Fiscal Year 2010 Department of Defense Authorization and Appropriations Requests
Senator Carl Levin
(Alphabetical Order by Recommended Recipient)

Item Name: **Advanced Lithium Iron Phosphate Battery System**
Request: $3,000,000
Recipient: A123 Systems
Location: Ann Arbor, MI
Project Description: *Advanced Lithium Iron Phosphate Battery System* – This funding would continue development of cells and battery packs for hybrid HMMWVs and other tactical vehicle platforms. The project will use nanophosphate electrode technology originally developed under Small Business Innovative Research funding. This project will develop a platform for lithium-ion battery packs for Army vehicles, addressing issues of higher power and energy for vehicle requirements including silent watch, silent mobility, exportable power, longer battery life, high and low temperature operation, improved safety and reduced fuel consumption. The focus of the effort will be to optimize recently developed large format cells for military application and to integrate these cells into rugged packs to be delivered for field testing. The proposed lithium-ion cells offer superior performance retention at high temperatures compared to alternative battery technologies, which is critical to limiting thermal management burden in military vehicles. The proposed nanophosphate cells also offer superior safety characteristics with regard to thermal abuse and crush or penetration.

Item Name: **Fuel Cell Unmanned Robotic System**
Request: $6,000,000
Recipient: Adaptive Materials
Location: Ann Arbor, MI
Project Description: *Fuel Cell Unmanned Robotic System* - The United States Army and Marines 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.

Item Name: **Electric Drive Advanced Tactical Wheeled Armored Vehicle System**
Request: $8,200,000
Recipient: Advanced Defense Vehicle Systems
Location: Lake Orion, MI
Project Description: *Electric Drive Advanced Tactical Wheeled Armored Vehicle System* - The Department of Defense has requirements for a more fuel-efficient vehicle fleet. There is a growing need for electric drive systems, which are desirable because of their silent operation, 100 percent torque availability at any speed, and the ability to readily provide exportable power in the field, in all theaters of operation. This project is focused on the development of an electric drive system for a tactical wheeled vehicle. This technology has the potential to substantially increase the range of a vehicle, as well as provide for silent electric operations when required. Additionally, electric drive

technology provides for substantially increased horsepower and torque transmitted to the wheels at a much reduced weight when compared to conventional mechanical automotive systems.

Item Name: **Next Generation Casting Initiative**
Request: $5,000,000
Recipient: Alcoa Howmet
Location: Whitehall, MI
Project Description: *Next Generation Casting Initiative* – 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.

Item Name: **Dynamometer Facility Upgrade**
Request: $4,500,000
Recipient: AVL North America
Location: Plymouth, MI
Project Description: *Dynamometer Facility Upgrade* – This funding would continue a dynamometer facility upgrade for the U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC). The current TARDEC dynamometer facility is outdated and does not meet the increasing and varied testing requirements of the Army. This upgrade will provide the Army with the ability to evaluate the range of current, interim, and future conventional and hybrid electric power trains and their components. Additionally, this improved dynamometer facility will contribute to a shortened development cycle for new vehicles by allowing for the modeling and evaluation of multiple proposed design solutions in different theoretical battlefield conditions without the necessity to build numerous prototype vehicles.

Item Name: **USSOCOM M53 Individual Protective Mask**
Request: $4,000,000
Recipient: Avon Protection Systems
Location: Cadillac, MI
Project Description: *USSOCOM M53 Individual Protective Mask* – The U.S. Special Operations Command (USSOCOM) has a validated requirement of 14,601 M53 Individual Protective Masks for defense against chemical and biological weapons. However, only 10,156 masks have been procured to this point, leaving a shortage of 4,445 masks. These masks replace the less effective legacy models and offer improved comfort for extended wear times, internal communications capability, and improved weapons sighting.

Item Name: **Hydraulic Hybrid Vehicles for the Tactical Wheeled Fleet**
Request: $3,500,000
Recipient: Bosch Rexroth
Location: Rochester Hills, MI

Project Description: *Hydraulic Hybrid Vehicles for the Tactical Wheeled Fleet* - 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: $4,000,000
Recipient: Calumet Electronics Corporation
Location: Calumet, MI
Project Description: *Highly Integrated Optical Interconnect for Military Avionics* – 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 JSF. It is also anticipated that this technology could be transitioned to other Navy surface and sub-surface platforms in the future. Dow Corning Corporation of Midland, Michigan is a global leader in silicon-based optical interconnection technology and 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: *Advanced Materials Research for Alternative Energy and Transportation* - 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: *Biofuels Program* – 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 form 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: *Vehicle Fuel Cell and Hydrogen Logistics Program* – 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: **Silicon Carbide Electronics for Ground Vehicles**
Request: $4,500,000
Recipient: Dow Corning Corporation
Location: Midland, MI
Project Description: *Silicon Carbide Electronics for Ground Vehicles* - Hybrid electric vehicles are likely to become a central element for future tactical ground forces. The U.S. Army also expects hybrid-electric powered vehicles to help the service attain reduced fuel consumption goals in the near term. Silicon Carbide (SiC)-based power semiconductors have been identified as an enabling technology that meets the Army's need for hybrid electric vehicle power distribution and management. Under this project, Dow Corning will coordinate a device fabrication team to develop an integrated solutions platform to address and eliminate process challenges including SiC materials costs, device fabrication issues, and packaging of high-power, high-temperature components.

Item Name: **Decontamination of B. Anthracis and C. Difficile Spores**
Request: $2,500,000
Contractor: Eastern Michigan University
Address: Ypsilanti, MI
Project Description: *Decontamination of B. Anthracis and C. Difficile Spores* – This project will investigate new decontamination treatments utilizing chemicals that are lethal to Gram positive bacteria, including anthrax. The decontamination treatments to be investigated are benign to physical property and contaminated surfaces. This research seeks to not only provide military and civilian authorities with easier to use and less damaging decontamination methods, but could result in new paints and coatings for a variety of applications, including protective overcoats.

Item Name: **Next Generation Superchargers for Military Engines**
Request: $4,000,000
Recipient: Eaton Automotive
Location: Marshall, MI
Project Description: *Next Generation Superchargers for Military Engines* - Military vehicle power and acceleration have suffered greatly as vehicle weight has increased. Larger engines could increase vehicle power; however, underhood space is limited. Therefore, a retrofitable solution is required that will fit within the tight space constraints. To address this immediate military need, Eaton will seek to develop and demonstrate an advanced high pressure ratio supercharger specifically designed to meet the harsh requirements of military diesel engines. The advanced supercharger will provide the capability to increase vehicle power and acceleration for a wide range of vehicles. It will be retrofitable, easily maintainable and cost-effective. It will also lower particulate emissions and could provide increased fuel economy for future vehicles.

Item Name: **Auxiliary Power for Military Vehicles and Trucks**
Request: $6,000,000
Recipient: Energy Technology Components
Location: Ann Arbor, MI
Project Description: *Auxiliary Power for Military Vehicles and Trucks* - The U.S. Army vehicle fleet is facing ever-increasing demand for on-board electricity generation to support electronic systems. Currently, this demand is being met by extremely inefficient idling of the vehicle's main propulsion system. This has created a case for solid-oxide fuel cell (SOFC) based auxiliary power units, but an on-board fuel reformer is needed to convert the JP-8 or diesel fuel into a hydrogen-rich gas for SOFC consumption. The purpose of this project is to develop SOFC-based auxiliary power units that are needed for of overall systems integration into Army vehicles.

Item Name: **Advanced Thermal Management System**
Request: $9,600,000
Contractor: Engineered Machined Products Incorporated
Address: Escanaba, MI
Project Description: *Advanced Thermal Management System* – 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: **Operator Driving Simulators for the U.S. Army National Guard**
Request: $5,000,000
Recipient: FAAC Incorporated
Location: Ann Arbor, MI
Project Description: *Operator Driving Simulators for the U.S. Army National Guard* – 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: **Land/Sea-Based Air Systems Maintenance and Air Worthiness**
Request: $3,000,000
Recipient: Focus:HOPE
Location: Detroit, MI
Project Description: *Land/Sea-Based Air Systems Maintenance and Air Worthiness* – Advanced manufacturing and coating processes have the potential to more effectively maintain and repair parts needed by the Navy. For example, the use of laser-aided direct metal deposition and friction stir processing techniques offer the promise of significant reductions in cost and lead time by reducing material and energy costs. In addition, thermal/plasma spraying and physical/chemical vapor deposition technologies have the potential to enhance the durability and performance of many parts required by the Navy.

Item Name: **Applied Power Management Control and Integration**
Request: $3,600,000
Recipient: Global Embedded Technologies
Location: Farmington Hills, MI
Project Description: *Applied Power Management Control and Integration* - Army vehicles are approaching or have already exceeded the non-mobility electrical power generation capability available for mission critical equipment. Electrification of vehicle subsystems promises to save fuel and extend missions, but these subsystems add an additional burden to the electrical system on military ground vehicles and need to be optimally managed and controlled within a power system to fully realize the potential benefits. With increasing power demand excessive heat also becomes compounding issue. This project will leverage the success of previous Small Business Innovative Research funding for this purpose and focus development efforts on power management to militarize technology for combat and unmanned ground vehicles.

Item Name: **Lightweight Advanced Metals Program**
Request: $5,000,000
Recipient: General Motors Corporation
Location: Detroit, MI

Project Description: *Lightweight Advanced Metals Program* - The Lightweight Advanced Metals Program (LAMP) is intended to be a joint program between the U.S. Army Tank-Automotive Research, Development and Engineering Center and General Motors Corporation to advance technologies that produce lightweight metal components for both military and commercial automotive applications. The LAMP will seek to reduce weight, maintain structural integrity, enhance survivability and improve fuel efficiency on vehicles by developing low cost, light weight, high strength metals such as castings, powder metal forgings, and titanium components. In addition, the project will develop advanced metals technologies and/or rapid manufacturing processes to reduce overall cost, lead time, and increase U.S. capability to produce parts at near net shape while improving the productivity of metal casting production.

Item Name: **Policy Decision Point**
Request: $3,500,000
Recipient: InfoTech Solutions for Business, Inc.
Location: Inkster, MI
Project Description: *Policy Decision Point* - Policy Decision Point (PDP) is a technology that makes access control decisions in response to requests from a user or software entity trying to gain access to a protected resource. The goal of the project is to develop a robust and reliable PDP that will meet specific requirements dictated by the Navy within the context its afloat information network. It is my understanding that no commercially available PDP meets these requirements.

Item Name: **Strap-On Autonomy for Legacy Tactical and Convoy Vehicles**
Request: $3,000,000
Recipient: iRobot Corporation
Location: Troy, MI
Project Description: *Strap-On Autonomy for Legacy Tactical and Convoy Vehicles* - The Department of Defense has a need for transport units that can operate autonomously, thus keeping soldiers as far away from improvised explosive devices and other threats as possible. iRobot has developed an Intelligent Vehicle Robotic Kit which can be adapted to any legacy tactical or convoy vehicle in order to add autonomous capability. Additional development is needed to enable these capabilities at convoy speeds and to ensure effective solutions optimized for standard tactical and convoy vehicles.

Item Name: **Chemical Agent Fate Appropriate Response Tool**
Request: $4,500,000
Recipient: Kettering University
Location: Flint, MI
Project Description: *Chemical Agent Fate Appropriate Response Tool* – 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. Additionally, the Chemical Agent Fate Response Operations Tool will be expanded for application with industrial toxic chemicals.

Item Name: **Heavy Fuel Engines for Unmanned Ground Vehicles**
Request: $4,000,000
Recipient: L-3 Combat Propulsion Systems
Location: Muskegon, MI
Project Description: *Heavy Fuel Engines for Unmanned Ground Vehicles* - The Department of Defense identified the need for new, advanced propulsion systems for unmanned ground vehicles (UGV). All new UGV systems specify a requirement for engines that operate on heavy fuels (JP-8 aviation fuel and diesel fuels), possess high power densities (power to weight and volume ratio) and low specific fuel consumption (high efficiency). Unfortunately, the options for medium-sized, high power density and low specific fuel consumption engines manufactured in the United States are limited. This project seeks to develop such an engine for installation and testing on a UGV.

Item Name: **Integrated Simulation Process for Reliability, Fuel Efficiency and Performance**
Request: $4,000,000
Recipient: LMS North America
Location: Troy, MI
Project Description: *Integrated Simulation Process for Reliability, Fuel Efficiency and Performance* - The objective of this program is for the development, verification, and deployment of an integrated modeling and simulation process that can predict and validate performance specifications of vehicle variants with a higher levels of reliability and fuel economy than is currently possible. This will be accomplished through the utilization of both new and existing design methods and software tools at a much earlier stage of the development of military ground vehicles, as well as for technology insertion development on existing fleet.

Item Name: **Air National Guard Infrared Joint Threat Emitters**
Request: $3,200,000
Recipient: Michigan Air National Guard
Location: Lansing, MI
Project Description: *Air National Guard Infrared Joint Threat Emitters* – The Infrared Joint Threat Emitter (JTE) System simulates electronic combat signals and is designed to provide realistic electronic warfare training for pilots and aircrew members. This JTE system for the Air National Guard's Combat Readiness and Training Center in Alpena, Michigan 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: **Advanced Composite Materials Research**
Request: $7,000,000

Recipient: Michigan State University
Location: East Lansing, MI
Project Description: *Advanced Composite Materials Research* – This continuing project has the goal of advancing the design of vehicles that are durable, light-weight, safe, environmentally-friendly, and functionally-appropriate for specified applications in the military. Novel experimental and simulation methods are used to investigate behavior, develop unique fastening techniques, verify simulations, and monitor performance. Smart sensing systems are also utilized for analysis, nondestructive evaluation, and structural health monitoring. Advanced materials concepts are exploited to create multifunctional and self-repairing structures for use in demanding conditions. The Michigan State University Composite Vehicle Research Center in East Lansing, Michigan is currently working on this project in collaboration with the U.S. Army Tank-Automotive Research, Development and Engineering Center and the Office of Naval Research.

Item Name: **Pre-discharge Threat Cues**
Request: $3,500,000
Recipient: Michigan Technological University
Location: Houghton, MI
Project Description: *Pre-discharge Threat Cues* - 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: **Ground Robotics Reliability Research**
Request: $2,000,000
Recipient: National Center for Manufacturing Sciences
Location: Ann Arbor, MI
Project Description: *Ground Robotics Reliability Research* - The Joint Robotics Center at the U.S. Army Tank-Automotive Research, Development and Engineering Center is the lead organization for military ground vehicle robotics integration efforts and coordination of support across the life cycle spectrum (research, development, acquisition and sustainment) for all current and future military unmanned ground vehicles and robotic platforms. This project will support the mission of the Joint Robotics Center by leveraging the expertise of industry and academia to solve robotics manufacturing challenges. Among the research topics to be addressed are the manufacturing and operational reliability of robotic systems, the use of modeling and simulation tools in robotics design, and the development of lessons learned to support survivability improvements for robotics systems.

Item Name: **Plug-In Hybrid Vehicle Electrification Program**
Request: $4,100,000
Contractor: NextEnergy Center

Location: Detroit, MI
Project Description: *Plug-In Hybrid Vehicle Electrification Program* – 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: **Autonomous Superconducting Fault Current Limiting Systems**
Request: $4,000,000
Recipient: Nove Technologies, Incorporated
Location: Metamora, MI
Project Description: *Autonomous Superconducting Fault Current Limiting Systems* - Modern electric power generation and distribution systems on naval ships are susceptible to catastrophic high current surges (i.e. fault currents) that may result in permanent equipment damage and total power system shutdown. Efficient, reliable, and stable shipboard power systems are critical to the operation of present and future naval surface combatants. Conventional hardware (e.g. fuses, circuit breakers, etc.) provide some degree of protection, but are insufficient to meet the critical requirements for reliable, uninterrupted power under the most adverse conditions of warfare. This project seeks to develop a current limiting system to help address current and future shipboard power systems issues. Nove Technologies, Incorporated of Metamora, Michigan has experience with fault current limiting systems and an existing relationship with the Office of Naval Research.

Item Name: **Automotive Tribology Research**
Request: $2,000,000
Recipient: Oakland University
Location: Rochester, MI
Project Description: *Automotive Tribology Center* – 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 Supercontinuum Laser for Light Aircraft Missile Defense**
Request: $2,400,000
Recipient: Omni Sciences
Location: Ann Arbor, MI
Project Description: *Mid-infrared Supercontinuum Laser for Light Aircraft Missile Defense* – The goal of this project is to accelerate the development of a 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: **Model Based Management Decision Tools for Ground Vehicles**
Request: $4,500,000
Contractor: Ricardo Incorporated
Location: Van Buren Township, MI
Project Description: *Model Based Management Decision Tools for Ground Vehicles* - The complexity of modern military vehicles is increasing because of the requirement for improved armor, weapons, electronics, and communications systems. To shorten development time and reduce cost, computer simulation of the actual functions of vehicle systems must be expanded. Currently, not enough components are accurately simulated and few are simulated together as a system (co-simulation). Long, arduous test programs demanding considerable resources are currently used to develop vehicles, but only a few things can be tested during a single test event. Computer design of full vehicles with great fidelity is now conceivable due to the advancements in computers and models. Full vehicle co-simulation will provide a wider range of "virtual tests" and optimize systems' interaction. New vehicles must be delivered faster, with better fuel economy, reliability, increased payloads, and lower costs. This project would continue the development of computer co-simulation tools for the Marine Personnel Carrier. Funding will provide the government and industry with management decision computer tools to optimize vehicle development and performance.

Item Name: **Ultrasonic Consolidation for Armor Applications**
Request: $3,900,000
Recipient: Solidica, Incorporated
Location: Ann Arbor, MI
Project Description: *Ultrasonic Consolidation for Armor Applications* - 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: **Advanced Water Analysis for Deployed Operations**
Request: $2,500,000
Recipient: Translume, Inc.
Location: Ann Arbor, MI
Project Description: *Advanced Water Analysis for Deployed Operations* – Providing clean water to warfighters at forward operating locations remains a significant logistics challenge and is critical to

mission readiness. The Department of Defense's primary goal for water analysis technology is to monitor the integrity of the filtration systems as a verification of the removal of particles at the end of the water purification process. The current capability for monitoring water quality in the field is limited to hand held devices that cannot measure down to the sensitivity needed and does not provide continuous monitoring. This project is designed to address these water quality testing challenges.

Item Name: **Amorphous Si Flexible Photovotaics for Grid Parity**
Request: $14,000,000
Recipient: United Solar Ovonic
Location: Auburn Hills, MI
Project Description: *Amorphous Si Flexible Photovotaics for Grid Parity* – The Department of Defense has established policy concerning achieving 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: **Software Assurance Education and Research Institute**
Request: $1,800,000
Recipient: University of Detroit Mercy
Location: Detroit, MI
Project Description: *Software Assurance Education and Research Institute* – Currently, there is little understanding of how to best integrate the teaching of secure practices in the development, acquisition, and operation of software into higher education curricula. This project will help ensure that the teaching of secure software practice is an integral part of all computer science, software engineering, and information systems programs in higher education. These funds will continue to support the generation of instructional materials and recommendations for the incorporation of secure software practices in higher education curricula. The University of Detroit Mercy in Detroit, Michigan has been certified as a National Center of Academic Excellence in Information Assurance Education by the National Security Agency (NSA) and is currently working with the NSA on this project.

Item Name: **On-demand Custom Body Implants/Prosthesis for Injured Personnel**
Request: $3,000,000
Recipient: University of Michigan - Dearborn
Location: Dearborn, MI
Project Description: *On-demand Custom Body Implants/Prosthesis for Injured Personnel* - Currently, prostheses are made though a series of labor intensive manual steps, resulting in long lead times and high procurement costs. This funding would support the development of a manufacturing platform that would reduce the lead time and cost of procuring implants/prosthesis while also producing better body parts compared to off-the-shelf implants. The human body varies greatly in both size and shape. The purpose of a customized implant/prosthesis takes these variations into consideration by fitting the implant/prosthesis to the patient rather than the patient to the implant/prosthesis. The proposed effort will utilize materials that are proven and currently used for implants/prosthesis, but will also develop new materials to find innovative solutions for many

currently non-treatable medical ailments.

Item Name: **Advanced Battery Development Program**
Request: $20,000,000
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI
Project Description: *Advanced Battery Development Program* – This project would initiate a new advanced battery technology development program at the Army's Tank-Automotive Research Development and Engineering Center. Advanced battery technology offers tremendous potential to significantly improve the near term operational performance and capability for military vehicles to generate, distribute and store electrical power. Advanced batteries are recognized as a critical component of developing military hybrid vehicles, and hybridization of military platforms will provide a significant opportunity to improve energy efficiency. The Defense Science Board's Task Force on Department of Defense Energy Strategy recommended an increased investment in energy storage technologies to improve the performance of electrically powered vehicles. Advanced automotive batteries are being pursued by the military for a variety of operational motivations, with ongoing work in two key areas – technology developments to improve performance characteristics and manufacturing technologies to establish basic manufacturing capabilities. This program will focus efforts to develop both advanced battery technology and the manufacturing technology required to bring these technologies to full utilization. In FY10, the program will include development of a technology and manufacturing roadmap to reach these goals by 2015.

Item Name: **Hybrid Engine Development Program**
Request: $8,000,000
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI
Project Description: *Hybrid Engine Development Program for the Tactical Wheeled Vehicle Fleet* – This funding would continue a program initiated in FY08 to improve hybrid vehicle technology that is optimized for military use to be carried out by the U.S. Army Tank-Automotive Research, Development and Engineering Center. The program includes both basic and applied research in engine technology, power electronics, and control technology. Research areas include theoretical, computational design and analysis, and experimental verification components.

Item Name: **Unmanned Ground Vehicle Initiative (UGVI)**
Request: $12,000,000
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI
Project Description: *Unmanned Ground Vehicle Development Initiative* – 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 Systems Engineering and Integration Activities**
Request: $20,000,000
Recipient: U.S. Army Tank-Automotive Research, Development and Engineering Center
Location: Warren, MI
Project Description: *Vehicle Systems Engineering and Integration Activities* - In the last ten years, the Department of Defense's (DoD) acquisition workforce has been drastically reduced as acquisition and systems integration functions have been increasingly provided by contractors. The DoD has recognized a need for many of these functions to be performed by government personnel and has set out to rebuild its acquisition workforce accordingly. The U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC) has a requirement to further develop the in-house technical, systems engineering and systems integration skills necessary to serve as the systems integrator for all current and future Army manned and unmanned ground vehicles. These funds will help TARDEC to significantly expand its technical in-house capabilities through retraining of its current workforce and the hiring of engineers, scientists and technicians.

Item Name: **Sonic Infrared Imaging Technology Development**
Request: $2,000,000
Recipient: Wayne State University
Location: Detroit, MI
Project Description: *Sonic Infrared Imaging Technology Development* - 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: **Dual-Use Hybrid Vehicle Safety and Reliability Monitoring**
Request: $2,000,000
Recipient: Western Michigan University
Location: Kalamazoo, MI
Project Description: *Dual-Use Hybrid Vehicle Safety and Reliability Monitoring* - The ever increasing roles the U.S. Army play in the global defense of our nation's security have seen the Army ground vehicles operating in harsh and diverse environments. The reliability of hybrid vehicles in battlefield conditions including Iraq and Afghanistan is not known. The subsystems, such as the drivelines and battery packs, are complex and can be susceptible to combat damages, causing concerns in hybrid vehicle reliability and safety and the safety of our war fighters. This project is focused on applied research in dual-use hybrid ground vehicle safety and reliability modeling. It will develop system level computer modeling of hybrid vehicle platforms based on real-world data. Factors such as the weight and the structural characteristics of the battery pack, motors, and the protective armor, will be considered. Western Michigan University in Kalamazoo, Michigan is currently working with the U.S. Army Tank-Automotive Research, Development and Engineering Center on related projects.

Item Name: **Long Range Supersonic Engine for High Speed Strike**
Request: $15,000,000
Recipient: Williams International
Location: Walled Lake, MI
Project Description: *Long Range Supersonic Engine for High Speed Strike* – Our current inventory of cruise missiles and warheads are in need of improved deep penetrating capability to destroy deep, highly fortified concrete reinforced bunkers. Supersonic delivery of weapons with new advanced conventional warheads will greatly improve depth of penetration. This cruise missile engine capability does not exist today. The Department of Defense is addressing this deficiency with accelerated and expanded demonstration of the Versatile Affordable Advanced Turbine Engine (VAATE) High-Speed Turbine Engine Demonstrator (HiSTED) supersonic cruise missile engine program. The objective of the VAATE/HiSTED supersonic missile engine program is to demonstrate the feasibility of an engine that can power a long range, Mach 4+ strike weapon against conventional and unconventional targets such as relocatable missile launchers, high value political and strategic targets, hardened and deeply buried bunkers and weapons of mass destruction. Williams International of Walled Lake, Michigan has been working on the VAATE program with the Department of Defense for several years.

United States Senate

WASHINGTON, DC 20510

May 15, 2009

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 2010 Defense Appropriations Bill, we are writing to request continuing support for Department of Defense (DoD) manufacturing research and development initiatives. We believe these requests 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 the Department with the level of manufacturing technology investments in the early 1980s. The Fiscal Year 2010 budget request for Manufacturing Technology programs in DoD represents only 0.25% of the requested RDT&E budget.

We are requesting funding for two merit-based, competitive initiatives to address the shortfall in DoD funding of manufacturing research and development. It is anticipated that both of these initiatives will be part of the Senate Armed Services Committee-reported version of the Fiscal Year 2010 National Defense Authorization Act, as they were in previous years.

First, we request $30.0 million in Defense-wide Research, Development, Test & Evaluation (Line 238, PE#0708011S) to continue the Industrial Base Innovation Fund (IBIF) established 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, 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 and Joint Defense Manufacturing Technology Panel in coordination with the Deputy Undersecretary of Defense for Industrial Policy, and has begun to invest 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.

Second, we request $10.0 million in Defense-wide Research, Development, Test & Evaluation (Line 39, PE#0603680D8Z) for a High Performance Manufacturing Technology Initiative to advance manufacturing technologies that support the defense industrial base, improve the performance of defense systems, and reduce life cycle costs. The Fiscal Year 2006 National Defense Authorization Act (P.L.109-163) established the high performance defense manufacturing technology research and development program with a goal of identifying and transitioning advanced manufacturing processes and technologies whose utilization would create significant productivity and efficiency gains in the defense manufacturing base. This legislation has been endorsed by the DSB's Task Force on the Manufacturing Technology Program. These funds would continue activities under this program, including development of test beds and prototypes of advanced manufacturing technologies, diffusion of advanced manufacturing processes throughout the industrial base, and the development of technology roadmaps to ensure that the DoD can access required manufacturing and technology capabilities in critical defense technologies. They would also support the continued development and use of manufacturing readiness levels and assessments to help ensure that acquisition programs are taking manufacturing costs and technical issues into account as they develop and mature.

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 2010 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

Jeff Bingaman

Olympia J. Snowe

Joseph I. Lieberman

Debbie Stabenow

Jack Reed

Mark Begich

Jim Webb

Robert P. Casey, Jr.

Roland W. Burris

Daniel K. Akaka