with hydrogen quickly after use, devising hydrogen release systems that can flow hydrogen from the solid storage system into fuel cells in a controlled, repeatable manner, and making the entire storage system cost-effective relative to other storage systems or more traditional engine technologies. Combined, the program continually evaluates new technologies in fuel cells, fuel reforming, hydrogen storage and generation, and battlefield electric power, as well as technologies for successful development of a hydrogen refueling infrastructure.

Item Name: Ground Robotics Manufacturing and Supply Chain Development

Request: \$10,000,000

Recipient: Defense Production Act

Project Description: Ground robotics systems for military applications are expensive and often produced in small quantities. Demand for these systems continues to increase, but cannot be met by current domestic production capabilities. The primary purpose of Title III of the Defense Production Act (DPA) is to “create, expand, or restore domestic industrial base capabilities.” Under the authorities of the DPA, this funding would support merit-based investments in the ground robotics manufacturing base and supply chain designed to increase domestic production capabilities, reduce the costs of robotic platforms and components, and improve robotics manufacturing processes. DPA investments would have a positive impact both on the availability of ground robotics systems for our warfighters and also improve the reliability of such systems in deployed environments.

Item Name: SiC Inverters for Army Tactical Quiet Generators

Request: \$2,000,000

Recipient: Dow Corning Corporation

Location: Midland, MI

Project Description: Advanced power electronics is highlighted in the Army's Mobile Electric Power Master Plan for integration into advanced generators by incorporating results from the Army Research Lab silicon carbide (SiC) power electronics development program. By manufacturing and integrating state-of-the-art SiC power modules into generator units, the Army could reduce the weight of the power electronic inverter systems by approximately 50 percent while simultaneously enabling two times reduction in electrical conversion losses compared to legacy power systems technology, thus significantly contributing to overall Army fuel saving goals. The objectives of this program include: 1.) Leveraging state of the art SiC technology to rapidly develop and deliver commercial product based on 150 mm epiwafers, enabling broad acceptance of SiC devices through the significant cost reduction associated with wafer area scaling; 2.) developing capability at 100 and 150 mm diameter technology for thick (c.a. 100 um) SiC epitaxy to enable low cost device fabrication for high voltage applications in power systems; and 3.) fabricate SiC devices for insertion in Army power systems development programs.

Item Name: Flame Retardant Textile Fabric

Request: \$1,500,000

Recipient: Eastern Michigan University

Location: Ypsilanti, MI

Project Description: This project seeks to develop a more cost-effective and fire-resistant fabric than is currently available. Previous research showed that intumescent flame retardants generate far higher levels of char than conventional retardants and in doing so provide extremely high levels of fire resistance to underlying surfaces (garment). However, a major drawback of using conventional intumescent flame retardants in textile applications, usually as applied coatings, is that even the most water-insoluble intumescent do not survive the textile-laundering processes. Project objectives include development of: 1.) the appropriate fiber combination for advanced fire-retardant treatment; 2.) the finishing agent using advanced chemistry; and 3.) the fire-resistant agent-application technique. The resulting fabric will be subjected to extensive testing for flammability, durability, and thermal properties.

Item Name: Advanced Thermal and Oil Management System

Request: \$10,600,000

Contractor: Engineered Machined Products Incorporated

Address: Escanaba, MI

Project Description: This funding will continue research efforts by the Army into advanced thermal management technology for combat vehicles. The Army's increased operation tempo has placed greater demand on the engines in its tracked and wheeled vehicle fleets. Advanced thermal management technologies have helped the Army combat the challenges associated with overheating engine blocks, among other things. Continuing this research will enable the Army to leverage private sector technological advancements as the Army continues to push the limits of the ground combat and tactical fleets. Engineered Machined Products Incorporated of Escanaba, Michigan has been working with the Army on this project for several years.

Item Name: U.S. Army Operator Driving Simulator

Request: \$5,000,000

Recipient: FAAC Incorporated

Location: Ann Arbor, MI

Project Description: The U.S. Army National Guard has an ongoing need to train Soldiers in a variety of stressful and dangerous driving situations. This funding would pay for driving simulators that will allow deploying National Guard Soldiers to maximize their training time while providing a realistic experience without risk to personnel or equipment. It is my understanding that FAAC Incorporated of Ann Arbor, Michigan manufactures the only U.S. Army authorized Operator Driving Simulator.

Item Name: Mobile Laser Deposition Work Cell

Request: \$3,000,000

Recipient: Focus: HOPE

Location: Detroit, MI

Project Description: This project would develop a mobile laser deposition work cell for deployment aboard ships and to remote areas to conduct on-demand repair of parts required for naval platforms. The work cell would be housed in a standard ISO container and will incorporate a variety of laser deposition, welding, milling, grinding, and measurement technologies to allow for precision repair of parts in deployed locations. Such a capability could reduce repair time and costs for high-demand parts. Focus: HOPE in Detroit, MI has been working with the Naval Undersea Warfare Center in Keyport, Washington on related projects for several years.

Item Name: Autonomous Connected Vehicle Proving Center

Request: \$2,000,000

Recipient: Henry Ford Community College

Location: Dearborn, MI

Project Description: The goals of this initiative are to identify opportunities, create networks, and promote synergies between industry, government, and academia to accelerate development, production, and technology transition of autonomous/connected vehicles and robotics technology-based scientific capabilities. For the military, connected autonomous vehicles and systems can provide greater force effectiveness and efficiency while reducing unnecessary risk to troops. Connectivity enabled autonomous technologies would revolutionize military logistics both in efficiency and resiliency, and provide outstanding force effectiveness capability. For example, autonomous vehicles performing route clearance and reconnaissance missions and robotic "wingmen" integrated as members of each squad reduce unnecessary risks and provide tremendous force multiplication capabilities.

Item Name: Holographic Grenade Launcher Sighting System

Request: \$3,000,000

Recipient: L-3 EO Technology

Location: Ann Arbor, MI

Project Description: U.S. Special Operations Command (USSOCOM) has a validated requirement for 5,386 Enhanced Combat Optical Sight-Grenade Launcher (ECOS-GL) sights and plans to procure 350 in FY11. The ECOS-GL is a grenade launcher day/night sight which provides a holographic ballistic reticle that takes into account the trajectory of the grenade due to drag, gravity and spin drift. The holographic ECOS-GL sight allows for rapid target acquisition and high aiming accuracy without mechanical adjustments to the sighting system. This funding would help USSOCOM to accelerate the fielding of these sights.

Item Name: Large Aircraft Podded Infrared Countermeasures Systems

Request: \$11,000,000

Recipient: Michigan Air National Guard

Location: Lansing, MI

Project Description: The AN/AAQ-24(V) Guardian is a podded infrared countermeasure system designed to protect fixed wing aircraft against man-portable (shoulder-launched) infrared-guided surface-to-air missiles. The system uses sensors to detect a launched surface-to-air missile and then locks on to the missile in flight and jams the missile's guidance system with a beam of infrared energy. The system operates autonomously with no action required of the flight crew. This funding would procure Guardian AN/AAQ-24(V) systems for 10 Air National Guard KC-135 aircraft.

Item Name: Advanced Energy Storage Research

Request: \$5,000,000

Recipient: Michigan State University

Location: East Lansing, MI

Project Description: Energy storage is a critical issue for the warfighter during all aspects of their training and deployment cycles. This funding would continue basic research to advance the fundamental understanding of atomic and molecular level processes that govern the operation, performance, and failure mechanisms on existing energy storage systems and to develop materials, methods and devices to store energy and to manage energy distribution in applications ranging from personal, to vehicular and to installation levels in collaboration with government and industry. This research is primarily focused on: 1) the fundamental understanding of the operation and performance of existing and future batteries and ultracapacitors at the atomic and molecular level; 2) development of advanced nanostructured and multifunctional materials to increase performance, durability and reliability of batteries and ultracapacitors; and 3) development of systems level control and operation, with a focus on batteries and supercapacitors at a range of levels from personal to vehicular to installation levels.

Item Name: Pre-Discharge Threat Cues

Request: \$3,500,000

Recipient: Michigan Technological University

Location: Houghton, MI

Project Description: The Army has launched the development of vehicle borne sensor systems to serve as the basis of active protection systems. These systems can take the form of RADAR, electro-optical/infrared radar imagers, acoustics, etc. Electro-optic technology has been used for threat cuing. However, threats typically deploy in shadows. In addition, the dynamic range between bright sunlight areas and shadow are so great that visual and normal camera modalities do not have the dynamic range to pick up these threats. High dynamic range photography developed in the movie industry can be applied to this problem to great advantage. In addition RADAR technology can defeat deployments using obscuration (e.g. curtains, bushes) which is extremely difficult to overcome with solely Electro-optic technology. This project seeks to develop a joint high dynamic range photography and high range resolution RADAR system for mobile platforms to provide pre-discharge threat warning in urban and mountain environments.

Item Name: Plug-In Hybrid Electric Vehicle Program

Request: \$4,730,000

Contractor: NextEnergy Center

Location: Detroit, MI

Project Description: This project is designed to develop and test advanced plug-in hybrid vehicle technologies that can effectively produce high quality electric power for installations and forward operating bases. Under this cooperative program with the Army's National Automotive Center, the NextEnergy Center will develop and deploy Smart Plug-In Hybrid Vehicle (PHEV) technology that provides new capability to manage power distribution and reduce Department of Defense fuel consumption using conventional generation, renewable generation, and vehicles with exportable electric power. A smart PHEV will supplement electrical power generation and reduce emissions by the vehicle fleet.

Item Name: Automotive Tribology Research

Request: \$2,500,000

Recipient: Oakland University

Location: Rochester, MI

Project Description: This project will be focused on engine and transmission tribology (i.e. lubrication, friction and wear). Research will be conducted to lower friction and wear, reduce weight, improve fuel economy, lower emissions and produce higher power output of military ground vehicles. Specific projects will be designed to study tribological effects of various high-tech coatings and surface treatments, including coatings containing nano-particles. New environmentally-friendly oil additives will also be studied with the goal of lowering friction and wear. A vigorous analytical modeling effort will also be conducted to allow for rapid evaluations of new vehicle designs. The results of this research could be used by the Army to help reduce ground vehicle fuel costs, maintenance, and other logistics requirements while also improving vehicle performance.

Item Name: Mid-Infrared Super-Continuum Laser for Light Aircraft Missile Defense

Request: \$3,500,000

Recipient: Omni Sciences

Location: Ann Arbor, MI

Project Description: The goal of this project is to accelerate the development of a potentially disruptive laser technology that could more effectively mimic the heat signature of helicopters and other aircraft for light aircraft missile defense than is currently available. When pointed at an incoming heat-seeking missile, this technology can be used to confuse the missile's guidance system and steer it away from the aircraft. Current laser systems for this purpose are expensive, large, heavy, and difficult to maintain. The technology developed using these funds could be more cost effective to produce and easier to maintain than current technologies because it has no moving parts. In addition, this technology will be developed as a "drop in" solution that can be easily integrated in countermeasures that are currently in place on military helicopters and other aircraft.

Item Name: Magnesium Armor Composite

Request: \$2,258,000

Recipient: REL, Inc.

Location: Calumet, MI

Project Description: This project seeks to increase the survivability of military ground vehicles as well as create a new processing technology designed to advance manufacturing in the United States. For a number of years, the Army invested in the design and potential application of metal matrix composites for armor and structural-armor applications. Such composites can exhibit hardness and stiffness comparable to steel but at much lower density. However, because of its extraordinary hardness and wear resistance abilities, such composites are extremely difficult and expensive to machine for finishing. This project would utilize squeeze casting technology for the manufacturing of magnesium armor composite materials. There are numerous structural and ballistic components in Army systems that could potentially benefit from the availability of a low cost manufacturing technology for high performance products and armor materials.

Item Name: Decision and Energy Reduction Tool

Request: \$4,500,000

Recipient: Ricardo, Inc.

Location: Van Buren Township, MI

Project Description: Fuel delivery to the battlefield and forward operating bases is a tremendous force protection, logistical and financial cost challenge. Reduction in fuel consumption is needed to prevent unnecessary exposure of personnel across the battlefield. In addition, vehicle systems must operate longer and farther on less energy, and provide the same or better performance with improved armor, new weapons, electronics, and communications systems installed which can demand more energy. This funding will help develop computer tools capable of near real time prediction of performance of various technologies when applied to the legacy and future vehicle fleets. The output from such a toolset would include a complete set of vehicle performance parameters for any set of compatible technologies based on the tool user's desires. Decision support tools would be incorporated to allow the user to make direct comparisons across a technological spectrum, and to analyze the behavior of the vehicle in its modeled operational environment. The results allow for an accurate and defensible definition of the energy and performance gains which will be achievable in next-generation vehicles and multi-model vehicle fleets.

Item Name: Titanium Aluminide Smart Armor

Request: \$2,900,000

Recipient: Solidica, Inc.

Location: Ann Arbor, MI

Project Description: A process called ultrasonic consolidation enables the production of laminates of dissimilar metals, such as titanium and aluminum, for many applications, including vehicle armor. When further processed at elevated temperature and pressure, a new, third material is formed, known as titanium aluminide. This material is much harder and stiffer than either the titanium or aluminum alone. The resulting material containing all three material constituents possesses superior properties for armor, particularly in multi-hit and blast applications. Conventional casting and welding techniques are not able to produce the same results. Because the material is composed of half aluminum, it is lighter and cheaper than titanium armor and can provide superior performance against blast effects.

Item Name: Amorphous Si Flexible Photovoltaics for Grid Parity

Request: \$8,000,000
Recipient: United Solar Ovonic
Location: Auburn Hills, MI

Project Description: The Department of Defense has established policy concerning the achievement of energy security goals through increased use of alternative energy, especially by deploying photovoltaics on its buildings. This project seeks to develop technologies necessary to lower the cost of roof top solar electric systems to reach grid parity. The proposal involves development of thin film deposition technology to reduce cost of solar panels, and innovative installation methods to integrate the solar laminates with the roof at a low cost. The goal is to generate solar electricity at a cost comparable to that obtained by burning of fossil fuels.

Item Name: Force Projection Technology
Request: \$8,000,000
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI

Project Description: This funding would be used by the U.S. Army Tank-Automotive Research, Development and Engineering Center to support merit-based awards for research, development and engineering support for Army fuels and lubricants, water purification and handling, military bridging, material handling, mechanical counter-mine and counter-improvised explosive device equipment. Increased investment would help meet Army requirements for the mobilization and support of military personnel and equipment in deployed locations.

Item Name: Ground System Power and Mobility
Request: \$12,000,000
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI

Project Description: This funding would be used by the U.S. Army Tank-Automotive Research, Development and Engineering Center to support merit-based awards for the development of technologies designed to increase fuel economy and improve mobility of military ground vehicles. Research topics would include high energy/high power batteries; ultracapacitors; hybrid power sources; and advanced engine technologies. The goal of this research is to enable the Army to acquire more efficient, mobile, and survivable ground vehicles.

Item Name: Ground System Survivability
Request: \$10,000,000
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI

Project Description: This funding would be used by the U.S. Army Tank-Automotive Research, Development and Engineering Center to support merit-based awards for the development and integration of technologies to help protect ground vehicles and troops from the range of threats they face in the combat environment. This would be accomplished through Army demonstrations, studies, models, and performance evaluations to improve the survivability of ground vehicles. These efforts support Army goals of acquiring ground vehicle platforms with more effective, affordable, and manufacturable protection.

Item Name: Unmanned Ground Vehicle Initiative

Request: \$12,000,000

Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center

Location: Warren, MI

Project Description: The Unmanned Ground Vehicle Initiative (UGVI) will continue to be executed by the ground vehicle experts at the U.S. Army Tank-Automotive Research, Development and Engineering Center in Warren, Michigan. This funding will be used for merit-based awards in integrating and demonstrating sensor technologies, perception hardware and software, and robotic control technologies that are required to enable unmanned ground vehicle systems to maneuver with minimal human intervention, for on and off road missions while at militarily significant speeds. Mature technologies are incorporated in UGV technology demonstrators, so that performance can be evaluated for multiple tactical and sustainment applications. Technical challenges addressed will include obstacle avoidance, perception limitations, intelligent situational behaviors, command and control, frequency of human intervention, and operations in adverse weather.

Item Name: Vehicle Electronics and Architecture

Request: \$12,000,000

Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center

Location: Warren, MI

Project Description: This funding would be used by the U.S. Army Tank-Automotive Research, Development and Engineering Center to support merit-based awards for the development of technologies, processes, and capabilities to improve Army ground vehicle systems development, integration, and life-cycle support. Specific research areas would include power, electronics, and software architecture; robotic vehicle control architecture; vehicle data networks; condition-based maintenance; and other related technologies. The resulting technologies could improve ground vehicle capabilities and reduce life-cycle costs.

Item Name: Sonic Infrared Imaging Technology Development

Request: \$2,000,000

Recipient: Wayne State University

Location: Detroit, MI

Project Description: Aging aircraft suffer from fatigue-induced cracks in both fuselage structures and engines, which, if not detected early enough, can propagate and result in catastrophic accidents. Sonic infrared imaging technology is a hybrid of ultrasonic and infrared imaging that is more efficient and reliable than current methods. Wayne State University in Detroit is developing sonic infrared imaging technology for military and commercial applications.

Item Name: Hybrid Electric Drive System Integration Simulation and Testing

Request: \$5,000,000

Recipient: Western Michigan University

Location: Kalamazoo, MI

Project Description: Advanced system integration technologies are of interest to the Army for the purpose of evaluating hybrid electric vehicle systems intended to improve the efficiency and mobility of military ground vehicles. This funding would support applied research to solve emerging engineering problems in dual-use hybrid electric drive system integration. Through

the development of a system level computer modeling platform and testing, factors such as the weight and the structural characteristics of the battery pack, motors and the protective armor will be considered.

Item Name: Tomahawk Cost Reduction Initiative

Request: \$7,600,000

Recipient: Williams International

Location: Walled Lake, MI

Project Description: The Tomahawk cruise missile has been used in every theater of operations since Desert Storm. Tomahawk remains one the United States most reliable precision weapons in our nation's inventory. Tomahawk currently costs the U.S. Navy approximately \$729,000 per missile, with the largest expense being the jet engine designed by Williams International in Walled Lake, Michigan. Requested funding would support non-recurring engineering and implementation requirements for efforts to conduct manufacturing system improvements, design manufacturing analysis and engine/missile interface improvements. Engineering and manufacturing analysis and tests are planned to improve and qualify manufacturing efficiencies on key components of the engine and improve the cost of manufacturing resulting in a positive return-on-investment.

United States Senate

WASHINGTON, DC 20510

April 23, 2010

The Honorable Daniel K. Inouye
Chairman
Committee on Appropriations
United States Senate
Washington, DC 20510

The Honorable Thad Cochran
Ranking Member
Committee on Appropriations
United States Senate
Washington, DC 20510

Dear Senator Inouye and Senator Cochran:

As the committee begins its consideration of the Fiscal Year 2011 Defense Appropriations Bill, we are writing to request continued support for a Department of Defense (DOD) manufacturing research and development initiative called the Industrial Base Innovation Fund. We believe this request will support the needs of our men and women in uniform while also strengthening the defense industrial base, creating and preserving manufacturing and engineering jobs, and enhancing our national economic competitiveness.

As you are well aware, advanced weapons systems are increasingly costly to develop, field, and sustain. A February 2006 report by the Defense Science Board (DSB) regarding the DOD's Manufacturing Technology Program points out that manufacturing technology plays a critical role in addressing development, acquisition, and sustainment problems associated with these programs.

In its report, the DSB recommended increased funding for the Manufacturing Technology Program over a 5-year period to a level of "one percent of the RDT&E budget," to align DOD with the level of manufacturing technology investments in the early 1980s. The Fiscal Year 2011 budget request for Manufacturing Technology programs in DOD represents only 0.25% of the requested RDT&E budget. The President's request for Manufacturing Technology programs across DOD for fiscal year 2011 is \$188 million, falling well short of the DSB goal, and also \$13 million below the fiscal year 2010 requested level.

We are requesting funding for a merit-based, competitive initiative to address the shortfall in DOD funding of manufacturing research and development. It is anticipated that this initiative will be part of the Senate Armed Services Committee-reported version of the Fiscal Year 2011 National Defense Authorization Act, as it has been in previous years.

We request \$30.0 million in Defense-wide Research, Development, Test & Evaluation (Line 245, PE#0708011S) to continue the Industrial Base Innovation Fund (IBIF) established and funded in previous defense authorization and appropriations acts. This effort supports the DOD's ability to address specific shortfalls in the defense industrial base to meet short-term surge manufacturing requirements. The surge production requirements of current operations have stressed the industrial base and lead to intolerable wait times for the delivery of some much needed materiel to the battlefield. This IBIF focuses on the development of advanced

manufacturing technologies that can reduce the time required to produce high demand items such as body and vehicle armor, Improvised Explosive Device (IED) jammers, and Mine Resistant, Ambush Protected (MRAP) vehicles during surges in military operations and to preserve or expand diminishing critical defense industrial base capabilities. The previous funding provided by your committee for this project is being executed by the Defense Logistics Agency in coordination with the Deputy Undersecretary of Defense for Industrial Policy, and has been invested in competitively awarded research on technologies to address critical surge production and defense manufacturing needs such as low cost titanium production, titanium and ceramic armor production, environmentally improved welding processes, optical lens manufacturing capability, and improved lithium battery production. Past IBIF investments have also established and increased the capacity of domestic sources for transparent armor material used on MRAPs and High Mobility Multipurpose Wheeled Vehicles (HMMWVs), optics for night vision equipment, and fiber optics for use on military helicopters.

We certify that neither we nor our immediate family have a pecuniary interest in any of the congressionally directed spending items that we have requested in the Fiscal Year 2011 Defense Appropriations bill and report, consistent with the requirements of paragraph 9 of Rule XLIV of the Standing Rules of the Senate.

Thank you for your consideration of these requests.

Sincerely,



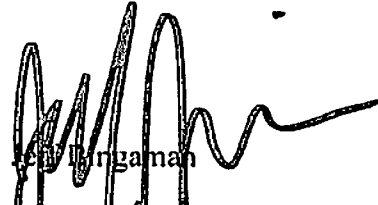
Christopher J. Dodd



Carl Levin



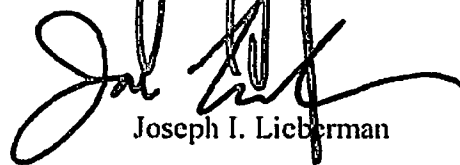
John F. Kerry



William H. Ingram



Olympia J. Snowe



Joseph I. Lieberman



Debbie Stabenow



Susan M. Collins

Bob Casey, Jr.

Robert P. Casey, Jr.

Jim Webb

Jim Webb

Roland W. Burris

Roland W. Burris

Mark Begich

Mark Begich

United States Senate

WASHINGTON, DC 20510

May 24, 2010

The Honorable Daniel K. Inouye
Chairman
Senate Committee on Appropriations
Capitol Building, S-128
Washington, D.C. 20510

The Honorable Thad Cochran
Ranking Member
Senate Committee on Appropriations
Capitol Building, S-128
Washington, D.C. 20510

Dear Chairman Inouye and Ranking Member Cochran:

We share your deep commitment to America's youth and nourishing their interest in critical skills such as math and science. As you know, one program that has proven to be particularly effective in this effort is the Department of Defense's STARBASE Program, of which you have been consistently supportive. STARBASE is a highly efficient and effective hands-on educational program run by our dedicated men and women in uniform. Given its record of success, we respectfully request the subcommittee consider a sufficient increase to the Fiscal Year 2011 Civil Military Program line in the Operations and Maintenance Defense Wide Account.

Currently, STARBASE operates at 60 locations in 34 states, the District of Columbia, and the territory of Puerto Rico. An increase to the president's budget request would ensure adequate funding for the existing 60 programs and allow for an expansion of the program that would reach approximately 100,000 students annually.

Managed by the Assistant Secretary of Defense for Reserve Affairs, STARBASE is an outreach program that strengthens the relationships between the military, communities, and school districts. In doing so, it also raises the interest of students who are traditionally underrepresented in science, technology, engineering, and mathematics (STEM) programs. STARBASE gives young people some meaningful contact with the military and introduces them to the technological foundations of national security. It also helps maintain a highly skilled U.S. defense, aerospace and homeland security workforce.

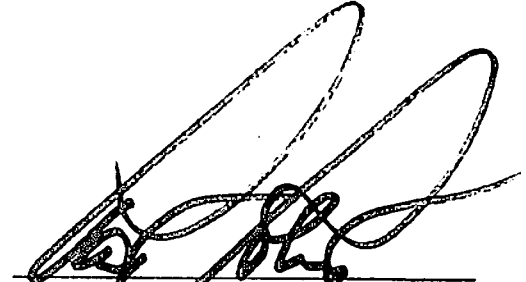
Since the program's inception, over 545,000 youth have participated and subsequently shown increased levels of interest in math and science. Many students have expressed a strong desire to pursue further education in STEM and help secure our nation's competitiveness.

We hope you will join us in fully supporting the DoD STARBASE Program. We greatly appreciate your past support and thank you in advance for your consideration this year.


Sincerely,



Mary L. Landrieu
United States Senator




Pat Roberts
United States Senator




Ron Wyden
United States Senator



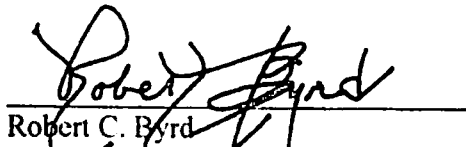
Patrick J. Leahy
United States Senator




Saxby Chambliss
United States Senator




Christopher "Kit" S. Bond
United States Senator




Robert C. Byrd
United States Senator



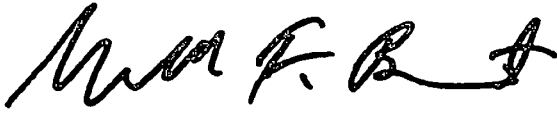
Carl Levin
United States Senator



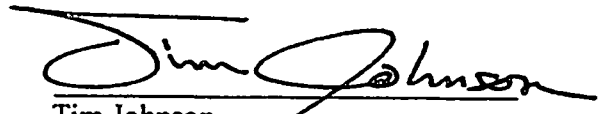
Susan M. Collins
United States Senator



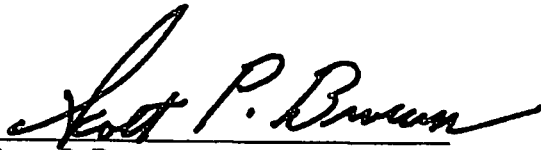
Johnny Isakson
United States Senator



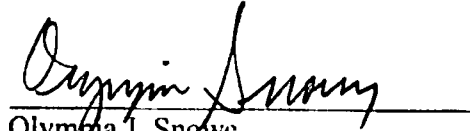
Michael F. Bennet
United States Senator



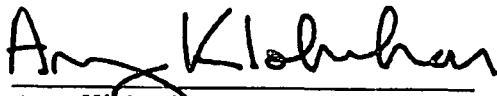
Tim Johnson
United States Senator



Scott P. Brown
United States Senator



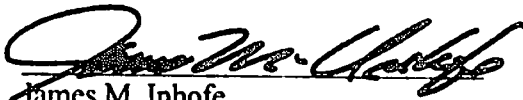
Olympia J. Snowe
United States Senator



Amy Klobuchar
United States Senator



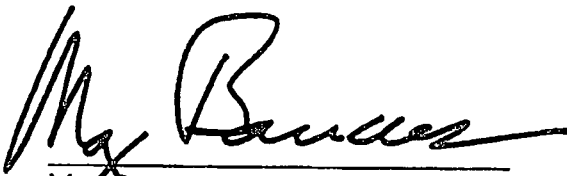
Debbie Stabenow
United States Senator



James M. Inhofe
United States Senator



Sam Brownback
United States Senator



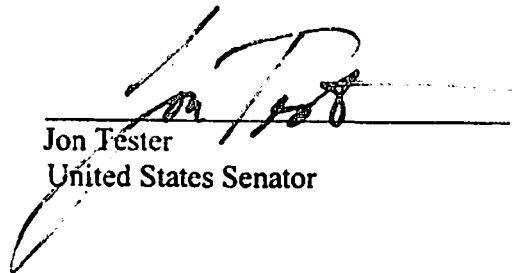
Max Baucus
United States Senator



Al Franken
United States Senator



Mike Johanns
United States Senator



Jon Tester
United States Senator

United States Senate

WASHINGTON, DC 20510-2202

November 19, 2011

The Honorable Daniel Inouye
Senate Appropriations Committee
Subcommittee on Defense, Chairman
Senate Dirksen Office Building, Room 119
Washington, DC 20510

The Honorable Thad Cochran
Senate Appropriations Committee
Subcommittee on Defense, Ranking Member
Senate Dirksen Office Building, Room 119
Washington, DC 20510

Dear Senator Inouye and Senator Cochran:

As work continues on the Fiscal Year 2011 Defense Appropriations bill, I would like to reiterate my support for the projects that were included at my request in the Subcommittee's mark of the bill. (Appendix A)

Additionally, I would like to express my support for a number of other projects which were included in the Subcommittee's mark. (Appendix B)

Finally, I would like to express my support for a number of projects which were included in the House Defense Appropriations Subcommittee-passed version of the Fiscal Year 2011 Defense Appropriations bill. (Appendix C)

I certify that neither I nor my immediate family has a pecuniary interest in any of the congressionally directed spending items that I have requested in the fiscal year 2011 Defense Appropriations bill and report, consistent with the requirements of paragraph 9 of Rule XLIV of the Standing Rules of the Senate. I further certify that I have posted a description of the items requested on my official website, along with the accompanying justification.

Should your staffs have any questions, please have them contact Michael Noblet of my staff at (202) 224-9206.

Sincerely,



Carl Levin

APPENDIX A

Item Name: Advanced Energy Storage Research
Request: \$2,000,000
Account: Research & Development, Army
Line: 2
PE: 0601102A
Recipient: Michigan State University
Location: East Lansing, MI

Project Description: Energy storage is a critical issue for the warfighter during all aspects of their training and deployment cycles. This funding would continue basic research to advance the fundamental understanding of atomic and molecular level processes that govern the operation, performance, and failure mechanisms on existing energy storage systems and to develop materials, methods and devices to store energy and to manage energy distribution in applications ranging from personal, to vehicular and to installation levels in collaboration with government and industry. This research is primarily focused on: 1) the fundamental understanding of the operation and performance of existing and future batteries and ultracapacitors at the atomic and molecular level; 2) development of advanced nanostructured and multifunctional materials to increase performance, durability and reliability of batteries and ultracapacitors; and 3) development of systems level control and operation, with a focus on batteries and supercapacitors at a range of levels from personal to vehicular to installation levels.

Item Name: Magnesium Armor Manufacturing for Ground Vehicles
Request: \$2,000,000
Account: Research & Development, Army
Line: 5
PE: 0602105A
Recipient: REL, Inc.
Location: Calumet, MI

Project Description: This project seeks to increase the survivability of military ground vehicles as well as create a new processing technology designed to advance manufacturing in the United States. For a number of years, the Army invested in the design and potential application of metal matrix composites for armor and structural-armor applications. Such composites can exhibit hardness and stiffness comparable to steel but at much lower density. However, because of its extraordinary hardness and wear resistance abilities, such composites are extremely difficult and expensive to machine for finishing. This project would utilize squeeze casting technology for the manufacturing of magnesium armor composite materials. There are numerous structural and ballistic components in Army systems that could potentially benefit from the availability of a low cost manufacturing technology for high performance products and armor materials.

Item Name: Advanced Materials Research for Alternative Energy and Transportation
Request: \$1,000,000
Account: Research & Development, Army
Line: 13

PE: 0602601A
Recipient: Central Michigan University
Location: Mount Pleasant, MI

Project Description: This project is intended to provide the basis for new applied technologies that can be adopted by the Army and the commercial sector to provide a multifaceted solution to the nation's needs for sustainable domestic energy generation and storage. For example, current research at Central Michigan University (CMU) is focused on the use of nanotechnology to the design of novel energy storage systems. In addition, the use of polymer foams, commonly called ferroelectrets, to convert mechanical vibrations into electrical energy is also being studied. CMU scientists are also developing sophisticated computational tools to model complex catalytic reactions involved in a range of energy-related processes including: the efficient conversion of chemical into electrical energy, the improvement of existing catalysts for hydrocarbon combustion, the creation of more efficient gas separation technologies, and the development of reliable gas sensors.

Item Name: Hybrid Electric Vehicle Reliability Research
Request: \$3,000,000
Account: Research & Development, Army
Line: 13
PE: 0602601A
Recipient: Western Michigan University
Location: Kalamazoo, MI

Project Description: Advanced system integration technologies are of interest to the Army for the purpose of evaluating hybrid electric vehicle systems intended to improve the efficiency and mobility of military ground vehicles. This funding would support applied research to solve emerging engineering problems in dual-use hybrid electric drive system integration. Through the development of a system level computer modeling platform and testing, factors such as the weight and the structural characteristics of the battery pack, motors and the protective armor will be considered.

Item Name: Unmanned Ground Vehicle Initiative
Request: \$10,000,000
Account: Research & Development, Army
Line: 13
PE: 0602601A
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI

Project Description: The Unmanned Ground Vehicle Initiative (UGVI) will continue to be executed by the ground vehicle experts at the U.S. Army Tank-Automotive Research, Development and Engineering Center in Warren, Michigan. This funding will be used for merit-based awards in integrating and demonstrating sensor technologies, perception hardware and software, and robotic control technologies that are required to enable unmanned ground vehicle systems to maneuver with minimal human intervention, for on and off road missions while at militarily significant speeds. Mature technologies are incorporated in UGV technology

demonstrators, so that performance can be evaluated for multiple tactical and sustainment applications. Technical challenges addressed will include obstacle avoidance, perception limitations, intelligent situational behaviors, command and control, frequency of human intervention, and operations in adverse weather.

Item Name: Silicon Carbide Devices for Power Systems

Request: \$2,000,000

Account: Research & Development, Army

Line: 18

PE: 0602705A

Recipient: Dow Corning Corporation

Location: Midland, MI

Project Description: Advanced power electronics is highlighted in the Army's Mobile Electric Power Master Plan for integration into advanced generators by incorporating results from the Army Research Lab silicon carbide (SiC) power electronics development program. By manufacturing and integrating state-of-the-art SiC power modules into generator units, the Army could reduce the weight of the power electronic inverter systems by approximately 50 percent while simultaneously enabling two times reduction in electrical conversion losses compared to legacy power systems technology, thus significantly contributing to overall Army fuel saving goals. The objectives of this program include: 1.) Leveraging state of the art SiC technology to rapidly develop and deliver commercial product based on 150 mm epiwafers, enabling broad acceptance of SiC devices through the significant cost reduction associated with wafer area scaling; 2.) developing capability at 100 and 150 mm diameter technology for thick (c.a. 100 um) SiC epitaxy to enable low cost device fabrication for high voltage applications in power systems; and 3.) fabricate SiC devices for insertion in Army power systems development programs.

Item Name: Advanced Thermal Management Systems

Request: \$2,000,000

Account: Research & Development, Army

Line: 33

PE: 0603005A

Recipient: Engineered Machined Products Incorporated

Location: Escanaba, MI

Project Description: This funding will continue research efforts by the Army into advanced thermal management technology for combat vehicles. The Army's increased operation tempo has placed greater demand on the engines in its tracked and wheeled vehicle fleets. Advanced thermal management technologies have helped the Army combat the challenges associated with overheating engine blocks, among other things. Continuing this research will enable the Army to leverage private sector technological advancements as the Army continues to push the limits of the ground combat and tactical fleets. Engineered Machined Products Incorporated of Escanaba, Michigan has been working with the Army on this project for several years.

Item Name: Force Projection Technology Development
Request: \$4,000,000
Account: Research & Development, Army
Line: 33
PE: 0603005A
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI

Project Description: This funding would be used by the U.S. Army Tank-Automotive Research, Development and Engineering Center to support merit-based awards for research, development and engineering support for Army fuels and lubricants, water purification and handling, military bridging, material handling, mechanical counter-mine and counter-improvised explosive device equipment. Increased investment would help meet Army requirements for the mobilization and support of military personnel and equipment in deployed locations.

Item Name: Ground System Power and Mobility Enhancement
Request: \$10,000,000
Account: Research & Development, Army
Line: 33
PE: 0603005A
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI

Project Description: This funding would be used by the U.S. Army Tank-Automotive Research, Development and Engineering Center to support merit-based awards for the development of technologies designed to increase fuel economy and improve mobility of military ground vehicles. Research topics would include high energy/high power batteries; ultracapacitors; hybrid power sources; and advanced engine technologies. The goal of this research is to enable the Army to acquire more efficient, mobile, and survivable ground vehicles.

Item Name: Hydraulic Hybrid Vehicles for the Tactical Wheeled Fleet
Request: \$2,700,000
Account: Research & Development, Army
Line: 33
PE: 0603005A
Recipient: Bosch Rexroth
Location: Rochester Hills, MI

Project Description: Bosch Rexroth Corporation has been working with the Army for several years on the development of an advanced hydraulic hybrid technology for military ground vehicles. The heart of this hydraulic hybrid system is a new line of advanced, highly efficient, hydraulic pump and motor products which will replace the conventional automatic transmission and significantly improve overall vehicle drivetrain efficiency in vehicles. This technology could improve fuel economy by up to 60 percent as compared to conventional drivetrain configuration, reduce the required logistics support footprint for vehicles, reduce maintenance and replacement costs of brakes, and improve acceleration.

Item Name: Improved Ground System Survivability
Request: \$5,000,000
Account: Research & Development, Army
Line: 33
PE: 0603005A
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI

Project Description: This funding would be used by the U.S. Army Tank-Automotive Research, Development and Engineering Center to support merit-based awards for the development and integration of technologies to help protect ground vehicles and troops from the range of threats they face in the combat environment. This would be accomplished through Army demonstrations, studies, models, and performance evaluations to improve the survivability of ground vehicles. These efforts support Army goals of acquiring ground vehicle platforms with more effective, affordable, and manufacturable protection.

Item Name: Plug-In Hybrid Electric Vehicle Program
Request: \$3,000,000
Account: Research & Development, Army
Line: 33
PE: 0603005A
Contractor: NextEnergy Center
Location: Detroit, MI

Project Description: This project is designed to develop and test advanced plug-in hybrid vehicle technologies that can effectively produce high quality electric power for installations and forward operating buses. Under this cooperative program with the Army's National Automotive Center, the NextEnergy Center will develop and deploy Smart Plug-In Hybrid Vehicle (PHEV) technology that provides new capability to manage power distribution and reduce Department of Defense fuel consumption using conventional generation, renewable generation, and vehicles with exportable electric power. A smart PHEV will supplement electrical power generation and reduce emissions by the vehicle fleet.

Item Name: Threat Cue Research
Request: \$2,000,000
Account: Research & Development, Army
Line: 33
PE: 0603005A
Recipient: Michigan Technological University
Location: Houghton, MI

Project Description: The Army has launched the development of vehicle borne sensor systems to serve as the basis of active protection systems. These systems can take the form of RADAR, electro-optical/infrared radar imagers, acoustics, etc. Electro-optic technology has been used for threat cuing. However, threats typically deploy in shadows. In addition, the dynamic range between bright sunlight areas and shadow are so great that visual and normal camera modalities do not have the dynamic range to pick up these threats. High dynamic range photography

developed in the movie industry can be applied to this problem to great advantage. In addition RADAR technology can defeat deployments using obscuration (e.g. curtains, bushes) which is extremely difficult to overcome with solely Electro-optic technology. This project seeks to develop a joint high dynamic range photography and high range resolution RADAR system for mobile platforms to provide pre-discharge threat warning in urban and mountain environments.

Item Name: Vehicle Electronics and Architecture Development
Request: \$5,000,000
Account: Research & Development, Army
Line: 33
PE: 0603005A
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI

Project Description: This funding would be used by the U.S. Army Tank-Automotive Research, Development and Engineering Center to support merit-based awards for the development of technologies, processes, and capabilities to improve Army ground vehicle systems development, integration, and life-cycle support. Specific research areas would include power, electronics, and software architecture; robotic vehicle control architecture; vehicle data networks; condition-based maintenance; and other related technologies. The resulting technologies could improve ground vehicle capabilities and reduce life-cycle costs.

Item Name: Photovoltaic Technology Development
Request: \$5,000,000
Account: Research & Development, Army
Line: 50
PE: 0603734A
Recipient: United Solar Ovonic
Location: Auburn Hills, MI

Project Description: The Department of Defense has established policy concerning the achievement of energy security goals through increased use of alternative energy, especially by deploying photovoltaics on its buildings. This project seeks to develop technologies necessary to lower the cost of roof top solar electric systems to reach grid parity. The proposal involves development of thin film deposition technology to reduce cost of solar panels, and innovative installation methods to integrate the solar laminates with the roof at a low cost. The goal is to generate solar electricity at a cost comparable to that obtained by burning of fossil fuels.

Item Name: Mobile Repair Capability
Request: \$3,000,000
Account: Research & Development, Navy
Line: 16
PE: 0603123N
Recipient: Focus: HOPE
Location: Detroit, MI

Project Description: This project would develop a mobile laser deposition work cell for

deployment aboard ships and to remote areas to conduct on-demand repair of parts required for naval platforms. The work cell would be housed in a standard ISO container and will incorporate a variety of laser deposition, welding, milling, grinding, and measurement technologies to allow for precision repair of parts in deployed locations. Such a capability could reduce repair time and costs for high-demand parts. Focus: HOPE in Detroit, MI has been working with the Naval Undersea Warfare Center in Keyport, Washington on related projects for several years.

Item Name: Decision and Energy Reduction Tool

Request: \$2,000,000

Account: Research & Development, Navy

Line: 52

PE: 0603635M

Recipient: Ricardo, Inc.

Location: Van Buren Township, MI

Project Description: Fuel delivery to the battlefield and forward operating bases is a tremendous force protection, logistical and financial cost challenge. Reduction in fuel consumption is needed to prevent unnecessary exposure of personnel across the battlefield. In addition, vehicle systems must operate longer and farther on less energy, and provide the same or better performance with improved armor, new weapons, electronics, and communications systems installed which can demand more energy. This funding will help develop computer tools capable of near real time prediction of performance of various technologies when applied to the legacy and future vehicle fleets. The output from such a toolset would include a complete set of vehicle performance parameters for any set of compatible technologies based on the tool user's desires. Decision support tools would be incorporated to allow the user to make direct comparisons across a technological spectrum, and to analyze the behavior of the vehicle in its modeled operational environment. The results allow for an accurate and defensible definition of the energy and performance gains which will be achievable in next-generation vehicles and multi-model vehicle fleets.

Item Name: Tomahawk Cost Reduction Initiative

Request: \$3,800,000

Account: Research & Development, Navy

Line: 170

PE: 0204229N

Recipient: Williams International

Location: Walled Lake, MI

Project Description: The Tomahawk cruise missile has been used in every theater of operations since Desert Storm. Tomahawk remains one the United States most reliable precision weapons in our nation's inventory. Tomahawk currently costs the U.S. Navy approximately \$729,000 per missile, with the largest expense being the jet engine designed by Williams International in Walled Lake, Michigan. Requested funding would support non-recurring engineering and implementation requirements for efforts to conduct manufacturing system improvements, design manufacturing analysis and engine/missile interface improvements. Engineering and

manufacturing analysis and tests are planned to improve and qualify manufacturing efficiencies on key components of the engine and improve the cost of manufacturing resulting in a positive return-on-investment.

Item Name: Biofuels Program
Request: \$2,000,000
Account: Research & Development, Defense Wide
Line: 44
PE: 0603712S
Recipient: Defense Logistics Agency
Location: Fort Belvoir, VA

Project Description: This funding would continue this merit-based program carried out by the Defense Logistics Agency (DLA) to develop biofuels and associated technologies that could have benefits for the Department of Defense (DoD). Interest in biofuels is driven by high oil prices, environmental concerns, as well as national security concerns. Aggressive efforts are required to develop advanced biofuels such as cellulosic ethanol and butanol, high yield biodiesel, and wood-derived bio-oil, all of which have significant potential to be utilized by DoD. This program focuses on the following goals – improving the technology and equipment for cellulosic biomass pretreatment, developing enzymes optimized to produce sugars from the pretreated biomass and microorganisms, investigating genetic modification of bio-based fuel crops with the goal of maximizing fuel yield, and assessing the utility of various bio-based fuels for electricity production.

Item Name: Industrial Base Innovation Fund
Request: \$30,000,000
Account: Research & Development, Defense Wide
Line: 245
PE: 0708011S
Recipient: Defense Logistics Agency
Location: Fort Belvoir, VA

Project Description: This funding would continue the Industrial Base Innovation Fund (IBIF) to support the DoD's ability to address specific shortfalls in the defense industrial base to meet short term surge manufacturing requirements. Previous funding has been used for investments in competitively awarded research on technologies to address critical surge production and defense manufacturing needs such as low cost titanium production, titanium and ceramic armor production, environmentally improved welding processes, optical lens manufacturing capability, and improved lithium battery production. Past IBIF investments have established and increased the capacity for domestic sources for transparent armor material used on MRAPs and HMMWVs, optics for night vision equipment, and fiber optics for use on military helicopters.

Item Name: STARBASE
Request: \$10,000,000
Account: Operation and Maintenance, Defense Wide
Line: Civil Military Programs

Project Description: The Department of Defense STARBASE Program is an effective science, technology, engineering, and mathematics education outreach initiative that has reached more than 545,000 youths at 60 locations in 34 States operated by either active, Guard, or Reserve commands. The STARBASE Program has been a productive investment in the future of our youth and will help build and enlarge the talent pool of potential workers needed to support the Department of Defense workforce.

APPENDIX B

Item Name: MRAP Armored Vehicle Precision Engineering and Manufacturing Advancement
Request: \$2,000,000
Account: Research & Development, Army
Line: 3
PE: 0601103A
Recipient: Precision Engineering and Manufacturing Alliance
Location: Ann Arbor, MI

Project Description: Funding for this project would be used to develop and configure high-definition metrology, defect detection, and completeness-of-assembly technology research and development results needed for improved engineering and manufacturing process control for MRAP and related U.S. Army and Marine armored vehicles; thereby, promoting and improving the reliability, service life, performance, and manufacturing cost efficiency of these essential vehicles as deployed to U.S. combat troops.

Item Name: Intelligent Orthopedic Fracture Implant System
Request: \$1,500,000
Account: Research & Development, Army
Line: 30
PE: 0603002A
Recipient: Mott Community College
Location: Flint, MI

Project Description: Funds will be used for new technological developments in materials science, microelectronics, micro-fabrication, and drug delivery through nano-encapsulation and controlled release to develop an intelligent orthopedic fracture implant system that promotes more complete healing, reduces rehabilitation time, and improves the long-term quality of life for injured personnel.

Item Name: Hydrocarbon Fueled Solid Oxide Fuel Cell Manufacturability
Request: \$2,000,000
Account: Research & Development, Army
Line: 33
PE: 0603005A
Recipient: Adaptive Materials
Location: Ann Arbor, MI

Project Description: The United States Army and Marine Corps operate man-portable and man-transportable robotic systems to keep the warfighter out of harm's way during "dirty, dull, and dangerous missions." Due to their small size these vehicles typically operate off batteries. These batteries, however have limited duration and therefore severely limit the capabilities. The addition of a fuel cell to the robotic platform would greatly increase the on-board available power and also greatly lengthen the time that power is available. Fuel cells come in many different varieties, but a solid oxide fuel cell system running on propane would enable logistical elements to source the fuel globally from many different suppliers similar to how JP-8 is

sourced. This project would continue the development of such a fuel cell and the associated manufacturing process for ground robotics applications.

Item Name: Metals Affordability Initiative
Request: \$10,000,000
Account: Research & Development, Air Force
Line: 15
PE: 0603112F
Recipient: Metals Affordability Initiative
Location: N/A

Project Description: The Metals Affordability Initiative (MAI) is a government-industry cooperative program established in 1999 focused on reducing lifecycle costs through technology innovation in the U.S. specialty aerospace metals industry. MAI currently includes 19 companies which are partnered with the Air Force Research Lab. Participation in MAI-funded projects requires a minimum 25 percent industry cost share, increasing the Air Force's return on investment.

Item Name: Next Generation Casting Initiative
Request: \$2,000,000
Account: Research & Development, Air Force
Line: 27
PE: 0603680F
Recipient: Alcoa Howmet
Location: Whitehall, MI

Project Description: This project will support the development of innovative, cost-effective manufacturing technologies for use by the aerospace casting industry for critical defense programs. Under the proposed project, industry and government partners team will conduct research, development, design, and engineering support on pre-competitive issues including core quality, inspection methodology, and modeling/simulation to increase yield, allow increased component complexity, and improve basic casting practices for application to key aerospace platforms. The proposed effort will provide the Department of Defense and industry with an integrated approach to improve casting component performance, maximize producibility, and enhance affordability.

APPENDIX C

Item Name: Multi-Disciplinary Center for Diagnosis and Treatment of Breast Cancer
Request: \$4,000,000
Account: Research & Development, Army
Line: 3
PE: 0601103A
Recipient: Wayne State University
Location: Detroit, MI

Project Description: This project would help to translate landmark technologies from the engineering laboratory to the patient bedside, in conjunction with a cancer management continuum that begins with screening and diagnosis, transitions to better treatment guidance, and then monitors therapy outcomes at the local breast and full-body levels (systemic responses). Combining such a system with systemic immune monitoring would have a profound impact on the diagnosis and management of breast cancer.

Item Name: Nano-Bio-Hybrid Solar and Light Scavenging
Request: \$2,000,000
Account: Research & Development, Army
Line: 5
PE: 0602105A
Recipient: Michigan Technological University
Location: Houghton, MI

Project Description: Interior lighting contains energy that could be locally scavenged for energy supplies. This funding would support nanotechnology research and development to reduce the battery payload for military use and reduce dependency on petroleum fuels for generators. In the future, soldiers will be equipped with a wide-array of new technologies requiring electrical power for operation. Using nano-bio-hybrid materials in light-harvesting electrical systems could provide increased power-to-weight ratio, reduced cost and logistics overhead.

Item Name: Enhanced Visual Fidelity Simulation
Request: \$2,500,000
Account: Research & Development, Army
Line: 13
PE: 0602601A
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI

Project Description: TARDEC provides modeling, analysis and testing services to a variety of DoD organizations and contractors involved in vehicle system development, production and support. This request would improve TARDEC's existing motion-based simulators that seek to accurately reproduce motions experienced in vehicle proving ground tests or field operations. Specifically, it would add data sensors and new/upgraded software and a combat vehicle cab with a re-configurable menu-driven crew station to TARDEC's existing simulators that would be

able to better model battlefield scenarios and improve how the simulators interface with soldiers so it better measures soldiers' performance. The upgrade would include cognitive measuring equipment to include bio-sensing and eye tracking at multiple soldier locations. The benefits of the project include improved data that results from more realistic simulations; cognitive engineered crew stations that match soldier capabilities in non-linear battlefield conditions; and crew stations that meet full spectrum operations.

Item Name: University of Detroit Mercy Advanced Robotics Research and Education
Request: \$500,000
Account: Research & Development, Army
Line: 13
PE: 0602601A
Recipient: University of Detroit Mercy
Location: Detroit, MI

Project Description: The purpose of this project is to provide integral advanced robotics research to the Department of Defense, specifically the Tank Automotive Research, Development and Engineering Center, and provide a steady supply of specialized engineering talent for the defense and industrial robotics community in Michigan. The proposed research is directly relevant to the Joint Capability Areas identified in the Department of Defense "Unmanned Systems Integrated Roadmap 2009-2034", including the Battle Space Awareness, Command and Control, and Net Centric areas.

Item Name: Cancer Vaccine and Immunotherapy Project
Request: \$4,500,000
Account: Research & Development, Army
Line: 28
PE: 0602787A
Recipient: Karmanos Cancer Institute
Location: Detroit, MI

Project Description: The Cancer Vaccine and Immunotherapy Project would develop novel immune agents that combat cancer by mobilizing the patient's own immune system. This is based on research and clinical trials underway at Karmanos Cancer Institute and will develop a cancer vaccine to "kill" cancer cells that standard therapies leave behind.

Item Name: Center for Genetic Origins of Cancer
Request: \$2,500,000
Account: Research & Development, Army
Line: 30
PE: 0603002A
Recipient: University of Michigan
Location: Ann Arbor, MI

Project Description: This funding would accelerate research into the genetic origins of cancer, which could have a significant impact on the development of breakthrough diagnostic approaches and result in more effective and less toxic cancer treatments. The University of

Michigan Comprehensive Cancer Center is a nationally recognized leader in research on the genetic origins of cancer, with seminal contributions in defining cancer stem cells, describing genetic changes in cancer and creating novel molecular therapeutic and diagnostic tools.

Item Name: Henry Ford Health System Physician Executable Guidelines Systems

Request: \$2,000,000

Account: Research & Development, Army

Line: 30

PE: 0603002A

Recipient: Henry Ford Health System

Location: Detroit, MI

Project Description: This program would allow for the integration of clinical practice guidelines into any medical record without the need to program or reprogram software.

Item Name: Accelerated Advanced Manufacturing Open Innovation Network for Transportation

Request: \$5,000,000

Account: Research & Development, Army

Line: 33

PE: 0603005A

Recipient: AutoHarvest Foundation

Location: Ann Arbor, MI

Project Description: This project would operate an open innovation network focused on advanced manufacturing and automotive technology to invigorate the automotive industry and accelerate the infusion of advanced technology into the Department of Defense's ground and air warfare vehicles to enhance national security.

Item Name: Autonomous Connected Vehicle Proving Center

Request: \$2,000,000

Account: Research & Development, Army

Line: 33

PE: 0603005A

Recipient: Henry Ford Community College

Location: Dearborn, MI

Project Description: The goals of this initiative are to identify opportunities, create networks, and promote synergies between industry, government, and academia to accelerate development, production, and technology transition of autonomous/connected vehicles and robotics technology-based scientific capabilities. For the military, connected autonomous vehicles and systems can provide greater force effectiveness and efficiency while reducing unnecessary risk to troops. Connectivity enabled autonomous technologies would revolutionize military logistics both in efficiency and resiliency, and provide outstanding force effectiveness capability. For example, autonomous vehicles performing route clearance and reconnaissance missions and robotic "wingmen" integrated as members of each squad reduce unnecessary risks and provide tremendous force multiplication capabilities.

Item Name: Flammability, Smoke, Toxicity Standards for Military Ground Vehicles to Improve Health for the Troops

Request: \$4,800,000

Account: Research & Development, Army

Line: 33

PE: 0603005A

Recipient: Lawrence Technological University

Location: Southfield, MI

Project Description: Under this project, Lawrence Technological University's Center for Innovative Materials (CIMR) would work with the U.S. Army Tank Automotive Research Development and Engineering Center (TARDEC) and the Army Research Laboratory to provide assessment, testing and evaluation of materials, vehicle components, vehicle sections, and entire vehicles to determine acceptable flammability, smoke and toxicity (FST) standards aimed at improving health and safety in Army vehicles and increasing survivability for troops. The Army does not currently have a FST standard for military ground vehicles. The development of such a standard will be essential to lower the risk in the integration and application of any new material to enhance combat survivability and performance. CIMR has the testing facilities and capabilities to conduct the necessary FST tests and help the Army develop the standards. Testing would be performed under different environmental conditions as certain conditions may exacerbate problems in the FST arena.

Item Name: Wayne State University Sonic IR Imaging Technology Development

Request: \$1,000,000

Account: Research & Development, Air Force

Line: 18

PE: 0603112F

Recipient: Wayne State University

Location: Detroit, MI

Project Description: Aging aircraft suffer from fatigue-induced cracks in both fuselage structures and engines, which, if not detected early enough, can propagate and result in catastrophic accidents. Sonic infrared imaging technology is a hybrid of ultrasonic and infrared imaging that is more efficient and reliable than current methods. Wayne State University in Detroit is developing sonic infrared imaging technology for military and commercial applications.

Item Name: Chemical and Biological Agent Fate Appropriate Response Operational Tool

Request: \$3,000,000

Account: Research & Development, Defense Wide

Line: 14

PE: 0602384BP

Recipient: Kettering University

Location: Flint, MI

Project Description: Proper planning, resource management, response, and consequence management for scenarios involving the use of chemical warfare agents, toxic industrial

chemicals, and toxic industrial materials depends on the knowledge of the magnitude of the hazardous situation and the effect of the chemicals on exposed military personnel as well as civilian personnel. This project will utilize models developed in the DoD Chemical Agent Fate Program to help provide decision makers with the knowledge necessary to make effective plans and carry out the critical response to provide force protection and save lives. This tool will also apply to Homeland Security scenarios and is directly applicable for use in decision making involving the general population as well as our military forces. This effort will take a spiral development approach, beginning with construction of a prototype system based on current capabilities of the models and data from the Agent Fate Program, enabled through the expertise and facilities of Kettering University. Subsequent enhancements of the initial capability will continue to leverage on-going research and maintain a state-of-the-art response tool.

Item Name: Joint Threat Emitter
Request: \$1,000,000
Account: Other Procurement, Air Force
Line: 29
PE: N/A
Recipient: Alpena Combat Readiness Training Center
Location: Alpena, MI

Project Description: The Joint Threat Emitter (JTE) System simulates electronic combat signals and is designed to provide realistic electronic warfare training for pilots and aircrew members. The JTE will replace several older, harder-to-sustain threat emitters, and is specifically designed to allow for spiral upgrades to ensure future threats are quickly integrated into the system. Threat Emitters have proven to be a tremendously effective training tool, and the JTE will further prepare our pilots for the threats that face them.

Item Name: Distance Learning Education for U.S. Navy Personnel
Request: \$1,126,000
Account: Operation and Maintenance, Navy
Line: Professional Development Education
PE: N/A
Recipient: Sienna Heights University
Location: Adrian, MI

Project Description: This project would provide educational opportunities to U.S. Navy personnel serving throughout the United States and around the world. The completion of degree programs, especially in the applied sciences, will also enhance the likelihood that returning Navy personnel will be able to secure civilian employment upon returning home following their service to our country.