

TITLE II—RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

Subtitle A—Authorization of Appropriations

Subtitle B—Program Requirements, Restrictions, and Limitations

Continued development of competitive propulsion system for the Joint Strike Fighter program (sec. 211)

The committee recommends a provision that would require the Department to obligate sufficient funds for fiscal year 2010 for the continued development and procurement of the F136 competitive propulsion system for the F-35 Lightning II to ensure that the Department continues the system development and demonstration (SDD) program during fiscal year 2010. The committee understands that current plans for the F136 Joint Strike Fighter (JSF) propulsion system would complete the development in sufficient time to conduct a first competitive contract award in fiscal year 2012, concurrent with the award for the sixth lot of low-rate initial production aircraft.

The budget request included \$1,741.3 million in PE 64800N, and \$1,858.1 million in PE 64800F for continued development of the JSF program, but included no funds for continuing the SDD phase of the F136 program.

The committee continues to believe that, in light of studies performed by the Department of Defense, the Institute for Defense Analyses, and the Government Accountability Office, it is in the best interests of the Nation to continue the development of the F136. Though the results of these studies were, in the aggregate, inconclusive on whether there would be a financial benefit to the Department in continuing to develop a competitive propulsion system for the JSF program, the committee notes that all studies identified significant non-financial factors of a two-engine competitive program. These included better engine performance; improved contractor responsiveness; a more robust industrial base; increased engine reliability; and improved operational readiness. The committee believes that the benefits, which could be derived from the non-financial factors, favor continuing the JSF competitive propulsion system program.

Therefore, the committee recommends an increase of \$438.9 million for continuing F136 SDD, with half that amount added to PE 64800N and the other half added to PE 64800F.

Enhancement of duties of Director of Department of Defense Test Resource Management Center with respect to the major range and test facility base (sec. 212)

The committee recommends a provision that would amend the authority of the Director of the Department of Defense Test Resource Management Center to review changes to major test range funding before changes are implemented. The committee established the Test Resource Management Center in order to ensure that the Department is adequately investing in the test capabilities it requires to develop and deploy needed defense systems to meet current and emerging operational needs. The provision would allow the Director to review changes to test resource funding that occur outside the traditional planning, programming, and budgeting process, as well as to ensure that the Director has access to all the information he or she needs to make recommendations to the Undersecretary of Defense for Acquisition, Technology, and Logistics on test resource issues.

Guidance on specification of funding requested for operation, sustainment, modernization, and personnel of major ranges and test facilities (sec. 213)

The committee recommends a provision that would clarify the information required in budget justification materials delivered to Congress describing amounts requested for test and evaluation activities. The committee is concerned that existing justification materials provide incomplete and inconsistent information and are not comparable across services and agencies. The committee believes that the Army, Air Force, and the Defense Information Systems Agency (DISA) are each underfunding test and evaluation capabilities potentially to the long-term detriment of the Department of Defense and its ability to develop and field new systems. The committee believes that the Director of the Test Resource Management Center should play a key role in ensuring that the budget justification materials are prepared and displayed in a consistent manner across the Department to provide maximum transparency for Congress and the public.

Permanent authority for the Joint Defense Manufacturing Technology Panel (sec. 214)

The committee recommends a provision that would authorize the establishment of a Joint Defense Manufacturing Technology Panel (JDMTP) as a permanent part of the statutorily mandated Manufacturing Technology Program. The committee notes that the December 2008 Report to Congress on Implementation of Department of Defense ManTech Projects estimated that investments in the program made between fiscal years 2003 and 2005 could result in over \$6.3 billion in savings for the Department through lower production costs and increased systems reliability and performance. The committee believes that the activities of the existing JDMTP have contributed significantly to these types of successes for the program, as well as other important initiatives, such as the use of manufacturing readiness level assessment tools, investment in joint manufacturing research projects, and enhanced dissemination of manufacturing advances into the defense industrial base. The com-

mittee directs the services and the Office of the Secretary of Defense to continue to support the activities and initiatives of the JDMTP in order to continue to reduce life cycle and acquisition costs for defense systems.

Extension and enhancement of Global Research Watch program (sec. 215)

The committee recommends a provision that would extend the requirement for the Department to execute the Global Research Watch program. The program was established by the committee to provide a centralized repository of information on international research and technology capabilities in areas of interest to the Department for the purposes of enabling international cooperative activities and providing data and analyses to inform Department research investment decisions. The provision would also limit the funds available to military department programs that support international research assessment activities until the military departments provide information consistent with the statutory goals of the Global Research Watch program to the Director of Defense Research and Engineering.

The committee notes that Department efforts to comply with the statutory requirement for the program have not been complete or successful to date. The committee further notes that the Department has requested funding for fiscal year 2010 in the Militarily Critical Technologies Program for the purpose of improving and expanding “the focus of the DSTL [Defense Science and Technology List] effort to represent a broader global research watch.”

Three-year extension of authority for prizes for advanced technology achievements (sec. 216)

The committee recommends a provision that would extend the Department of Defense’s authority to award prizes for advanced technology achievements. The committee notes that the Department has successfully used this authority to hold challenge competitions for robotic vehicles and wearable power technologies. These competitions have encouraged large groups of researchers and innovators to work on defense challenges for the first time, highlighted the importance of defense research and technology to address warfighter needs, and advanced state-of-the-art critical defense technologies.

Modification of report requirements regarding defense science and technology program (sec. 217)

The committee recommends a provision that would modify the funding objective established by Congress for the defense science and technology program as well as the reporting requirements triggered when the Department fails to achieve established goals. The committee notes that the Department’s rhetoric on modernizing defense capabilities to meet the emerging threats of the 21st century does not match its investment strategy for the programs that develop those capabilities. The committee notes that the fiscal year 2010 budget request for science and technology programs has decreased by over \$50.0 million in constant dollars with respect to the fiscal year 2009 budget request.

The committee notes that reduced investments in science and technology programs will inevitably lead to a number of negative consequences. First, the Department will not be able to take advantage of new research ideas and innovative technologies that are being developed within the private sector, which may lead to enhanced defense capabilities. Second, the United States may lose the technical lead it enjoys in critical defense research areas such as advanced materials, nanotechnology, biotechnology, and cybersecurity to global competitors. Both of these outcomes would result in a long-term loss of military superiority for the United States. The committee's provision requires the Department to provide information to Congress that will help address both of these concerns and better evaluate future science and technology budget submissions.

Programs for ground combat vehicle and self propelled howitzer capabilities for the Army (sec. 218)

The committee recommends a provision that would require the Secretary of Defense to carry out programs to develop, test, and field an operationally effective, suitable, survivable, and affordable next-generation ground combat vehicle and next-generation self-propelled howitzer for the Army. The Secretary of Defense is further required to develop a strategy and plan for each of these programs and to report annually on the investments made for each in the budget request.

On April 6, 2009, Secretary of Defense Gates announced the restructuring of the Future Combat Systems (FCS) program and cancelled the manned ground vehicle (MGV) component of the program, including the non-line of sight cannon (NLOS-C). Secretary Gates was concerned that there were significant unanswered questions in the FCS vehicle design strategy and that despite some adjustments to the MGVs, they did not adequately reflect the lessons of counterinsurgency and close quarters combat in Iraq and Afghanistan. Secretary Gates was also critical that the Army's vehicle modernization and equipping strategy did not include a role for Mine-Resistant Ambush-Protected vehicles that have been used successfully in current conflicts. After re-evaluating requirements, technology, and approach, the Army will re-launch its next-generation ground combat vehicle modernization program, including a competitive bidding process. Also, in his April 6th announcement, and again shortly after at a speech delivered to the Army War College, Secretary Gates emphasized his conviction that the Army needs a next-generation ground combat vehicle program and his commitment to support the Army's resource requirements to field this vehicle in 5 to 7 years.

Secretary Gates' decisions were implemented on June 23, 2009, by the Under Secretary of Defense for Acquisition, Technology, and Logistics issuing an Acquisition Decision Memorandum to the Secretary of the Army directing the cancellation of the FCS Brigade Combat Team acquisition program and a stop-work order for the NLOS-C.

The committee recognizes that the Army will need some time to react to these programmatic changes and reexamine its ground combat vehicle requirements. The committee is also aware that Army modernization priorities and programs are subject to further

adjustment depending upon the analysis and recommendations of the Quadrennial Defense Review. The committee is concerned that Secretary Gates' pronouncement that the Army will have a new ground combat vehicle in 5 to 7 years and the Chief of Staff of the Army's target fielding for such a system by 2015 to 2017 may be introducing schedule pressure on the program before its requirements have been defined and technologically realistic and affordable alternatives considered.

The committee has been a strong supporter of Army modernization over the years, including FCS and its MGV and NLOS-C components. However, the committee is concerned that instability in Army modernization strategy and plans contributes to management problems and avoidable cost, schedule, and technology risk. The Army's best chance to ultimately deliver a next-generation ground combat vehicle and a self-propelled howitzer depends on the creation of well planned, realistic, and affordable programs resourced and managed in a disciplined manner consistent with acquisition law and regulation.

The recommended provision would direct the creation of two development programs, one each for a next-generation ground combat vehicle and a next-generation self-propelled howitzer to ensure the continuation of the Army's effort to meet its future requirements for these capabilities. To the extent practical, these new programs should take advantage of the range of relevant and mature technologies already developed as part of the full FCS program and its MGV and NLOS-C components.

The recommended provision would also require appropriate acquisition strategies and plans to ensure that these programs comply with the requirements of the recently enacted Weapons Systems Acquisition Reform Act of 2009 (Public Law 111-124). Additionally, the provision would require an annual report detailing the investments requested to develop these capabilities and ensure that the Defense Department is honoring its commitment that necessary resources will be available for the next-generation ground combat vehicle to provide program stability and reduce risk.

Finally, the committee understands that continuing analysis and important initial decisions will be made in the coming months with regard to the next-generation ground combat vehicle program. Information from these analyses and decisions could be available for the committee's consideration before completing action on the National Defense Authorization Act for Fiscal Year 2010. Therefore, the committee directs the Secretary of the Army to provide a report to the congressional defense committees not later than September 8, 2009, that updates the Army's strategy and plans for the next-generation ground combat vehicle program, including its requirements determination, analysis of alternatives, and any cost and schedule estimates.

Assessment of technological maturity and integration risk of Army modernization programs (sec. 219)

The committee recommends a provision that would require the Director of Defense Research and Engineering to review and assess the technological maturity and integration risk of the technologies critical to the development and deployment of systems and tech-

nologies related to the platforms, sensors, and networks of the Future Combat Systems (FCS). The committee understands that major restructuring of the FCS program was partially driven by concerns over the lack of technological maturity of important elements of this system of systems. The committee believes that a detailed technical review and analysis of FCS-related technologies and associated systems will provide important insight and data to inform the requirements, structure, baseline, and schedule for a successor modernization program, as well as to help prioritize the investment of resources.

The committee notes that these types of reviews and assessments are consistent with the mandates established in the Weapon Systems Acquisition Reform Act of 2009 (Public Law 111–23).

Assessment of strategy for technology for modernization of the combat vehicle and tactical wheeled vehicle fleets (sec. 220)

The committee recommends a provision that would require the Secretary of Defense to contract for an independent assessment of a strategy for technology development that could support the modernization of the defense combat vehicle and tactical wheeled vehicle fleet. The committee notes that these types of vehicles have played a critical role in the military operations of various nations in operations in Lebanon, Afghanistan, and Iraq, and have incorporated new technologies, such as armor and improvised explosive device jammers, as a result of lessons learned from those operations.

In light of the major restructuring of the Future Combat Systems program; the termination of the Manned Ground Vehicle program; the initiation of the Joint Light Tactical Vehicle program; the fielding of Mine Resistant Ambush Protected Vehicles; the desire to reduce energy costs to the Department of Defense; and the proliferation of threats such as improvised explosive devices, explosively formed penetrators, and rocket propelled grenades; the committee believes that it is an opportune time to reshape the Department's vehicle modernization research, development, and fielding strategies, so as to prioritize capability gaps that need to be addressed and investments that will support those efforts. The committee understands that some of these discussions are currently ongoing in the Department of Defense and believes that an independent technical assessment will contribute useful data and analysis to those deliberations.

The committee directs that this assessment address all aspects of vehicle systems and the full range of operational missions for the Army, Marine Corps, and U.S. Special Operations Command.

Systems engineering and prototyping program (sec. 221)

The committee recommends a provision that would establish a systems engineering and prototyping program in the Department of Defense under the management of the Under Secretary of Defense for Acquisition, Technology, and Logistics.

The committee notes that the Weapons Acquisition Reform Act of 2009 (Public Law 111–23) has highlighted the need for a greater emphasis on systems engineering and prototyping as a means to

improve the acquisition process. The recommended provision would support those efforts by establishing a program that will help build and train the government and industry workforce needed to perform those critical design and engineering tasks. Through the funding of innovative, rapid systems engineering and prototyping projects this initiative will encourage the exercising of the Nation's systems engineering technical workforce as well as the development of systems and technology that can address Department needs and requirements.

The provision would require the Under Secretary to manage the program through the services and defense agencies and would require cost sharing between organizations to help maximize the probability of addressing joint problems, grow the base of experienced acquisition personnel, and promote the likelihood of transition into programs of record or deployment. The committee intends that programs funded under the programs be selected on a competitive basis. Elsewhere in this report, the committee recommends an authorization of funding to support the initiation of this program.

Finally, the committee notes that this provision is not intended to change in any way the requirements of the recently enacted Weapon Systems Acquisition Reform Act of 2009 (Public Law 111-23) regarding competitive prototyping.

Subtitle C—Missile Defense Programs

Sense of Congress on ballistic missile defense (sec. 241)

The committee recommends a provision that would express the sense of Congress regarding ballistic missile defense, namely that the United States should develop, test, field, and maintain operationally effective, cost-effective, affordable, reliable, suitable, and survivable ballistic missile defense systems that are capable of defending the United States, its forward deployed forces, allies, and other friendly nations from the threat of ballistic missile attacks from nations such as North Korea and Iran; that the missile defense force structure and inventory levels of such missile defense systems should be determined based on an assessment of ballistic missile threats and a determination by senior military leaders, combatant commanders, and defense officials of the requirements and capabilities needed to address those threats; and that the test and evaluation program for such missile defense systems should be rigorous, robust, operationally realistic, and capable of providing a high level of confidence in the capability of such systems, including their continuing effectiveness over the course of their service lives, and that adequate resources should be available for such test and evaluation program, including interceptor missiles and targets for flight tests.

Comprehensive plan for test and evaluation of the ballistic missile defense system (sec. 242)

The committee recommends a provision that would require the Secretary of Defense to establish a comprehensive plan for the developmental and operational testing and evaluation of the Ballistic Missile Defense System and its various elements. The plan would

include a number of specific elements related to objectives, procedures, data requirements, and related test activities. The provision would require the Secretary to submit an unclassified report to the congressional defense committees, not later than March 1, 2011, setting forth and describing the test plan and each of its elements. Additionally, the report would include a description of test and evaluation activities specifically related to the Ground-based Midcourse Defense (GMD) element, including plans for salvo tests, multiple simultaneous target engagement testing, intercept testing using the Cobra Dane radar as the engagement sensor, and plans to test and demonstrate the ability of the GMD system to accomplish its mission over the planned term of its operational service life (sustainment testing).

Assessment and plan for the Ground-based Midcourse Defense element of the Ballistic Missile Defense System (sec. 243)

The committee recommends a provision that would require the Secretary of Defense, as part of the Quadrennial Defense Review and the Ballistic Missile Defense Review, to conduct an assessment of the Ground-based Midcourse Defense (GMD) element of the Ballistic Missile Defense System, and future options for the GMD element. The assessment would consider such matters as: the military requirement for GMD capabilities; current and planned GMD capabilities; force structure and inventory levels; infrastructure; and the number of Ground-Based Interceptors needed for operational and testing purposes.

The provision would also require the Secretary to establish a plan for the GMD element, covering such matters as the GMD program schedule, funding plan, maintaining the effectiveness of the GMD element over the course of its service life; flight testing; and production of Ground-Based Interceptors for operational and testing purposes.

The provision would require the Secretary to submit to the congressional defense committees, at the time of the budget submission for fiscal year 2011, a report setting forth the results of the assessment and a report setting forth the plan required in the provision.

The provision would also express the Sense of Congress concerning the GMD element.

The committee is aware that, as part of its plan to field 30 effective operational Ground-Based Interceptors, the Missile Defense Agency plans to complete seven silos at Missile Field 2 at Fort Greely, Alaska, to replace the older silos at Missile Field 1. The committee notes that four of the seven silos at Missile Field 2 are nearly complete, and that it would be possible to complete all seven silos in fiscal year 2010 with additional funding. The committee understands there could be a cost savings benefit to such an acceleration. If the Department believes there is benefit to completing the seven silos in Missile Field 2 during fiscal year 2010, the committee would look favorably upon a reprogramming request from the Secretary of Defense to provide the funds to complete the seven silos in fiscal year 2010.

**Report on potential missile defense cooperation with Russia
(sec. 244)**

The committee recommends a provision that would require the Secretary of Defense to submit a report to the congressional defense committees, not later than 120 days after enactment of this Act, setting forth potential options for cooperation among or between the United States, the North Atlantic Treaty Organization (NATO), and the Russian Federation on ballistic missile defense. The report would include a description of proposals made by the United States, NATO, or the Russian Federation for such cooperation, as well as a description of data sharing options, assessments of the potential for certain types of cooperation, and an assessment of the potential security benefits of such cooperation.

Subtitle D—Other Matters

**Repeal of requirement for biennial Joint Warfighting
Science and Technology Plan (sec. 251)**

The committee recommends a provision that would eliminate the biennial Joint Warfighting Science and Technology Plan reporting requirement. The committee commends efforts to invest in research and technologies that will develop joint warfighting capabilities, but believes that Department resources can be better invested in higher priority research or management endeavors.

Budget Items

Army

Army basic research

The budget request included \$377.3 million for Army basic research programs. The Army's basic research program makes investments in a number of thrust areas including materials science, mathematical and information sciences, network science, and environmental science. Consistent with those research thrusts, the committee recommends increases in PE 61102A of an additional \$3.5 million for ballistic protection materials research and an additional \$2.0 million for research characterizing critical global natural environments in support of military operations worldwide. The committee also recommends increases in PE 61103A of \$2.0 million for nanocomposite materials research; \$2.0 million for research on open source intelligence analyses techniques; \$2.0 million for research on advanced nanoscale memory devices and nanosensors; \$1.0 million for electrolyte research for battery applications; \$1.2 million for immersive simulation research; \$2.0 million for materials processing research; and \$1.5 million for structural response modeling and analysis.

Minerva

The budget request included \$88.4 million in PE 61103A for Army university research initiatives. This account includes a total of \$13.3 million for the Minerva Research Initiative, a portion of the roughly \$20.0 million being requested for this purpose across the Department of Defense. The committee directs that at least

\$7.5 million of the amount requested in PE 61103A be used to develop in-house Department of Defense capabilities at defense laboratories and schools consistent with the research goals of the Minerva Initiative. Further, the committee directs that no Minerva Initiative funds may be transferred to the National Science Foundation unless that agency equally matches any Department of Defense funding provided for research projects funded under the Initiative.

Materials technologies

The budget request included \$27.2 million in PE 62105A for applied research on materials technology. The committee notes that the Defense Science Board Task Force on the Department of Defense Energy Strategy recommended that the Department continue to invest in mobile, in-theater synthetic fuels processes which would address the Department's fuel problem by reducing battlespace fuel demand. Consistent with that recommendation, the committee recommends an additional \$4.0 million for the research on advanced biofuels.

The Army's current Future Combat Systems armor development technology objective seeks to develop lightweight, affordable, manufacturable armor protection against a variety of threats. In support of that objective, the committee recommends an additional \$3.0 million for applied composite materials research; \$3.0 million for research on high strength glass fibers for armor applications; \$2.5 million for advanced moldable composite armor technology development; \$2.0 million for advanced manufacturing technologies; and \$4.5 million for smart materials and structures research.

The 2007 report on the Defense Nanotechnology Research Program indicated that the Department is working to increase investments in nanomanufacturing since "this area remains a significant barrier to the commercialization of nanomaterials and nanotechnology-based products." The committee recommends an additional \$4.0 million for research on manufacturing of nanosensors for military applications.

Sensor research

The budget request included \$50.6 million in PE 62120A for applied research on sensors and electronic survivability. The 2007 Department of Defense Nanotechnology Research and Development Report recommended that sustained support of development of novel devices and systems was necessary to enhance Department of Defense capabilities in information technology, energy storage, and other areas. In support of that recommendation, the committee recommends an increase of \$2.5 million for research on nanoelectronic memory, sensor, and energy devices.

Manned-unmanned systems teaming

The budget request included \$41.3 million in PE 62211A for research on aviation technologies. The 2005 National Research Council report on "Interfaces for Ground and Air Military Robots" identified one of the goals of Army efforts in robotics is to support collaborative operations among manned and unmanned vehicles. In support of that goal, the committee recommends an additional \$2.0

million for development of guidance, navigation, and control technologies for manned-unmanned systems teaming operations.

Advanced concepts and simulation

The budget request included \$17.5 million in PE 62308A for advanced concepts and simulation research. The 2006 National Research Council study on “Defense Modeling, Simulation, and Analysis” recommended research investment on video game-based training and simulation to further training and education activities in the Department of Defense. Consistent with that recommendation, the committee recommends an additional \$2.0 million for cognitive modeling and simulation research to support tactical decision-making by military planners in training and operational scenarios.

Ground vehicle research

The budget request included \$55.9 million in PE 62601A and \$89.6 million in PE 63005A for research on combat vehicles and automotive technologies. The Army has established a technology objective to develop advanced survivability systems for the protection of crew and passengers in current and future tactical wheeled vehicles. To support these efforts, the committee recommends an increase of \$2.0 million in PE 63005A for systems that identify and warn vehicles of incoming threats, and \$11.0 million in PE 62601A for research on advanced coatings, composite materials, and metals for vehicle armor and vehicle shelters.

The Army has established a technology objective to develop and demonstrate wheeled vehicle power and mobility technologies, including commercial engines adapted to military requirements that reduce cost, increase efficiency, and improve reliability. To support these efforts, the committee recommends an increase of \$2.0 million in PE 62601A for research on engine and transmission friction and wear, and an increase of \$23.5 million in PE 63005A for development of suspension systems, advanced power electronics, reliability assessment systems, and other engine subsystems.

The committee also recommends an increase of \$20.0 million in PE 62601A for vehicle systems engineering and an additional \$4.0 million in PE 63005A for equipment to accurately measure vehicle engine performance. These additions are to support Army efforts to integrate advanced armors, networks, active protection systems, power and propulsion systems, and to enhance the government workforce’s capabilities to replace the systems engineering efforts that have been traditionally performed by contractors.

Army electromagnetic gun

The budget request included \$11.7 million in PE 63004A, \$4.1 million in PE 62618A, and \$6.4 million in PE 61104A for activities related to the Army’s Electromagnetic (EM) Gun initiative. The committee believes that the technologies related to EM Gun size, weight, power, and thermal management require a platform much larger than the system currently or will prospectively provide in direct-fire capability to the Army, therefore calling into question the operational utility of the system as currently envisioned. The committee is also concerned that the Army, Navy, and the Defense Advanced Research Projects Agency collaborative program on EM gun

technologies, as envisioned originally by Congress and the Department of Defense, has never materialized. Therefore, the committee reduces funding relating to the Army's EM Gun initiative by \$11.5 million in PE 63004A and \$2.0 million in PE 62618A. The committee continues to authorize funding for activities on power and energy issues and basic research efforts to support development of future EM gun systems.

Reactive armor technologies

The budget request included \$61.8 million in PE 62618A for ballistics technologies. The Army has established a technology objective to develop armor and vehicle structure technologies to influence all future generations of combat vehicles. To support this effort and enhance industrial production capacity, the committee recommends an increase of \$3.0 million for research on reactive armor systems.

Acoustic sensors systems

The budget request included \$41.1 million in PE 62624A for applied research on weapons and munitions technology. The Army's Sensor and Information Fusion for Improved Hostile Fire Situational Awareness technology objective seeks to develop enhanced acoustic and other sensors to detect, locate, and classify a wide range of threats. In support of these efforts, the committee recommends an additional \$2.0 million for continued development of gunfire detection and location systems, and an additional \$3.0 million for research on innovative acoustic signal processing techniques to address high clutter environment battlefield sensing challenges.

Army electronics research

The budget request included \$61.4 million in PE 62705A for research on electronics and electronic devices. The Army's non-primary power system technology objective seeks to provide electrical power solutions for ground vehicles during engine-off operations. In support of that goal, the committee recommends an increase of \$2.5 million for hybrid battery systems that could be used during silent watch operations.

The Army's dismounted soldier power technology objective seeks to develop and demonstrate technologies to provide small, lightweight, low-cost power sources. Consistent with that objective, the committee recommends an increase of \$3.5 million for research on hybrid portable power systems.

Military engineering technology

The budget request included \$54.8 million in PE 62784A for military engineering technologies. In support of efforts to develop lower cost, lightweight, blast resistant materials for use at forward operating bases and other military installations, the committee recommends an additional \$3.0 million for research on ballistic materials for force protection applications.

The Army's has established a technology objective to improve battlespace and terrain awareness for forces by creating actionable information from terrain, atmospheric, and weather impacts and

their effects on Army assets. In support of this objective, the committee recommends an additional \$2.0 million for geosciences and atmospheric research.

The Army has a stated objective to create prognostics and diagnostic systems for operational readiness and condition-based maintenance by developing technologies to detect health status and performance as well as environmental conditions and metrics that limit the lifetime of military assets. In support of this objective, the committee recommends an additional \$3.5 million for sensors and communication systems to monitor structural integrity of defense infrastructure.

Ballistic protection systems

The budget request included \$27.1 million in PE 62787A for warfighter technologies. The Army is currently undertaking efforts to improve the ballistic protection capabilities of infrastructures at base camps in order to reduce vulnerability to mortars and improvised explosive devices. In support of those efforts, the committee recommends an increase of \$3.0 million for development of advanced composite ballistic panels.

The Army's enhanced performance personnel armor technology objective seeks to develop materials technology and tools to address emerging ballistic and blast threats. In support of that objective, the committee recommends an increase of \$3.0 million for research on enhanced ballistic protection materials. In order to help address the threat of burn injuries to deployed warfighters, the committee recommends an increase of \$2.5 million for thermal resistant fiber research.

Medical technologies

The budget request included \$99.0 million in PE 62787A for applied research on medical technologies. In support of the Army's objective to develop fluid resuscitation technology to reduce injury and loss of life on the battlefield, the committee recommends an additional \$2.0 million for research on advanced functional nanomaterials for biological processes such as drug and critical fluid delivery.

To support development of combat casualty care capabilities, the committee recommends an additional \$5.5 million for research on hemorrhaging, advanced tissue replacement, and bone regeneration relevant to military trauma care; an additional \$3.5 million for biomechanics research to evaluate the risk of brain injury from blast and blunt loading; \$3.5 million for research on equipment designs to reduce neurotrauma in warfighters; and \$5.0 million for research on explosion blast interactions with protective equipment and personnel. The committee also recommends an additional \$2.5 million for research on secondary trauma issues facing service personnel who are treating mental health problems, in coordination with existing Army and Department of Defense programs in this area.

The committee notes that although the Department of Defense has significantly increased investments in medical research over previous budget requests, there is still limited investment in capabilities to prevent and treat infectious diseases. To enhance efforts in this area, the committee recommends an additional \$2.0 million

for research on treatments for dengue fever and \$2.5 million for malaria vaccine research.

Army advanced medical research and technologies

The budget request included \$72.9 million in PE 63002A for advanced medical technologies. The Army's medical research program on this effort focuses on warfighter medical protection performance standards that demonstrate and transition technologies and tools associated with biomechanical-based health risks, injury assessment and prediction, soldier survivability, and performance during continuous operations. Consistent with these efforts, the committee recommends an additional \$2.0 million for the development of biosensor controller and monitor systems, and \$2.5 million for body temperature conditioning technologies.

The committee notes that the Army has established the Armed Forces Institute of Regenerative Medicine (AFIRM). The committee notes that AFIRM is developing clinical therapies in areas including burn repair, wound healing, and limb reconstruction, regeneration, or transplantation. The committee recommends an additional \$4.0 million to support the activities of the institute.

The committee commends the Defense Advanced Research Projects Agency for its work developing advanced prosthetics technologies for use by wounded warriors. In support of these efforts, the committee recommends an additional \$2.0 million for lower limb prosthetics development, and \$8.0 million to support transition of prosthetics technologies to clinical practice to improve amputee patient care.

The committee further recommends an additional \$7.5 million for research on the integration of medical technologies to address combat casualty care issues, and \$12.0 million to support research on Gulf War illnesses.

Army aviation technologies

The budget request included \$60.1 million in PE 63003A for advanced aviation technologies. The Army's aviation science and technology program includes funding for the Advanced Affordable Turbine Engine (AATE) program. The goal of the AATE program is to develop the next generation utility and attack helicopter engine. In support of that goal, the committee recommends an additional \$4.0 million for the AATE program, and \$5.0 million for the development of full authority digital engine controls.

In support of the Army's technology objective to develop technologies for small JP-8 fueled engines for small unmanned aerial vehicles (UAV), the committee recommends an additional \$3.0 million for research on heavy fuel UAV propulsion systems.

Consistent with committee efforts to enhance systems engineering and prototyping capabilities, the committee recommends an additional \$2.0 million for aviation weapon systems integration technologies and \$3.75 million for an enterprise resource planning system for Army prototype integration efforts.

The Army is currently investing in a number of capability-based operations and sustainment technologies that improve the operational availability of rotorcraft while reducing operating and support costs. In support of these efforts, the committee recommends

an additional \$2.0 million for development of an inspection system for helicopter rotor blades and other composite components.

Army weapons and munitions technology

The budget request included \$66.4 million in PE 63004A for advanced weapons and munitions technologies. The committee recommends an additional \$3.0 million for efforts to reduce vehicle weight and improve fuel efficiency by developing low cost, lightweight, high strength metals such as castings, powder metal forgings, and titanium components. In support of Department of Defense efforts to increase manufacturing capabilities of advanced systems based on nanotechnology, the committee recommends an increase of \$4.0 million for nanotechnology manufacturing research.

Alternative energy research

The committee notes that the Department of Defense has begun to make significant efforts to improve energy efficiency of its installations, processes, platforms, and weapons systems. These investments have the promise of reducing Department costs, increasing defense capabilities, and reducing dependence on foreign sources of energy.

In order to support these efforts and expand Department investments in next generation energy technologies, promote technology demonstration and prototyping of advance energy technology systems, and to enhance the Department's role as an aggressive early adopter of novel energy technologies, the committee recommends a set of increases for competitively awarded energy research projects. The committee recommends an increase of \$20.0 million in PE 63005A, \$20.0 million in PE 62123N, \$20.0 million in PE 63216F, and \$20.0 million in PE 63712S for alternative energy research efforts.

Robotic systems

The budget request included \$89.6 million in PE 63005A for research on combat vehicles and automotive technologies. The committee notes the increasing use and value of robotic systems on the battlefield to perform counter-improvised explosive device maneuvers; intelligence, surveillance, and reconnaissance; and other tactical missions. The committee also notes that section 220 of the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (Public Law 106-398) established a goal that by 2015, one-third of the operational ground combat vehicles acquired through the Army's Future Combat Systems program will be unmanned. In support of these goals, the committee recommends an increase of \$24.5 million for the development of robotics systems, vehicle autonomy, and advanced energy and propulsion systems for robotic vehicles. The committee also recommends an increase of \$2.0 million in PE 63711D8Z for robotics operations training efforts. Finally, the committee recommends an increase of \$4.0 million in PE 62624A to continue the testing and development of weaponized unmanned ground vehicle platforms.

Tire development for joint light tactical vehicle program

The budget request includes \$181.6 million for combat vehicle and automotive advanced technology development. The committee recommends an increase of \$1.5 million to continue development efforts for lighter, more agile tires. This project will also sustain a critical manufacturing capability in the defense industrial base, thereby providing the Department with competitive alternatives for critical components in price and supply.

Vehicle energy and power programs

The budget request included \$89.6 million in PE 63005A and \$55.9 million in PE 62601A for combat vehicle research and development. The committee has been supportive of efforts to increase the energy efficiency and performance of combat and tactical vehicles through the application of advanced energy technologies. These technologies can also enable capabilities such as silent watch, extended range, and the provision of mobile electric power, all of which serve to enhance the operational capability of warfighters. To support the development of advanced battery technologies for vehicle systems, the committee recommends an increase of \$23.0 million for battery research and demonstrations.

The committee notes that the Army has been experimenting with a variety of hybrid systems to support Future Combat Systems, trucks, and light tactical vehicles. Consistent with the development of hybrid engines and systems to support military applications, the committee recommends an increase of \$30.6 million for hybrid engines and components.

In support of the development of advanced auxiliary power units (APU) to meet growing vehicle and equipment power requirements, the committee recommends an increase of \$9.0 million for the development of advanced APU systems.

Water analysis technologies

The budget request included \$89.6 million in PE 63005A for combat vehicle and automotive technologies. The committee notes that water represents a significant part of the sustainment requirement for deployed operations. The committee recommends an increase of \$2.0 million for the development of water analysis systems to improve water quality monitoring for deployed forces.

Training and simulation systems

The budget request included \$19.4 million in PE 63015A for next generation training and simulation systems. To enhance training for battlefield lifesaving skills, the committee recommends an additional \$2.5 million for combat medic training systems. The committee notes that the Army's Institute for Creative Technologies has developed a number of computer simulations that are being transitioned into Army training systems. To support these types of efforts, the committee recommends an additional \$4.5 million for joint fires and effects trainer system enhancements.

Mid-size unmanned ground vehicles

The budget request included \$12.0 million in PE 63125A for technologies to combat terrorism. The Army has an established tech-

nology objective to develop near autonomous unmanned systems for a variety of combat missions. In support of this effort, and to encourage systems engineering and prototyping activities, the committee recommends an increase of \$3.5 million for development of mid-size unmanned ground vehicles for counterterrorism missions.

Aircraft survivability systems

The budget request included \$19.2 million in PE 63270A for electronic warfare technologies. The Army has established a technology objective to develop and integrate threat warning sensors and countermeasures to protect aircraft against small arms, rocket propelled grenades, man-portable air defense systems, and other threats. Consistent with that objective, the committee recommends an additional \$2.0 million for development of laser technologies to improve aircraft survivability against missile threats.

Advanced imaging technologies

The budget request included \$64.0 million in PE 63313A for advanced missile and rocket technologies. The Army has a technical objective to develop tactical information technologies for assured network operations and to enable battlefield information sharing. Consistent with that objective, the committee recommends an increase of \$3.0 million for imaging and networking research to enable rapid and precise target discrimination and identification.

Bradley third generation forward looking infrared

The budget request included \$40.3 million in PE 63710A for night vision advanced technology, but provided no funds for third generation infrared technology. The committee recommends an increase of \$5.0 million in PE 63710A for Bradley infantry fighting vehicle third generation forward looking infrared technology development.

Military engineering systems

The budget request included \$5.9 million in PE 63734A for advanced military engineering technologies. The committee recommends an additional \$500,000 for permafrost research to enhance the understanding and implications of permafrost-related geophysical phenomenology on defense infrastructure and systems for current and future operations.

Consistent with efforts to improve Department of Defense energy security and efficiency, the committee recommends an additional \$8.0 million for development of solar cell technologies for use at military installations.

Counter-mortar radar systems

The budget request included \$41.2 million in PE 63772A for advanced tactical computer science and sensor technologies. The National Research Council's 2008 study on "Directed Energy Technology for Countering Rockets, Artillery, and Mortars (CRAM)" highlights the potential need for the development of radar systems that can perform precise tracking of targets in all-weather conditions. In support of that need, the committee recommends an in-

crease of \$4.0 million for research on advanced CRAM radar systems.

Advanced environmental controls

The budget request included \$14.7 million in PE 63305A for Army missile defense systems integration, but no funds for advanced environmental control systems. The committee recommends an increase of \$5.0 million in PE 63305A for the development of thermal management control systems that can support sensors and electronic systems that operate in the harsh environmental conditions required by missile defense systems. The committee notes that advanced environmental control systems have applicability to a variety of military systems that operate in harsh environments.

Advanced electronics integration

The budget request included \$14.7 million in PE 63305A for Army missile defense systems integration, but no funds for advanced electronics integration. The committee recommends an increase of \$4.0 million in PE 63305A for advanced electronics integration to improve state-of-the-art weapon system electronics, with the goal of reducing the size, weight, and cost of electronic components, while also reducing hazardous materials used in such advanced electronics. This effort supports Army objectives for research, prototyping, testing, and production technologies that have potential to produce more efficient, high performance, less hazardous, and lower cost electronics.

Adaptive robotic technology

The budget request included \$14.7 million in PE 63305A for Army missile defense systems integration, but no funds for development of adaptive robotic technology to improve integrated missile defense capabilities. The committee recommends an increase of \$3.5 million in PE 63305A for development of adaptive robotic technology for Army missile defense and space mission requirements, including processes, tools, models, and simulations for improved integration of complex functions and operations.

Joint future theater lift

The budget request included \$8.5 million in PE 63801A for Aviation Advanced Development, but no funds to sustain the technology base and risk reduction activities for advanced tiltrotor platforms, particularly for the joint future theater lift (JFTL) mission. In addition, the Joint Advanced Concepts Office within the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), which has purview over all Department of Defense (DOD) vertical take-off and landing (VTOL) technology, has insufficient resources to conduct analyses, planning, and oversight. The committee is concerned that the Department of Defense is on the verge of losing an opportunity to exploit technology that could enable fundamentally new ground force operational concepts, and provide major energy efficiencies, a baseline for future VTOL aircraft, and major benefits to commercial aviation.

The Army, the Defense Advanced Research Projects Agency (DARPA), U.S. Special Operations Command (SOCOM), the Na-

tional Aeronautics and Space Administration, along with private sector investments, have methodically matured technology for high-performance tiltrotor aircraft. In parallel, the Army, the Army Science Board, and the Defense Science Board, have examined the potential operational benefits and concepts of operation that advanced tiltrotor platforms could enable. The results of these activities indicate that a credible option exists to make large gains in effectiveness that the committee believes the Department must seriously address.

These efforts have been building towards a decision point that DOD must, in any event, soon face: a long-term replacement for the C-130 theater lift capability. The 2008 Air Mobility Master Plan stated that planned initial operational capability for a C-130 replacement is 2021, and, to support that date, that a prototype would need to be flying by 2015. As far as the committee knows, the Department has budgeted no funds for accomplishing this objective.

The Army and the Air Force are currently deadlocked over requirements for the JFTL platform. The Army is proposing requirements that only a high-performance VTOL/short take-off and vertical landing (STOVL) aircraft could meet; the Air Force is insisting on requirements that favor a fixed-wing jet. The committee notes that the Air Force touts that the C-17 is designed for the strategic delivery of troops and cargo directly to forward bases in the deployment area, operating through small, austere airfields. Extrapolating from this, the committee would expect the Air Force to embrace the direct delivery goal on the operational and tactical level.

The Army wants a VTOL/STOVL transport with strategic range that could (1) carry all the Army's ground vehicles except the M-1 tank; (2) support mounted vertical maneuver, including from sea basing; and (3) routinely deliver supplies and equipment directly to the point of need, instead of first to airfields and then via helicopter to forward locations. These missions could be conducted only with a heavy-lift VTOL/STOVL. Because of the ability to deliver cargo directly to the point of need, and the anticipated far greater efficiency of a tiltrotor as compared to helicopter transport, the Army projects that a tiltrotor JFTL would be far more efficient than a fixed-wing replacement for the C-130, providing major fuel savings, in addition to supporting revolutionary operational concepts.

Proponents of advanced tiltrotor concepts in the Army, the Army Science Board, and the Defense Science Board argue also that it could serve as a flexible tanker able to operate from forward locations near the point of need, rather than from distant airbases, including picking up fuel at sea. Proponents foresee that a large tiltrotor would also have major benefits for commercial aviation in relieving congestion at airports. Scaled down in size, proponents believe that advanced tiltrotor platforms would provide tremendous gains in performance and efficiency over current helicopters, and could become the basis in the future for higher-performing unmanned aerial vehicles.

The committee is aware that, for a number of years, the Army Science Board has recommended that the best way to resolve or

prove whether these capabilities are realistic is to conduct a competitive prototyping effort. The Defense Science Board in 2008 (Report on DOD Energy Strategy) made a similar, strongly worded recommendation.

The cost of such a prototyping effort would be substantial if it were conducted in the normal manner. Moreover, a plan to wait to conduct a competitive prototyping effort as part of an acquisition program would take years to begin, and presupposes that the current requirements dispute is resolved and that there is confidence in the cost and performance estimates of an advanced tiltrotor. This scenario seems unlikely, but possible, provided funds are forthcoming to sustain the industrial base in the interim.

An alternative would be to initiate now a competitive prototype of an advanced tiltrotor independent of a program of record and a formally approved requirement in the most streamlined manner possible. This is the approach used successfully to prototype the aircraft that became the F-16 and F-18 fighters, which was relatively inexpensive.

The committee is aware that DARPA offered to fund half the cost of this type of prototyping effort if a suitable partner would step forward. In addition to the Army and Marine Corps, potential participants include SOCOM and the Central Intelligence Agency, which could value, for a variety of sensitive missions, an efficient, large, and long-range aircraft that requires no runway.

The committee directs that the USD (AT&L), in consultation with the Vice Chairman of the Joint Chiefs of Staff, report to the congressional defense committees by December 1, 2009, on:

1. Plans to sustain the tiltrotor risk reduction activities for a JFTL;
2. How the Department intends to determine whether the revolutionary benefits of a heavy lift tiltrotor can be realized so that the Department may make an informed decision on the C-130 replacement program; and
3. The merits of initiating a low-cost, highly streamlined competitive prototyping effort immediately, at an appropriate scale to cover all potential mission applications, to determine whether cost and performance goals can be met, to help define requirements, and to sustain the industrial base.

The committee also recommends authorization of \$58.5 million for Aviation Advanced Development, an increase of \$50.0 million above the request, to sustain the tiltrotor industrial base through risk reduction activities. The committee recommends authorization of \$3.0 million in PE 63200D8Z, Joint Advanced Concepts Office, for planning and oversight of VTOL programs and activities across the Department.

Finally, the committee urges the Vice Chairman of the Joint Chiefs, as Chairman of the Joint Requirements Oversight Council, to ask the combatant commanders (COCOM) to provide detailed views on the requirements for JFTL. The committee notes that section 105 of the Weapon System Acquisition Reform Act of 2009 (Public Law 111-23) requires input from the COCOMs.

Logistics and engineer equipment-advanced development

The budget request includes \$32.1 million in PE 63804A for the ongoing development of the joint light tactical vehicle (JLTV). The committee continues to support the Army and Marine Corps development of a next-generation family of light tactical vehicles. However, the committee understands that the Army and Marine Corps lack a long-term tactical wheeled vehicle strategy. Additionally, the committee is concerned about the uncertainty in the services' plan to incorporate the sizable fleet of mine resistant ambush protected vehicles (MRAP) and the MRAP all-terrain-vehicle (M-ATV), which is still in development. Further, the committee believes that lessons learned from the eventual deployment of the M-ATV in Afghanistan will ultimately benefit the JLTV program and that JLTV should be more appropriately phased to incorporate these lessons.

Therefore, the committee recommends a decrease of \$10.0 million in funding for the JLTV program. This decrease is in addition to the committee's \$12.0 million reduction in the Marine Corps' funding request for the JLTV program.

Next-generation helmet ballistic materials technology

The budget request included \$74.8 million in PE 64601A for infantry support weapons. The committee notes that the Army is accelerating research and development of materials to increase personal protective equipment while reducing its weight. The committee recommends an increase of \$3.0 million in PE 64601A for next-generation helmet ballistic materials technology.

Type classification of the lightweight .50 caliber machine gun

The budget request included \$1.9 million in PE 64601A for the development of the lightweight .50 caliber machine gun. The committee recommends an increase of \$5.0 million in PE 64601A to complete the type classification of the lightweight .50 caliber machine gun.

Future combat system non-line of sight cannon

The budget request included \$58.2 million in PE 64647A for the contract termination liability associated with the cancellation of the Future Combat Systems (FCS) non-line of sight cannon (NLOS-C).

The Department of Defense has directed the cancellation of the FCS Brigade Combat Team acquisition program and issued a stop-work order with respect to the NLOS-C pending resolution of statutory requirements for system fielding. The committee understands that as of June 2, 2009, \$215.9 million in fiscal year 2009 research and development, procurement, and advanced procurement funds for FCS NLOS-C has not been executed. Final termination liability will not be negotiated until the program is formally cancelled; however, unexecuted funds currently available in the program appear adequate to cover the potential cost. Therefore, the funds requested for fiscal year 2010 are unjustified.

The committee notes that the Army has been attempting to modernize its armored self-propelled howitzer fleet for several years. The cancellation of the NLOS-C, following cancellation of the Crusader program in 2002, means that the current self-propelled how-

itzer system, the M109A6 Paladin, may remain the workhorse of the Army's armored artillery for several more years.

In 2008, the Army started the Paladin Integration Management (PIM) program to modernize and upgrade the M109A6 Paladin. The PIM program is part of the Army's overall heavy force management strategy to ensure the sustainability of current armored weapon systems capabilities. Planned Paladin upgrades to improve power train, suspension, power management, and electronic subsystems will support the modernization of fire control, navigation, communications, and gun drive systems. All these improvements will increase the Paladin's performance and reliability, reduce life cycle costs, and address electronic obsolescence issues to meet the Army's needs to 2050.

Accordingly, the committee recommends a decrease of \$58.2 million in PE 64660A and an increase of \$58.2 million in PE 64854A to complete testing, continue cost reduction efforts, and accelerate low rate initial production of the PIM program.

The committee further notes that the most mature prototype FCS NLOC-C technologies were those mission module components that were in some cases carried forward from the cancelled Crusader program. These weapons system technologies applied to M109A6 Paladin could have the potential to significantly improve the accuracy, reliability, and responsiveness of indirect fire support. The committee acknowledges that the Paladin PIM program provides critical capability updates for the M109A6 Paladin for today's heavy force. At the same time, the committee notes the need for a networked next-generation self-propelled howitzer program that keeps pace with other Army weapons modernization programs.

The committee therefore directs that the Army conduct an analysis of the technical feasibility, suitability, and affordability of upgrading the M109A6 Paladin with NLOS-C mission module components, such as fire control, munitions handling, and crew station capabilities. The Army shall provide the congressional defense committees with a report on the results of this analysis not later than September 30, 2009. The report required is not intended to delay the current PIM development or production schedule.

Future combat system manned ground vehicles and common ground vehicle

The budget request included \$368.6 million in PE 64660A for the contract termination liability associated with the cancellation of the Future Combat Systems (FCS) manned ground vehicle (MGV).

The Department of Defense has directed the cancellation of the FCS Brigade Combat Team program and initiation of a new Army ground vehicle program. After re-evaluating requirements, technology, and approach, the Department of Defense will re-launch the Army's combat vehicle modernization program, including a competitive process.

The committee understands that as of June 2, 2009, \$612.7 million in fiscal year 2008 and 2009 funds for FCS MGV has not been executed. Final termination liability has not been negotiated; however, unexecuted funds currently available in the program appear adequate to cover the potential cost. Therefore, the funds requested for fiscal year 2010 are unjustified.

Accordingly, the committee recommends a decrease of \$323.6 million in PE 64660A.

The committee agrees with the Secretary of Defense's assessment that the Army does need a next-generation ground combat vehicle modernization program and believes that the funds requested are better invested in related armored and tactical vehicle research and development activities. The committee recommends increases as follows for research and development activities to support Army ground vehicle modernization:

[In millions of dollars]

PE 62601A Army vehicle modernization research	\$25.0
PE 62618A Army vehicle survivability research	\$25.0
PE 63005A Army vehicle modernization technologies	\$50.0
PE 63653A Advanced tank armament systems	\$50.0
PE 64604A Medium tactical vehicle development	\$10.0
PE 64622A Heavy tactical vehicle development	\$10.0
PE 78045A Combat vehicle manufacturing technology	\$30.0

Elsewhere in this report, the committee recommends increases for additional high priority Army vehicle research and development projects.

The committee further recommends that all of the \$45.0 million remaining in PE 64660A shall be available only for the research and development of active protection systems for light, medium, and heavy vehicles against the full range of threats, including rocket-propelled grenades, antitank guided missiles, kinetic energy rounds, and other threats. The committee believes that these funds should be used to leverage ongoing live fire testing activities previously mandated by Congress, to develop common active protection system (APS) components that can be used for a variety of vehicle types, and also to address specific APS vehicle integration issues.

Urban training development

The budget request included \$30.2 million in PE 64715A for engineering development of non-system training devices. The committee recognizes the importance of developing up to date concepts and systems for training joint military operations in complex urban terrain that will increase unit effectiveness at reduced training costs. The committee recommends an increase of \$3.0 million in PE 64715A for research projects leading to the development of concepts and systems for joint military training in urban terrain and cultural environments.

Common guidance control module

The budget request included \$23.1 million in PE 64802A for development of precision guidance systems for artillery and mortar munitions. The committee recommends an increase of \$7.5 million in PE 64802A to accelerate the development of a common guidance control module adapted to the precision guidance kit for 105mm howitzer munitions.

Army test and evaluation programs

The budget request included \$51.8 million in PE 64759A for major test and evaluation investment. The committee notes that this account funds the operations, sustainment, and modernization

of Army test ranges. These ranges are critical to the delivery of operational systems to deployed forces since they provide the facilities and infrastructure for both the developmental and operational testing of defense systems to validate their operational effectiveness, suitability, and reliability.

The committee notes that the Director of the Test Resource Management Center has not certified the Army's fiscal year 2010 test budget after analyses indicated there was insufficient funding in this account to support the projected workload. The insufficient request in the fiscal year 2010 budget seems to indicate to the committee that the Army is willing to take risks with the effectiveness of both Army and other joint systems by providing inadequate testing resources. Risking inadequate testing resources can quickly lead to unknowable consequences for the cost and effectiveness of deployed systems as well as for the warfighters who depend on those systems. The committee directs the Secretary of the Army to work more closely with the Undersecretary of Defense for Acquisition, Technology, and Logistics to ensure that future Army investments in test resources is sufficient to meet the projected workload requirements of the users of Army test facilities. The committee recommends an increase of \$25.6 million in PE 65601A to correct the Army's underfunding of this account.

The budget request included \$2.9 million in PE 65605A for the Department of Defense High Energy Laser Test Facility (HELSTF). The committee notes that in 2009, the Army will complete a significant upgrade of the facility by adding a solid-state laser source from the Joint High Power Solid State Laser program. Following these upgrades, the Army plans to use the facility beginning in 2010 for tests associated with the High Energy Laser Technology Demonstrator program. To support these activities, the committee recommends an increase of \$6.0 million for HELSTF.

The committee notes that the Dugway Proving Grounds is the Department of Defense's premier testing facility for chemical and biological defense systems. To support the development of these capabilities, the committee recommends an increase of \$7.0 million for data fusion and test equipment improvements.

To help address the integration of test and training activities between Fort Bliss, White Sands Missile Range, and Holloman Air Force Base, the committee recommends an increase of \$3.0 million for tools for frequency management, airspace deconfliction, and real-time monitoring of ranges.

3D woven preform technology for Army munitions

The budget request included \$45.0 million in PE 65805A for munitions standardization, effectiveness, and safety, but provided no funds for 3D woven preform technology. The committee recommends an increase of \$2.2 million in PE 65805A for 3D woven preform technology for Army munitions applications.

Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System

The budget request included \$360.1 million in PE 12419A for continued development of the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS). The committee

notes that the JLENS program schedule has slipped by 1 year since last year. Accordingly, the committee recommends a reduction of \$20.0 million in PE 12419A for the JLENS program.

TOW missile improvements

The budget request included no funds in PE 23802A for other missile product improvements. The committee recommends an increase of \$5.0 million in PE 23802A for TOW missile improvements to demonstrate a new propulsion system that will be insensitive-munitions compliant, reduces time of flight, and extends the missile's maximum effective range beyond 5,000 meters.

Joint tactical ground station

The budget request included \$13.3 million in PE 28053A for Research, Development, Test, and Evaluation, for the Joint Tactical Ground Station (JTAGS), and \$6.7 million in Other Procurement, Army, line 70. The committee concludes that this program is an unnecessary expense since the Air Force provides the same missile warning data through the same principal data dissemination means—the Global Broadcast System. The Air Force also maintains survivable direct downlink and processing capabilities for assured injection into the broadcast. The committee recommends no funding in these accounts for JTAGS.

Collection management tools development

The budget request included \$2.1 million in PE 33028A for Research, Development, Test, and Evaluation, for Security and Intelligence Activities, but no funds to sustain the program to develop and improve automated tools for tasking the all-source intelligence collection process on foreign missile threats, from the identification of collection requirements through optimization of collection system deployment. The committee recommends an authorization of \$5.0 million above the requested amount for this activity.

A160 hummingbird

The budget request included \$202.5 million for Research, Development, Test, and Evaluation, in PE 35204A for Army Tactical Unmanned Aerial Vehicles (UAV), but no funds for the A160 Hummingbird. The A160 was developed by the Defense Advanced Research Projects Agency (DARPA) and has completed successful demonstrations. The A160 can carry a larger payload than the Predator with the same endurance and range, but, as a helicopter, is not dependent on any sort of prepared runway surface. The optimal speed rotor on the A160 makes it quiet and fuel efficient. There is every reason to believe that the A160, when matured through the accumulation of flight time, will be an excellent platform with huge potential across multiple mission areas.

DARPA developed the A160 along with the Foliage Penetration Reconnaissance, Surveillance, Tracking and Engagement Radar (FORESTER). This radar has a demonstrated capability to detect and track people walking beneath forest canopy at substantial range, but only when operated from a motionless platform like the A160. DARPA's objective was to produce a system that could support special forces and conventional forces in conducting surveil-

lance in the forest and jungle, such as in U.S. Southern Command (SOUTHCOM).

Congress and DARPA have already funded the production of a significant number of A160 airframes, in various configurations, most of which are owned by U.S. Special Operations Command (SOCOM). SOCOM has budgeted significant funds for an upcoming 4-month duration operational deployment to SOUTHCOM. However, SOCOM lacks the resources to sustain the factory and workforce that build the A160. Without additional funding by the start of fiscal year 2010, the factory will shut down, which could, practically speaking, mean the end of the program before users can determine fully its value. This situation is a reflection of DARPA's recurring problem in transitioning even its most successful technology developments.

The committee is dismayed at the prospect of the A160 program dying. It is very hard to conceive that the Department of Defense (DOD) would have no use for an endurance vertical take-off and landing (VTOL) UAV that requires no airfield and carries a large payload. Fortunately, the Army and the Intelligence, Surveillance, and Reconnaissance (ISR) Task Force have begun to take notice of this platform and recognize its potential. The Army G2 has indicated to the committee that the Army wants to deploy four A160 aircraft to Afghanistan, to be flown with the FORESTER or another radar that is also designed to detect humans walking, only in the open rather than under foliage. This radar, called the vehicle and dismount exploitation radar (VADER), also was developed by DARPA and the Joint Improvised Explosive Device (IED) Defeat Organization.

VADER does not have to be operated on a motionless platform to detect the movement of dismounted people, but platform speed affects performance. Above a certain platform speed, VADER cannot discriminate small target velocities from platform motion-induced clutter. The committee understands that the ISR Task Force intends to deploy VADER to Afghanistan as soon as possible. The VADER radar is too large for the Predator-1B and even the Predator-1C UAVs. The Task Force reluctantly decided to deploy on the Reaper UAV, and reportedly will seek funding in a reprogramming request.

However, the Reaper minimum airspeed is at the limit of where VADER is calculated to be able to detect dismounts, and is therefore a poor candidate for an initial deployment, at least until more sophisticated versions of VADER are available. The A160, in contrast, would be an excellent match for VADER, as it is for FORESTER. The committee therefore urges DOD to alter any planned reprogramming request to direct funds to an A160 deployment, as outlined here.

To support a sustained A160 deployment to Afghanistan, DOD would need to standardize existing SOCOM airframes, and manufacture new ones. These activities would sustain the factory and workforce through the end of fiscal year 2010 and, significantly, through the deployment to SOUTHCOM and part of the deployment to Afghanistan. The expectation is that, by that time, the A160 will have accumulated enough flight time to determine its vi-

tality and utility. At that point, DOD could make a fully informed decision on transitioning the A160 to a program of record.

The committee recommends \$288.5 million, \$86.0 million above the request, to support the sustained deployment of the A160 to Afghanistan with the FORESTER and VADER systems, including the production of five additional aircraft.

Army manufacturing technologies

The budget request included \$68.5 million in PE 78045A for manufacturing technologies. Among the Army's manufacturing technology program goals are the development of advanced manufacturing processes, enhancing quality while reducing cost, and transferring improved manufacturing technologies to the industrial base. In support of those goals, the committee recommends increases of \$2.0 million for the development of software-based intelligent manufacturing techniques to reduce costs of systems production; \$2.75 million for manufacturing metrology research; and \$2.5 million for repair technology development for aging and battle-damaged equipment.

Navy

Navy basic research

The budget request included \$531.3 million for Navy basic research activities. The Navy's survivability and self-defense science and technology focus area has a specific objective to develop advanced construction materials for survivable platforms. In support of that objective, the committee recommends an additional \$2.0 million in PE 61153N for blast and impact resistant structures, and an increase of \$2.0 million for research on nanoscale materials.

In support of efforts to train the next generation of defense scientists and engineers, the committee recommends an increase of \$1.0 million in PE 61152N for education outreach programs.

Energetics research

The budget request included \$59.8 million in PE 62114N for applied research on power projection technologies. The committee recommends an additional \$3.0 million for research on advanced energetic materials to support efforts to counter new types of asymmetric threats such as chemical-biological weapons as well as increasing capabilities to defeat deeply buried targets.

Navy force protection research

The budget request included \$91.4 million in PE 62123N for applied research on force protection technologies. The Navy's power, energy science, and technology focus area has a goal to develop efficient power conversion technologies with a wide range of energy sources to provide reliable power to a range of naval systems. To support this goal, the committee recommends increases of: \$4.0 million for research on integrated power systems for future platforms that have all-electric propulsion and weapon loads and \$2.5 million for research on reconfigurable shipboard power systems to increase system reliability and survivability.

The Navy's survivability and self-defense science and technology focus area seeks to enhance force protection by using innovative sensors to help detect and defeat incoming attacks. In support of that initiative, the committee recommends an increase of \$3.5 million for the development of port security sensors for under-hull inspection of ships.

Consistent with the Navy's platform mobility technology objectives to develop new advanced platform designs supporting new directions in naval warfare, such as increased agility, the committee recommends an increase of \$2.0 million for continued design and development of composite high-speed boats.

Warfighter sustainment technologies

The budget request included \$104.2 million in PE 62236N for applied research on warfighter sustainment technologies.

In support of continuing Navy and Department of Defense initiatives to reduce corrosion cost, the committee recommends an additional \$4.0 million for efforts on the development of sustainment and remanufacturing processes, asset health and logistics management techniques, and materials aging and corrosion abatement technologies.

The Department of Defense anti-tamper program seeks to deter the reverse engineering and exploitation of critical technology in order to impede technology transfer, stop alteration of system capability, and prevent the development of countermeasures to U.S. systems. In support of these efforts, the committee recommends an additional \$1.0 million in PE 62236N for research on anti-reverse engineering nanodevices, as well as an increase of \$3.0 million in PE 65790D8Z for research on anti-tamper software.

Advanced antenna technologies

The budget request included \$64.8 million in PE 62271N for applied research on electromagnetic systems. The Navy is seeking to reduce the number and size of antennae needed on ships but still maintain all necessary radar, communication, target tracking, and imaging capabilities. To support these efforts, the committee recommends an additional \$3.0 million for advanced digital radar systems.

Advanced unmanned underwater vehicle research

The budget request included \$48.8 million in PE 62435N for applied research on ocean warfighting environments. The Navy's platform mobility science and technology focus area includes the goal of development and delivery of system and equipment technologies to improve the performance of sea platforms to meet operational requirements. In support of this goal, the committee recommends an increase of \$3.5 million for advanced unmanned undersea vehicle research.

In order to support Navy efforts to enhance the understanding of optical propagation within challenging ocean environments in support of mine countermeasures and underwater autonomous network communications, the committee recommends an additional \$2.0 million for research on extended range underwater imaging sensors and optical communications networks.

Undersea warfare systems

The budget request included \$55.7 million in PE 62747N for applied research on undersea warfare technologies. The committee notes that undersea unmanned gliders are being developed for use in intelligence, surveillance, and reconnaissance and anti-submarine warfare missions. In support of those efforts, and to promote systems engineering and prototyping activities, the committee recommends an increase of \$3.0 million for littoral glider development.

Low observable platforms

The budget request included \$40.9 million in PE 62782N for applied research on mine and expeditionary warfare capabilities. To support Navy science and ethnology objectives to develop multi-spectral low observable technologies to improve platform stealth, the committee recommends an additional \$2.0 million for the development of electromagnetic signature assessment systems, and an increase of \$750,000 in PE 62747N for quiet, compact power systems for naval platforms.

Mobile intelligence and tracking systems

The budget request included \$108.0 million in PE 63114N for advanced technologies for power projection. The Navy has a science and technology objective to develop data fusion and analysis technologies for actionable intelligence generation to defeat adaptive irregular threats in complex environments. In support of that objective, the committee recommends an increase of \$4.0 million for research on data processing and fusion technologies to support multiple simultaneous detections, tracking, identification, and targeting of asymmetric and mobile threats in combat operations.

Force protection advanced technology

The budget request included \$66.0 million in PE 63123N for force protection advanced technology. This program addresses applied research associated with providing force protection capability for all naval platforms.

The budget request included no funding to develop advanced coating process technologies for naval aviation platforms and components. The committee believes that advancements in technologies, such as thermal/plasma spraying and physical/chemical vapor deposition would be suitable for naval aviation components. For example, these spray and vapor deposition technologies have the potential to produce thermal barrier coatings using conventional ceramics/metals or even novel nano-materials that produce the same or better properties than currently available exotic materials, while achieving substantial savings. The committee recommends an increase of \$3.0 million for developing and testing the advanced coating process technologies in manufacturing and remanufacturing naval aviation components.

The budget request included no funding for development of a lithium battery technology that could replace one of the three generators normally in operation or reserve aboard all large Navy ships. If lithium battery technology could be scaled up to a capacity of roughly 2.5 megawatts, such a battery would replace one of the

three ship service generators normally in operation or in reserve aboard all surface combatants. Such a battery system could provide a lower cost, higher quality source of electrical power that would replace redundant back-up power sources dedicated to subsystems throughout the ship. The committee recommends an increase of \$5.0 million to enable the development of such lithium battery technology.

The committee recommends a total authorization of \$74.0 million in PE 63123N for force protection advanced technology.

High-integrity global positioning system

The budget request included \$59.1 million in PE 63235N for the High-Integrity Global Positioning System. The committee recommends no funding for this program. The committee notes that there is still no demonstrated user for the concept; moreover the cost of implementing the concept would be very high and require additional expensive user equipment. It is also not clear how the approach is being considered or how the required hardware modifications are being coordinated with the Joint Tactical Radio System open architecture approach.

Marine Corps advanced technology demonstrations

The budget request included \$107.4 million in PE 63640M for Marine Corps advanced technology demonstrations. The most recent Marine Corps Science and Technology Strategic Plan identifies science and technology objectives related to development of high information content tactical sensors and urban-specific situational awareness capabilities. In support of those objectives, the committee recommends an increase of \$7.5 million for the development of acoustic sensors systems for ground warfare missions.

The Marine Corps Science and Technology Strategic Plan has a specific technology objective of developing advanced robotics systems for ground combat. In support of that objective, the committee recommends an additional \$2.0 million for the development of unmanned ground vehicle systems.

Semi-submersible unmanned undersea vehicle

The budget request included \$116.1 million in PE 63207N for air/ocean tactical applications. This program identifies new state-of-the-art government and commercial technologies, transitions, demonstrates, and integrates them into Navy combat systems that determine the operational effects of the physical environment on the performance of combat forces and their new and emerging platforms, sensors, systems, and munitions.

The budget request included no funding to develop a semisubmersible unmanned undersea vehicle (UUV) that could be used to evaluate new sensor technologies and reduce risk of employing them in regular Navy applications.

The committee understands that at least one such vehicle has been designed and completed development, and with modest additional funding, could complete launch and recovery validations and demonstrate UUV performance.

The committee recommends an increase of \$1.4 million in PE 63207N for these purposes.

Sonobuoy wave energy module

The budget request included \$16.6 million in PE 63254N for anti-submarine warfare systems development, but included no funding for developing technology that would extend the in-water life of sonobuoys. One such technology would rely on wave energy to recharge batteries of operating sonobuoys. The committee understands that this technology could also yield the benefit of replacing existing batteries with lighter, and more environmentally friendly power sources.

The committee recommends an increase of \$4.0 million in PE 63254N for maturing this wave energy application for sonobuoys.

Shipboard system component development

The budget request included \$1.7 million in PE 63513N for shipboard system component development, but included no funding for developing a hybrid propulsion system for the DDG-51 Aegis destroyer.

The committee believes that such a system installed on a DDG-51 would pay back the investment very quickly, as it would save potentially thousands of barrels of fuel per ship per year. The committee recommends an increase of \$9.3 million to design, build and test a hybrid electric drive system for DDG-51 destroyers.

The committee recommends a total authorization of \$11.0 million in PE 63513N for shipboard system component development.

Remote monitoring and troubleshooting project

The budget request included \$22.5 million in PE 63563N for ship concept advanced design activities, but included no funding for developing and implementing a remote monitoring and troubleshooting capability that would allow Navy engineers to provide global remote sustainment support to the fleet by remotely reading on-board sensors, monitoring shipboard system status, and providing expert advice to sailors as they maintain and repair ship systems. The committee believes that such a capability would yield savings, but, perhaps more importantly, lead to better readiness levels.

Therefore, the committee recommends an increase of \$5.8 million in PE 63563N for developing and fielding this capability.

Marine Corps ground combat/support systems

The budget request includes \$58.0 million in PE 63635N for the ongoing development of the joint light tactical vehicle (JLTV). The committee continues to support the Army and Marine Corps development of a next generation family of light tactical vehicles. However, the committee understands that the Army and Marine Corps lack a long-term tactical wheeled vehicle strategy. Additionally, the committee is concerned about the uncertainty in the services' plan to incorporate the sizable fleet of mine resistant ambush protected vehicles (MRAP) and the MRAP all-terrain-vehicle (M-ATV), which is still in development. Further, the committee believes that lessons learned from the eventual deployment of the M-ATV in Afghanistan will ultimately benefit the JLTV program and that JLTV should be more appropriately phased to incorporate these lessons.

Therefore, the committee recommends a decrease of \$12.0 million in funding for the JLTV program. This decrease is in addition to the committee's \$10.0 million reduction in the Army's funding request for the JLTV program.

Model-based management decision tools for ground vehicles

The budget request included \$73.8 million in PE 63635M for Research, Development, Testing, and Evaluation, of Marine Corps Ground Combat and Support Systems, but no funds for model-based management decision tools for ground vehicles.

The development of modern ground combat vehicles is more difficult due to the growing complexity of vehicle armor, suspension, electronics, and weapons. This complexity increases development time and expense, including the time to test components and subsystems. Computer simulation technology, however, is now robust enough to accurately model and simulate the behavior of multiple components simultaneously (co-simulation). Full-vehicle co-simulation could lower costs, speed development, and improve designs.

Therefore, the committee recommends an authorization of \$78.3 million, an increase of \$4.5 million for computer simulation tools for ground vehicle design and evaluation.

Navy energy program

The budget request included \$8.5 million in PE 63724N for the Navy energy program. The Navy has indicated that the budget request is not funding any energy research programs outside those in science and technology accounts and was unable to provide additional justification for the projects to be funded with the money requested in this program element. Therefore, the committee recommends a reduction of \$8.476 million from this account to reflect a lack of coordination with other Navy energy research investments.

Navy energy research

The budget request included \$8.5 million in PE 63724N for the Navy energy program. This program works to evaluate, adapt, and demonstrate energy related technologies for Navy aircraft and ship operations. In support of these goals the committee recommends an increase of \$5.5 million for the development of fuel cell technologies for naval applications, and an additional \$4.75 million for solar heat reflective materials to reduce cooling requirements.

Optical interconnect

The budget request included \$4.3 million in PE 63739N for Navy logistics productivity initiatives, but included no funding to develop low cost, high quality fiber optic interconnect technology for military aerospace application. 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 systems will depend upon tightly integrated optical fiber solutions, also known as optical interconnect. This solution optimizes space utilization while achieving high bandwidth, decreased weight, immunity to electromagnetic interference, resistance to corrosion, and improved safety

and security. The Navy has requirements for next-generation optical interconnect technology for several aircraft platform systems, and anticipates that this technology could be applied to Navy vessels as well. The committee recommends an increase of \$4.0 million to develop this important technology.

Radio frequency identification technology program

The budget request included \$4.3 million in PE 63739N for Navy logistics productivity initiatives, but included no funding to develop next-generation logistics management models that would allow the Department of the Navy and the Department of Defense to exploit the full potential of radio frequency identification (RFID) systems. The Department of Defense continues to field RFID systems, but has yet to exploit the full potential of the information available from RFID systems and the contribution such information could make to improving logistics management information systems. The committee recommends an increase of \$1.0 million to improve the decision support capability of existing logistics models and develop better algorithms for these models.

Mobile maritime sensor development

The budget request included \$190.0 million in PE 64501N for development efforts in support of a next-generation cruiser, CG(X). CG(X) is planned to be the replacement for the CG-47 class cruiser, with primary missions including air and missile defense. The Navy's last long-range shipbuilding plan proposed to procure the first ship of the CG(X) program in 2011. That schedule was clearly too optimistic.

Part of the delay came from questions about the CG(X) Analysis of Alternatives (AoA), called the Maritime Air and Missile Defense of Joint Forces (MAMDJF) AoA. One problem has been that demanding threat requirements have led to very demanding sensor requirements, some of which could only be fit on a cruiser-size vessel by achieving major technology breakthroughs.

Another cause of the delay was that, as the committee understands it, the Secretary of the Navy was asking questions about potential contributions of off-board, networked sensors and why the MAMDJF vessel had to be self-sufficient for target acquisition and tracking.

The committee recognizes that there are at least two other platforms within DOD inventories that could provide the basis for developing a more robust off-board sensor augmentation. Such an incremental development approach might not require that the Navy make such heroic technology improvements in surface combatant radar technology. These are the Navy's own programs to develop a Cobra Judy replacement vessel, and the Missile Defense Agency's Sea-Based X-Band radar.

A mobile maritime sensor could improve upon the performance of either of these radars by making more modest technology improvements that could provide requisite capability for radars that would be less risky, cheaper to acquire and operate, and potentially available sooner than sensors that must provide equivalent performance from within the relatively constrained confines of a surface combatant.

The committee recommends an increase of \$50.0 million to: (1) develop a radar architecture that would provide full field of view; (2) design of a partial array prototype; (3) develop, build, and test components of such an array; and (4) fabricate and test a partial array prototype. Information resulting from such an effort could provide valuable information upon which to base informed decisions about the best way to support the maritime air and missile defense mission.

Submarine communications at speed and depth

The budget request included \$122.7 million in PE 64503N, including \$16.2 million to continue development of capabilities to communicate with submarines when they are operating at normal depths and speeds. Such communications capability would permit submarines to provide better support to other forces in a battle group, while allowing submarines to maintain their stealthy posture.

The Navy has embarked on a program to develop this capability that is divided into two parts: Increment 1 and Increment 2. The Increment 1 program will bring some currently available, expendable buoy technologies to the fleet over the next 2 years.

The Navy plans to begin the Increment 2 program in fiscal year 2011. This program will include submarine-towed buoy systems to provide more persistent connectivity to submarines operating below periscope depth. However, the committee does not believe that the Navy has provided sufficient funding in the fiscal year 2010 budget request to develop the advanced technologies required in order to implement this next phase of the program.

The committee recommends an increase of \$5.0 million to develop these technologies.

Mold-in-place coating development

The budget request included \$154.8 million in PE 64558N to support design and development activities for submarines, but included no funding for developing a mold-in-place technology for installing or restoring advance submarine hull coatings. Since current techniques for installing these coatings are expensive and manpower intensive, having a process available that would reduce the time and effort to install or replace these coatings would yield savings to the Navy.

The committee recommends an increase of \$2.0 million to develop this capability.

New design SSN

The budget request included \$154.8 million in PE 64558N to support design and development activities for submarines, but included no funding for developing a common command and control module for application to *Virginia*-class submarines or a potential Trident replacement program.

The committee understands that the Navy could design a new command and control module for submarines that would enable rapid reconfiguration of mission equipment in these spaces, reduce the demands on watch standers, and reduce the total ownership costs to the Navy for supporting disparate command and control

configurations. Starting such a design now would permit the Navy to take best advantage of potential savings from achieving a common configuration in the fleet.

Therefore, the committee recommends an increase of \$9.0 million in PE 64558N to support these development activities.

Submarine tactical warfare system

The budget request included \$59.7 million in PE 64562N for developing enhancements to submarine combat control systems.

The budget request included no funding for developing an artificial intelligence-based combat systems kernel. Such a kernel would use expert systems, advanced signal and data processing, and mission-focused human systems integration to introduce much higher levels of automation that would optimize manning and increase command decision and combat system performance. The committee recommends an increase of \$5.0 million to support this development.

The budget request included no funding for developing a weapon acquisition and firing system (WAFS). Today's weapons systems are complex and require many manual procedures using reference documents to determine weapon settings and tactics while ensuring the safety of ships by employing proper weapon safety settings. This cumbersome process is too slow and error prone in many close combat situations. The WAFS provides a data fusion capability that can automatically develop an accurate target solution based on acoustic and non-acoustic sensors, eliminating the need for reference documents and lowering ship manning requirements. The committee recommends an increase of \$4.0 million to initiate research and development efforts as well as allowing for at-sea testing and implementation of real-time algorithms and associated in-board electronics necessary for installing WAFS on legacy and future classes of submarines.

The budget request included no funding for developing a submarine environment for evaluation and development. The Naval Undersea Warfare Center has created a futuristic submarine attack center to evaluate new command decision aids in a realistic environment. This facility has provided a low-cost, easily accessible testbed for small businesses, academia, and production system developers to create and test innovative technologies without incurring the expense of creating their own test facility. This has led to getting better technology to the fleet more quickly. The committee recommends an increase of \$4.0 million to expand this activity to improve the ability to perform proof of concept testing and concept of operations testing with fleet sailors using current submarines systems augmented by new technologies.

The committee recommends a total increase of \$13.0 million in PE 64562N for the submarine tactical warfare system programs.

Automated fiber optic manufacturing

The budget request included \$90.0 million in PE 64567N for ship contract design, but included no funding to build on an Office of Naval Research initiative to provide automated manufacturing for military-grade fiber optic assemblies for aircraft carriers and other naval vessels. The committee believes that such an activity could:

(1) improve the quality, reliability, and cost of such assemblies; and (2) facilitate field installation and maintenance of such systems for vessels while they are deployed. The committee recommends an increase of \$2.0 million to continue this development.

Autonomous unmanned surface vehicle

The budget request included \$35.5 million in PE 64755N for ship self-defense (detect and control) projects, but included no funding for the autonomous unmanned surface vehicle (AUSV) program. The AUSV program supports the U.S. Navy's anti-terrorism, force protection, and homeland defense missions. The AUSV can protect commercial harbors, coastal facilities such as commercial and military airports and nuclear power plants, inland waterways, and large lakes. The vessel will utilize a variety of advanced sensing and perimeter monitoring equipment for surveillance and detection of targets of interest. The committee recommends an increase of \$5.0 million to continue this development.

Next-generation Phalanx

The budget request included \$34.2 million in PE 64756N for ship self-defense (hard kill), but included no funding for next-generation Phalanx. The Phalanx weapon system is the Navy's principal close-in weapon system for ship self-defense, and has proven to be extremely adaptive for performance against emerging air and surface target sets. The continually evolving nature of the threat, unique challenges posed by operations in the littorals, increased emphasis on single ship probability of raid annihilation, and fact of life technology obsolescence require a continued development effort to sustain the superior performance of this critical ship self-defense system. The committee recommends an increase of \$12.0 million in PE 64756N for the continued development of the next-generation Phalanx.

NULKA anti-ship missile decoy system

The budget request included \$88.9 million for ship self-defense soft-kill systems development in PE 64757N, including \$4.8 million for various development activities related to the NULKA anti-ship missile decoy system.

The Navy has identified a series of development activities associated with the NULKA system that are required to understand and deal with emerging threats:

- (1) continue to pace anti-ship cruise missile threats with long pulse capability by incorporating radio frequency and digital design enhancements;
- (2) design an architecture that will ensure flawless operation with the SPY-3 multi-function radar (MFR);
- (3) integrate into NULKA into the Navy's Aegis weapon control system open architecture; and
- (4) provide shipboard test and trial support.

The committee recommends an increase of \$9.0 million for the NULKA development program to continue these efforts.

Navy medical research

The budget request included \$9.9 million in PE 64771N for medical systems development. To support efforts to protect deployed forces from infectious diseases, the committee recommends an increase of \$3.5 million for research on dengue fever vaccines. To support efforts to treat injured service members, the committee recommends an additional \$2.0 million for research on composite tissue transplantation techniques for treatment of traumatic injuries, an additional \$3.0 million for the development of advanced orthopedic surgical instrumentation, and an additional \$2.0 million for the development of custom body part and prosthetic implants.

Navy information technology programs

The budget request included \$69.0 million in PE 65013N for information technology development. To support initiatives to improve network centric operations, data fusion, and human systems interfaces, the committee recommends an increase of \$5.0 million for the development of integrated network-centric technology systems, and an increase of \$7.0 million for information systems research and technology.

Navy test and evaluation programs

The budget request included \$79.6 million in PE 64759N for major test and evaluation investment. To support effective interoperability testing and evaluation of complex, emerging joint systems, the committee recommends an increase of \$5.0 million for aviation enterprise interoperability upgrades.

Advanced linear accelerator facility

The budget request included \$75.0 million in PE 11221N, Research, Development, Test, and Evaluation, Navy (RDTEN), but included no funding for the Crane linear accelerator facility (LINAC). The committee recommends an increase of \$1.2 million for the LINAC to simulate the high radiation environment in space. The committee notes that this will complete the construction of the LINAC facility. The committee directs the Navy to develop and use the additional funds in conjunction with the Joint Radiation Hardened Electronics Oversight Council.

Expandable rigid wall composite shelter

The budget request included \$120.4 million in PE 26623M for Research, Development, Test, and Evaluation, for Marine Corps Ground Combat/Supporting Arms Systems. Current rigid wall shelters do not have ballistic protection, cannot carry loads such as sandbags on the roof, are poorly insulated, are subject to corrosion, and cannot be efficiently stacked on container ships. New carbon fiber hybrid composite technology will provide lightweight, rugged, thermally efficient, and electromagnetic interference-hardened shelters for the Marine Corps. The committee recommends an authorization of \$1.3 million for this initiative.

Marine personnel carrier support system

The budget request included \$120.4 million for Research, Development, Test, and Evaluation, in PE 26623M for Marine Corps

Ground Combat/Supporting Arms Systems, but no funds to initiate the Marine Personnel Carrier (MPC) Design for Supportability System. This system, initiated during the program's design phase, will reduce management and maintenance costs throughout the program's life cycle using modern modeling and collaborative software technology. The committee recommends an authorization of \$123.4 million, an increase of \$3.0 million above the request.

Ultrasonic consolidation for smart armor applications

The budget request included \$120.4 million in PE 26623M, Research, Development, Test, and Evaluation, Navy, for Marine Corps Ground Combat/Supporting Arms Systems, but insufficient funds to complete development of Ultrasonic Consolidation for Armor Applications technology.

Ultrasonic consolidation is a low-temperature process that enables the production of laminates of dissimilar metals to achieve properties not possible with conventional casting and welding techniques. This process can be used to fashion titanium aluminide, a lighter, cheaper, and more effective armor.

The committee recommends authorization of \$124.3 million, \$3.9 million above the request, to complete development of this technology.

High performance capabilities for military vehicles

The budget request included \$17.1 million in PE 26624M for Research, Development, Test, and Evaluation, for Marine Corps Combat Services Support, but no funds for the high performance capabilities for military vehicles project. This project is dedicated to applying the best practices of the motorsports industry to military vehicles, including engineering expertise, equipment, and technology. The committee recommends authorization of \$18.1 million, \$1.0 million above the request for this project.

Mobile User Objective System

The Navy is responsible for maintaining narrow band ultra-high frequency (UHF) satellite communications capability. The current on-orbit capability is provided through a combination of leased satellite capability, the Ultra-high frequency follow-on (UFO) satellites, the last of which was launched in 2003, and two previous generation UHF satellites, which have long surpassed their design lives. Several of the UFO satellites have failed early and several others are single string satellites. As a result, the UHF constellation is very fragile. If all the satellites continue to operate with no further failures the Navy expects to see the UHF constellation degrade to unacceptable levels in May 2010. The first Mobile User Objective System (MUOS), the next-generation UHF satellite, is already 11 months behind schedule and continues to have technical problems.

The committee continues to believe that the Navy should initiate a UHF backup capability through leased or hosted payload options. The committee understands that \$32.0 million remains from the brief but cancelled prior effort to look at this option. The committee recommends a decrease in Research, Development, Test, and Evaluation, Navy, PE 303109N line 192 of \$32.0 million and an in-

crease of \$32.0 million in Weapons Procurement, Navy, line 18, for a small UHF payload, of eight or fewer channels, on an existing small satellite bus. The committee directs the Navy to explore using a competition for a fixed price contract for additional UHF capability. In reviewing this option the Navy should look at utilizing the Operationally Responsive Space Office as a possible option for managing the augmentation, if the Navy believes that augmentation efforts will take program office focus away from the MUOS program.

The committee directs the Secretary of the Navy to report back to the congressional defense committees no later than January 1, 2010, with the plans for UHF augmentation and constellation sustainment.

Navy manufacturing technology

The budget request included \$56.7 million in PE 78011N for Navy manufacturing technology programs. The committee notes that the Defense Science Board has recommended that investments in the manufacturing technology program be increased to a level of 1 percent of the total research, development, test, and evaluation budget. The Board also found that the manufacturing technology program has invested in efforts that have reduced systems cost and improved systems performance. Consistent with those recommendations and findings, the committee recommends an increase of \$5.0 million for integrated manufacturing enterprise development to streamline manufacturing techniques, business practices, and practices to reduce costs of Navy platforms, and an additional \$2.5 million for development of advanced materials processing technologies and lower cost repair methods for a variety of sea and air systems.

National Shipbuilding Research Program-Advanced Shipbuilding Enterprise

The budget request included no funding in PE 78730N for maritime technology. The National Shipbuilding Research Program—Advanced Shipbuilding Enterprise (NSRP–ASE) is a collaborative effort between the Navy and industry which has yielded significant productivity improvements for Navy ship construction and repair. Under this program the Navy provides funding that is matched and exceeded by industry investment. Using this approach, the Navy has achieved a high return on investment by providing near-term savings and avoiding significant future costs. The committee believes that continuation of the NSRP–ASE effort is a vital element of the overarching objective of improving the affordability of naval warship construction and maintaining a healthy, innovative shipbuilding industrial base.

The committee recommends an increase of \$20.0 million in PE 78730N for the NSRP–ASE. The committee expects that the Navy will allocate funds directly to this program in future budget requests.

Air Force

Air Force basic research

The budget request included \$321.0 million in PE 61102F for defense research sciences activities. To support efforts in the development of next generation energy sources for military applications, the committee recommends an additional \$1.0 million for research supporting liquid fuel production processes and an additional \$1.5 million for research on wireless beamed power systems.

The National Research Council's 2006 study on "Basic Research in Information Science and Technology for Air Force Needs" recommended that the Air Force invest in research in information security "in support of the goal of measurable, available, secure, trustworthy, and sustainable network-enabled systems." Consistent with that recommendation the committee recommends increases of: \$4.0 million for development of cyber security related educational programs; \$4.0 million for research on security for critical and vulnerable control networks; and \$2.0 million for software engineering research to develop secure embedded software systems.

The report also highlighted the significant challenges that the Air Force will face in managing ever-larger volumes of data. To support the development of enhanced information management capabilities, the committee recommends an additional \$1.5 million for informatics research.

Finally, consistent with the committee's efforts to enhance systems engineering capabilities in the Department of Defense, the committee recommends an additional \$2.0 million for research on integrated design and manufacturing technologies and systems.

Air Force materials research

The budget request included \$128.0 million in PE 62102F for applied materials research. The committee notes that advanced tactical aircraft such as the F-22 and F-35 are facing critical thermal management issues which are forcing operational adjustments and potentially costly design and engineering changes. To help address these issues, the committee recommends an additional \$3.0 million for research on advanced thermal management structures.

The Air Force Research Laboratory has found that 3.9 percent (or nearly \$1.5 billion) of the Air Force's fiscal year 2004 operations and maintenance budget went toward addressing the costs of corrosion on Air Force platforms and weapon systems. To address corrosion issues in the Air Force, the committee recommends an additional \$2.0 million in PE 62102F for corrosion protection materials, and \$1.0 million to address corrosion issues in light alloy aerospace and automotive parts.

The Air Force's Energy Program Policy has a stated objective of developing renewable resources on Air Force bases. In support of that objective, the committee recommends an increase of \$4.0 million for efforts to design, implement, and test systems and processes capable of producing renewable energy at large scales for military installations, and an additional \$4.0 million for research to refine, as well as develop novel, energy bioconversion technologies to support defense needs.

The committee notes that the 2003 National Research Council study “Materials Research to Meet 21st Century Defense Needs” identified a number of high priority research areas in advanced materials in order to address defense requirements. The study recommended investing in technologies that would integrate non-destructive inspection and evaluation into the original design of both materials and structures. Consistent with this recommendation, the committee recommends an additional \$2.0 million for the development of health monitoring sensors for aerospace components. The National Research Council recommended that the Department of Defense “make investments in research leading to new strategies for the processing, manufacture, inspection, and maintenance of materials and systems.” Therefore, the committee recommends an increase of \$1.0 million for research on intelligent manufacturing models, analyses, and controls to develop the next generation of manufacturing processes and systems.

Finally, the committee recommends an additional \$2.75 million for the development of infrared laser media materials to support the development of laser communications, countermeasure, and sensing systems.

Aerospace vehicle technologies

The budget request included \$127.1 million in PE 62201F for aerospace vehicle technologies. The committee recommends an additional \$2.5 million for unmanned aerial system (UAS) collaboration technologies to support the development of advanced UAS and enhance the ability to integrate UAS pilots, sensor operators, and information analysts, as well as to better coordinate and collaborate their activities.

Air Force propulsion research

The budget request included \$196.5 million in PE 62203F for applied research in aerospace propulsion. Advanced aircraft engines require high reliability components that survive high vibrations, temperature, and speeds. In support of component development for the F-35, the committee recommends an increase of \$1.0 million for high speed bearing research.

In support of efforts to meet onboard electrical power requirements of engines and airborne weapon systems, the committee recommends an additional \$2.5 million for materials research and development via prototype fabrication and developmental testing of novel electric power technologies for propulsion applications. The committee also recommends an additional \$7.0 million for the development of lithium ion batteries for aviation applications.

To support efforts to develop hypersonics technology for missile, aircraft, and space access missions, the committee recommends an additional \$3.5 million for scramjet research.

Finally, to support efforts to reduce operating temperatures of turbine engines and improve their efficiency, the committee recommends an increase of \$4.0 million for the development of thermally efficient engine fuel pumping systems.

Reconfigurable electronics and software

The budget request included \$104.1 million in PE 62601F for space technologies. The Department of Defense's January 2007 "Response to Findings and Recommendations of the Defense Science Board Task Force on High Performance Microchip Supply" highlighted the Department's need for microelectronic systems, local field programmable gate arrays, with functions that could be changed to support different types of systems. In support of meeting that need, the committee recommends an increase of \$2.0 million for research on reconfigurable electronics.

The committee also recommends an increase of \$4.0 million in PE 63203F for the development of secure reconfigurable computing systems that would support development of protection technologies with sensors to meet the requirement for critical weapon systems technology to be tamperproof and uncompromised.

Seismic research program

The budget request included \$104.1 million in PE 62601F for space technologies. The committee recommends an additional \$7.5 million for the Air Force seismic research program. The committee notes that this program has and will continue to enable the United States to monitor compliance with the current moratorium on nuclear testing.

Chemical laser research

The committee notes that the 2008 Air Force Scientific Advisory Board study on advanced tactical lasers highlighted the fact that chemical lasers would be unsuitable for tactical applications "due to the atmospheric propagation of its operational wavelength, its weight and volume, its logistical requirements, and its limited magazine." The committee notes that the Department of Defense is moving towards the development and eventual fielding of solid state, fiber, and free electron lasers for a variety of missions that require high energy lasers, but has no such similar plans for chemical lasers. Therefore the committee recommends a reduction of \$5.75 million in PE 62605F and \$6.1 million in PE 62890F for activities related to chemical laser research and development.

High energy laser research

The budget request included \$52.8 million in PE 62890F for applied research on high energy lasers. The Department of Defense's report "Adaptive Optics for Military Applications: Laser Weapons and Space Surveillance" identified the development of deformable mirrors as a technical challenge to achieving laser weapon systems. The committee recommends an additional \$2.0 million to support research on advanced deformable mirrors for high energy laser weapons systems.

Air Force advanced materials research

The budget request included \$37.9 million in PE 63112F for the development of advanced materials for weapon systems. The committee recommends an additional \$7.0 million to support the Metals Affordability Initiative, a joint government and industry consortium aimed at strengthening the metals industrial base through

collaborative technology development and transition projects. The overall program helps improve current processing technologies and develop novel techniques for primary metal production, part manufacturing, and weapon system support.

To support Air Force efforts to develop cheaper, alternative sources of aviation fuel, the committee recommends an increase of \$5.0 million for sewage-derived biofuels research. Finally, to support efforts to improve the readiness and maintainability of airframes, the committee recommends an increase of \$2.0 million for research on nondestructive testing technologies.

Air Force advanced propulsion systems

The budget request included \$175.7 million in PE 63126F for aerospace propulsion and power technology. To support efforts under the High Speed Turbine Engine Demonstrator project as part of the Versatile Affordable Advanced Turbine Engine program, the committee recommends an additional \$10.0 million to develop supersonic turbine engines that can support the development of a long-range high-speed strike missile. The committee notes that the Department of Defense is continuing its investments in the development of unmanned aerial vehicle (UAV) capabilities for intelligence, strike, logistics, and other missions. In support of those efforts, the committee recommends an additional \$3.5 million for the development of scalable UAV engines.

Finally, to support continued development of high-temperature power electronics to meet critical needs of the Joint Strike Fighter and other aircraft platform systems, the committee recommends an increase of \$6.0 million for research on silicon carbide electronics.

Air Force manufacturing technology

The budget request included \$39.9 million in PE 63680F for the Air Force manufacturing technology program. The committee recommends an additional \$3.25 million for research on casting technology to support efforts to provide the Department of Defense an integrated approach to metal castings used in defense systems to improve component performance and affordability.

Optical interconnect technologies

The budget request included \$39.7 million in PE 63788F for development and demonstration of battlespace knowledge technologies. The Defense Research and Engineering's 2007 strategic plan highlights networks and communications, including technologies to address airborne networks, as an enabling technology that should receive the highest level of corporate attention and coordination. To support these efforts, the committee recommends an additional \$2.5 million for development of optical interconnects to support data communications onboard unmanned aircraft systems and satellites.

Space Protection Program

The budget request included \$97.7 million for Space Control Technology in Research, Development, Test, and Evaluation, Air Force, in line 40 including \$6.5 million for the Space Protection

Program (SPP). The committee recommends an additional \$6.5 million for the SPP.

Improving space situational awareness and protecting space assets is a high priority for the intelligence community and the Department of Defense as well as for the civilian community. A recent “day without space” exercise made clear that not only military systems but a broad array of civilian systems are dependent on military and intelligence space systems. Even such simple tasks such as getting money from an ATM or using a credit card to fill up a gas tank become impossible without space assets.

The SPP is a joint Air Force-National Reconnaissance Office program to bring in-depth analytic capacity to the problem of protecting space assets from natural occurring events, accidental events, and intentional actions of adversaries. The committee supports this collaborative approach to protect U.S. space interests and commends the Air Force and the National Reconnaissance Office (NRO) for establishing this unique effort. Having established this needed effort the committee expects both the Air Force and the NRO to support the effort.

The committee expects the SPP to execute an integrated strategy to review threats identified by the intelligence community to ascertain risks and vulnerabilities to space capabilities and then recommend solutions leading to comprehensive space protection capabilities. Specifically, the SPP office should focus on developing space protection architectures, identifying national capabilities and interdependencies, delivering tailored decision aids to operations centers, develop methodologies to address vulnerabilities in multiple orbit regimes, integrate cyber risks and threats into the National Infrastructure Protection Framework, and continue with the specific tasks currently assigned.

Space situational awareness

The budget request included \$97.7 million in Research, Development, Test, and Evaluation, Air Force (RDTEF), PE 63438F for Space Control Technology but no funds to integrate data from the Missile Defense X-band radar on the Sea-based X-band platform to integrate into the space surveillance network. The committee recommends an increase of \$6.0 million to develop a prototype to import this sensor capability into the space surveillance network.

Intercontinental Ballistic Missile Demonstration/Validation

The budget request included \$66.1 million for Intercontinental Ballistic Missile (ICBM) Demonstration Validation in Research, Development, Test, and Evaluation, Air Force, PE 63851F line 46. The committee notes that the various ICBM modernization programs will be coming to a close and will need to focus on sustainment. ICBM Demonstration Validation is focused on future ICBM concepts some of which, such as guidance systems, could be common to the Air Force and the Navy. The committee notes that the Navy is working on common concepts and urges the two services to work together to determine the full range of common applications for ballistic missile sustainment and modernization if needed. As a result the committee recommends a reduction of \$5.0 million.

Operationally Responsive Space

The budget request included \$112.9 million for Operationally Responsive Space (ORS) in Air Force Research, Development, Test, and Evaluation PE 64857 including \$31.9 million for ORS-1, a small satellite being built at the request of U.S. Central Command (CENTCOM) to satisfy the Command's urgent need number 3. The budget request does not keep the manufacture of the ORS-1 on schedule to meet the CENTCOM schedule. The committee notes that the Air Force intends to reprogram some additional funds to support ORS-1 but more is needed. The committee recommends an additional \$40.0 million for ORS-1.

On May 18, 2009, the ORS Office successfully launched another small satellite, which is in the process of completing its on-orbit check out. The committee expects the ORS Office to keep it informed as to the progress and operational utility of this most recent satellite.

ORS continues to make progress in all of its three tiers and in continuing to assess the value of small satellites to the warfighter, including the ability to rapidly configure and launch small satellites to meet need not otherwise met by airborne platforms. One of the ORS efforts could have applicability to the general space community approach to command satellites thorough multi-purpose systems rather than stove-piped ground systems.

The committee commends the ORS Office and other agencies and military services for participating in this innovative approach to space. The committee is concerned, however, that the ORS Office has not been able to take full advantage of various streamlined acquisition approaches and directs the Air Force to assist ORS in identifying areas where improvement is needed and to grant ORS the necessary authorities. ORS has been ably supported in its acquisition by the Air Force Space Development and Test Wing and the committee believes that this is a productive partnership.

One of the areas that the ORS Office has not focused on is next-generation launch capabilities. At the present there is adequate launch capability but it is expensive. The committee is aware of a different approach to designing launch vehicles that might reduce in the long run the cost of launch, and that might be suitable for small and medium (Delta II) class and below launch. The committee recommends \$15.0 million for the radially segmented launch vehicle for ORS and the Space Test Program to continue concept development and determine the technical validity of the approach.

Small imaging satellite competitive prototyping

The budget request included \$112.9 million in PE 64857F for Research, Development, Test, and Evaluation, for the Operationally Responsive Space (ORS) program. Elsewhere in this report, the committee recommends that the Department of Defense acquire the equivalent of one 1.5-meter commercial-class electro-optical imaging satellite, along with acquisition of the equivalent of one additional 1.1-meter commercial imaging satellite. These actions are recommended to mitigate risks in the collection capabilities of the intelligence community, to enhance the availability and utility of unclassified imagery for the warfighter, to increase the frequency

of satellite coverage, and to also enhance the survivability of space-based imaging in wartime.

For the longer-term, however, the committee believes the time has come to try a different approach to moderate-resolution imagery collection from space. The committee is persuaded that the technology exists to build very small and very inexpensive medium resolution (approximately .5 meter ground resolution) imaging satellites. A large constellation of very small satellites would provide frequent revisit, inherent survivability, graceful degradation, broad-area coverage and faster upgrades. The costs should not exceed \$100.0 million per satellite, including launch, with the ultimate goal being fixed pricing. If achievable, this concept would open up important new opportunities for the commercial data providers and government consumers alike.

The committee believes that the time is right to establish a competitive prototyping program to test the industry's cost claims and to demonstrate performance levels.

Accordingly, the committee recommends \$227.9 million, \$115.0 million above the request, to initiate a competitive proof-of-concept demonstration involving at least two credible industry teams. The committee expects that the Department of Defense will require each vendor to deliver at least two satellites, with a goal of spacecraft in orbit within 36 months of award. The satellites should be limited to a small mass and volume, with low development and recurring costs. The program should be guided by the Joint Staff, U.S. Strategic Command, the Air Force A2, and the Under Secretary of Defense for Intelligence.

National Polar-Orbiting Operational Environmental Satellite System

The budget request includes \$396.6 million in Research, Development, Test, and Evaluation, Air Force (RDTEF), PE 35178F for the National Polar-Orbiting Operational Environmental satellite system (NPOESS). As a result of a recent review, the Department of Defense has determined that the program is not adequately funded in fiscal year 2010. The committee recommends an additional \$80.0 million for NPOESS.

Internet routing in space

The budget request included no funds in Air Force Research, Development, Test, and Evaluation, to support the demonstration, evaluation, and use of a commercial Internet Router in Space (IRIS) for military communications on a commercial satellite for 1 year. The IRIS program, a joint concept technology demonstrator (JCTD) sponsored by U.S. Strategic Command, was funded as a demonstration project and will be launched later this year. Funding for the JCTD, however, only supports a 3 month demonstration of the capability. The committee recommends an increase of \$3.0 million in PE 604xxxF to continue the demonstration and to provide operational capability for an additional year. To address this and other new communications technologies for military communications satellites the committee recommends a new program element (PE) designed to reduce technological risk and mature tech-

nologies for potential future applications. This PE is discussed more fully elsewhere in this report.

The committee notes that IRIS is not useful for protected, secure, survivable communications such as had been envisioned for the transformational communications satellite program because the router is not designed to be radiation hardened. On the other hand, the router could be useful for other satellite applications, such as the Wide-band Global System (WGS) that do not have a requirement for radiation hardening.

Next-generation military satellite communications

The budget request included no funds in Air Force Research, Development, Test, and Evaluation (RDTEF), for next-generation military satellite communications to identify technologies that could be used on future military communications satellites. When the transformational communications satellite (T-Sat) was cancelled, several risk reduction efforts that could have application on future satellites were also cancelled. In addition, work on military unique radiation hardening requirements was also cancelled.

The committee recommends an increase of \$50.0 million in a new program element, PE 604xxxF. This new PE would be created to explore communications technologies that could be utilized on future blocks of current communications satellite or eventually on next-generation communications satellite. This program would be similar in concept to the Third Generation Infrared Satellite System (3GIRS), which is conducting risk reduction efforts for next-generation overhead persistent infrared technologies. These risk reduction efforts should include continued efforts to reduce the cost, weight, and complexity of current radiation hardening techniques.

One of the many problems with the T-Sat program was that it was started with very immature technologies. In the future if there are to be new or evolved communications satellites, the committee wants to ensure that the technologies are sufficiently mature to be fielded with low cost and schedule risk.

B-1B bomber active electronically scanned array radar

The budget request included no funds in Research, Development, Test, and Evaluation, Air Force (RDTEF) in PE 64226F for the B-1B bomber. The committee recommends an increase of \$2.0 million to design, install, and test an active electronically scanned array (AESA) radar on a B-1B bomber to evaluate the utility of an AESA to bomber operations. The AESA was developed for use on fighter and other aircraft and should require minimum modification for application and evaluation on the B-1B.

Space-based Infrared System

The budget request included \$512.6 million for the Space-based Infrared system (SBIRS) for Research, Development, Test, and Evaluation, Air Force, PE 64441 including \$62.6 million for ground systems development. The committee recommends an additional \$15.0 million for Highly Elliptical Orbit (HEO) ground integration and data exploitation.

The SBIRS program is a missile early warning, technical intelligence, and battlespace awareness system. Currently, there are

two of the HEO sensors on orbit. The Geosynchronous Earth Orbit (GEO) satellites continue to be plagued by schedule delays and cost overruns. The GEO-1 satellite has slipped an additional year since last year as it continues to have software problems. Additional funds were reprogrammed into SBIRS in fiscal year 2009 but the problems continue with the GEO-1 satellite. As a result, funds needed to resolve ground issues and HEO data exploitation have not been sufficient. The committee is very concerned that the performance capability of the two HEO sensors be fully understood and exploited including the benefits from HEO stereo applications.

Notwithstanding the continuing GEO-1 problems the Air Force will continue the SBIRS program through GEO-4 and most likely to GEO-5, -6, and even beyond. In looking ahead the committee is concerned that the Air Force is not buying the future GEO satellites in the most cost effective way possible. To reduce the cost of future GEO satellites, the committee directs the Secretary of the Air Force to determine the number of GEO satellites that will be needed beyond GEO-4 and the possibility of buying these satellites using fixed pricing. The committee notes that the overhead persistent infrared architecture study will be completed later this summer and that this study will inform the future requirements for SBIRS satellites and sensors.

Joint Strike Fighter

The budget request included \$1,741.3 million in PE 64800N, and \$1,858.1 million in PE 64800F for continued development of the Joint Strike Fighter (JSF) program, including \$476.0 million for management reserves to cover unforeseen problems that may arise during the system development and demonstration (SDD) phase of the program.

The Department conducted a review of JSF program costs and schedules last year. The group conducting the review, called the Joint Estimating Team (JET), recommended, among other things, that the management reserves available to the program executive officer (PEO) be increased throughout the remainder of SDD program. As a result of the JET recommendations, the Department increased management reserves to the level requested in the budget.

The Department has informed the committee that the PEO now believes that he can fully execute the fiscal year 2010 SDD program with only \$320.0 million, or \$156.0 million less than was included in the request.

Therefore, the committee recommends a decrease of \$78.0 million in PE 64800N and a decrease of \$78.0 million in PE 64800F to eliminate these excess management reserves.

Evolved Expendable Launch Vehicle

The budget request included \$26.5 million in Research, Development, Test, and Evaluation, Air Force, PE 64853F for the Evolved Expendable Launch Vehicle (EELV) but no funds to continue the Global Positioning System (GPS) based metric tracking effort. The committee recommends an additional \$12.0 million for GPS metric tracking. The committee understands that the Air Force will be reprogramming fiscal year 2009 funds for EELV GPS metric tracking and funds are needed in fiscal year 2010 to continue this important

effort need to support the east and west coast launch ranges. The long-term plan is to have all launches utilize GPS and reduce the amount of radar support for launches.

Combat Search and Rescue Replacement Aircraft

The budget request included \$90.0 million in PE 65277F for development of the Combat Search and Rescue Replacement Aircraft (CSAR-X). These fund various activities, including program support and purchasing helicopters for replacing operational losses.

The Air Force anticipated awarding the development contract for the CSAR-X in the spring of 2008, but the award was delayed twice by successful protests, and Secretary Gates has recommended terminating the current effort while the Department reviews the entire combat search and rescue mission area as part of the Quadrennial Defense Review (QDR).

The committee believes that funds available within this program from prior years is sufficient to support all of these fiscal year 2010 activities, and therefore, recommends a reduction of \$90.0 million in PE 65277F for CSAR-X. The committee strongly supports modernizing the combat search and rescue capability, but sees no need to authorize more funds than are required to support these activities in the interim while the Department conducts the QDR review.

Air Force test and evaluation

The budget request included \$60.8 million in PE 64759F for major test and evaluation investment. The committee notes that the Director of the Test Resource Management Center has expressed concern over the reductions in funding for government and contractor personnel at the Air Force's test ranges. The committee is also concerned that Air Force underinvestment will prevent the test ranges from fully meeting the workload projected for the ranges, putting developmental and operational testing of critical programs at risk. Cost growth and potentially insufficiently tested equipment may then be deployed to operational forces given insufficient testing. Therefore, the committee directs the Secretary of the Air Force to work more closely with the Director of the Test Resource Management Center to ensure that Air Force investment in its test ranges is sufficient to meet the workload requirements of its joint users. The committee recommends an increase of \$20.0 million in PE 65807F to address the shortfall in the Air Force budget request and alleviate the risk to operational users of equipment to be tested.

The committee also notes the importance to preserve the capability to test missiles and their sub-systems, such as sensors and structures, at very high speeds. To support the enhancement of these capabilities the committee recommends an increase of \$5.0 million for upgrades to the high speed test track at Holloman Air Force Base.

Multi-platform radar technology insertion program

The budget request included \$140.7 million in PE 27581F for research and development projects for the E-8 joint surveillance target attack radar system (JSTARS).

The cancelled E-10 aircraft program was supposed to be a test bed for the multi-platform radar technology insertion program (MP-RTIP). The Air Force, however, intends to field this MP-RTIP sensor suite on a number of other air vehicles, including the Global Hawk unmanned aerial vehicle (UAV).

The committee believes that the Air Force should pursue another path, whether that would be the E-8 JSTARS or some other platform, and field the better capability than can be achieved with the Global Hawk. Therefore, the committee recommends an increase of \$92.0 million in PE 27581F for maturing the MP-RTIP sensor suite.

Wide-area airborne surveillance

The budget request included \$46.0 million in PE 35206F for Research, Development, Test, and Evaluation (RDT&E) of the Gorgon Stare wide-area airborne surveillance system (WAAS); \$19.9 million in Aircraft Procurement Air Force, Line 25, and \$13.0 million in Operations and Maintenance, Air Force.

The committee recommends no funds to continue Gorgon Stare development, following the action of the appropriations conference on the fiscal year 2009 supplemental to deny funding for additional quick-reaction capability (QRC) systems. The committee recommends this action for multiple reasons.

WAAS requirements remain murky, despite the fact that the Gorgon Stare program passed through the Joint Requirements Oversight Council (JROC) process. The Air Force and the Marine Corps canceled delivery of five Angel Fire WAAS systems that had already been largely paid for even though the first increment of Gorgon Stare would provide similar performance. If current systems are not useful, there is little point in spending large sums and waiting an additional 1–2 years for a similar capability, even if it is to be deployed on a longer-endurance platform.

Data-driven studies by the Joint Staff, Program Analysis and Evaluation (PA&E), and the Office of the Under Secretary of Defense for Intelligence (USDI), raise serious questions about the utility of moderate resolution wide-area motion imagery. Increasing the resolution of these cameras to the levels that these studies suggest are needed leads to a dramatic reduction in the size of the area imaged. This reduction, in turn, leads to a large increase in the number of orbiting combat air patrols (CAPs), which casts doubt on the affordability of the capability.

Furthermore, the studies referenced above, so far, have not produced sufficient evidence that forensic analysis of moderate-resolution, wide-area motion imagery is productive enough to justify a large investment in sensors and platforms—especially in the absence of effective automated analytic tools.

The committee is also concerned that the Air Force has not demonstrated that it is prepared to optimize its ability to perform the joint WAAS mission. The Air Force insists that the Reaper platform, even when conducting WAAS missions, must carry a large weapons load as well as ancillary sensors, which limits the weight, space and power available for the WAAS sensor.

The committee's recommendation to terminate the Gorgon Stare program does not reflect lack of support for vigorous efforts to de-

termine the potential value of, and requirements for, WAAS motion imagery. The committee fully supports sustaining the Army Constant Hawk program and fully examining the value of forensic analysis based on all sources of geo-referenced intelligence data. The committee urges the Intelligence, Surveillance, and Reconnaissance (ISR) Task Force, the National Geospatial Intelligence Agency's Office of Counterterrorism, the Joint Staff, USDI, PA&E, and the Counter-improvised explosive device(IED) Operations Integration Center (COIC) of the Joint IED Defeat organization (JIEDDO) to rigorously assess the current and potential utility of the analysis of layered geo-referenced intelligence data, including WAAS and ground moving target indicator radar data.

The committee also strongly supports the ISR Task Force recommendation to accept delivery of the Angel Fire WAAS systems, narrow the sensor field of view for higher resolution, and pair the system with high-resolution motion video and other sensors.

These activities should assist the Department of Defense (DOD) in defining WAAS requirements. Meanwhile, DOD should sustain the vibrant WAAS technology industrial base to provide solutions to future QRC and program-of-record initiatives. The committee recommends authorization of \$10.0 million in PE 64400D8Z, Unmanned Systems Common Development, RDT&E Defense-Wide, line 101, for WAAS technology development broadly across the industrial base. The committee also recommends \$5.0 million in the same account to sustain the innovative processing activities planned in the Gorgon Stare program, and to develop automated WAAS motion imagery exploitation tools to support forensic analysis.

Multi-sensor detect, sense, and avoid

The Department of Defense faces a serious challenge in working with the Federal Aviation Administration to develop capabilities and procedures to enable unmanned aerial vehicles (UAVs) to operate safely within the national airspace. One element of these capabilities is sense and avoid technology for collision avoidance. The committee recommends authorization of \$4.0 million in PE 35219F, for the continued development of multi-sensor detect, sense, and avoid capabilities that will help achieve the goal of permitting UAV pilots/operators to file a flight plan, obtain an air traffic control clearance, and fly in domestic and international airspace.

Joint Space Operation Center System

The budget request included \$131.3 million for the Joint Space Operation Center (JSpOC) system in Air Force Research, Development, Testing, and Evaluation PE 35614F line 210. This is a new program element that results from a consolidation of several previous separate space situational awareness programs. The JSpOC system is focused on upgrading the ability of the JSpOC to track, monitor, predict, and to respond in real time to events in space. The committee recommends an additional \$6.0 million to continue the Karnac study, which is a joint Air Force and Department of Energy National Laboratory effort to utilize and modify existing capabilities developed to support the nuclear weapons program to im-

prove the JSpOC capabilities, including using nontraditional data and three dimensional modeling and simulation capability.

Biometric signature and passive physiological monitoring

The budget request included \$6.4 million in PE 91202F for research and development projects for Joint Personnel Recovery Agency, but included no funding to develop personnel identification technologies based on biometric sensors.

Passive biometric sensors show promise as a way of uniquely identifying personnel prior to deploying air rescue and evacuation forces to extract them.

The committee believes that the Department should pursue these technologies to avoid exposing search and rescue forces to needless risk. Therefore, the committee recommends an increase of \$5.0 million in PE 91202F for developing biometric signature and passive physiological monitoring systems.

Defense-wide

Defense Experimental Program to Stimulate Competitive Research

The budget request included no funding in PE 61114D8Z for the Defense Experimental Program to Stimulate Competitive Research (DEPSCoR). This program was established by Congress to enhance the capabilities of universities in eligible States to perform defense science and engineering research by competitively funding defense basic research programs and investing in research infrastructure. The committee notes that the recent Institute for Defense Analyses' study on DEPSCoR found that the program has led to successful transition of research innovations into Department acquisition programs and operational use. The study also found that participating States have increased the number and value of non-DEPSCoR research awards they have received from the Department of Defense. To support these successes and continue the congressionally mandated program, the committee recommends an increase of \$8.0 million for DEPSCoR.

In-vitro models for bio-defense vaccines

The budget request included \$59.0 million in PE 61384BP for chemical and biological defense basic research, but included no funds for development of lung models to improve vaccine development. The committee recommends an increase of \$2.0 million in PE 61384BP for development of an in-vitro lung model to support bio-defense vaccines against aerosolized pathogens. This research will improve understanding of the interaction between human lung immune cells and aerosolized biological agents, thus improving the effectiveness of future vaccines.

Information and communications technology

The budget request included \$282.3 million in PE 62303E for information and communications technology development. The committee recommends a reduction of \$4.5 million for the content distribution program. The committee recommends a reduction of \$7.5 million for the next generation core optical networks program. The

committee is concerned that these activities are not well coordinated with the well funded enterprise services and network communications programs in the military services and the Defense Information Systems Agency.

Cognitive computing

The budget request included \$142.8 million in PE 62304E for development of cognitive computing systems. The committee recommends a reduction of \$25.0 million for cognitive computing activities, including cognitive networking and computer learning programs such as Local Area Network droids, Situation-Aware Protocols in Edge Network Technologies, and Brood of Spectrum Supremacy. The Defense Advanced Research Projects Agency has been funding a number of these efforts in parallel for a number of years with limited transition success. The committee believes that some of these activities are redundant with extensive investments being made in the private sector and have unclear transition pathways to operational systems.

Biological decontamination research

The budget request included \$209.1 million in PE 62384BP for chemical and biological defense applied research. The committee recommends an increase of \$1.0 million in PE 62384BP for research of improved decontamination capabilities against spores of anthrax and *Clostridium difficile*, two agents of considerable concern to the Department of Defense. Such capabilities could be used to improve both protection and treatment of military service members.

Chemical and biological infrared detector

The budget request included \$209.1 million in PE 62384BP for chemical and biological defense applied research, but included no funds to develop miniaturized infrared detection technology. The committee recommends an increase of \$3.0 million in PE 62384BP to continue development and miniaturization of an advanced infrared detection system for chemical and biological agents. The objective is to demonstrate a functional prototype that operates at high speed and sensitivity with low false alarm rates. Such a system could reduce the logistical burden compared to other technologies.

Funding for meritorious bio-defense projects

The budget request included \$209.1 million in PE 62384BP for chemical and biological defense applied research, including \$21.0 million for the Transformational Medical Technologies Initiative (TMTI) program. The TMTI program is intended to develop new technologies to reduce risk from the likely emergence of genetically engineered or manipulated biological agents. A recent Broad Agency Announcement for the TMTI program stated that “the Government reserves the right to create and maintain a reserve list of proposals for potential funding, in the event that sufficient funding becomes available.” The committee is aware that there are eight such proposed TMTI projects that have been judged meritorious of funding, for a total of \$9.9 million. The committee believes that it is important for the Department to acknowledge when there are

proposed projects that would advance our military capabilities if funding were available, and encourages the Department to make this information known to the congressional defense committees, to help guide an assessment of the adequacy of resources and in the authorization of new investment activities.

The committee recommends an increase of \$9.9 million in PE 62384BP for the eight proposals that have been judged by the Department to be meritorious of funding, if funding becomes available.

Tactical technology

The budget request included \$276.1 million in PE 62702E for applied research on tactical technologies. The committee recommends a reduction of \$3.0 million from this account to delay the Submersible Aircraft new start program. The committee further recommends a reduction of \$10.0 million from the Extreme Accuracy Tasked Ordnance program. The committee believes that there are higher priority Army technologies on which the Defense Advanced Research Projects Agency and the Army could be collaborating.

Blast mitigation and protection

The budget request included \$219.1 million in PE 62718BR for the development of technologies to defeat weapons of mass destruction. The committee recommends an increase of \$2.0 million in PE 62718BR to continue blast mitigation and protection analysis and software development to improve the Vulnerability Assessment and Protection Option analytic tool used by the Defense Threat Reduction Agency to predict the effects of high-explosive blasts on buildings, and to design protection and mitigation options for military and government facilities.

Combating terrorism technologies

The budget request included \$81.9 million in PE 63122D8Z for combating terrorism technology support. The committee notes that urgent operational need statements have called for improved intelligence, reconnaissance, and surveillance tools. To support efforts to fulfill these operational needs, the committee recommends an increase of \$3.5 million for advanced reconnaissance and data exploitation systems. In order to support the development of advanced blast resistant construction materials and buildings, the committee recommends an increase of \$2.5 million for impact and blast loading laboratory testing technologies.

Advanced aerospace systems

The budget request included \$338.4 million in PE 63286E for advanced aerospace systems. The committee recommends a reduction of \$4.0 million for the Heliplane program. The committee recommends a reduction of \$5.0 million for the Disc-Rotor Compound Helicopter program. The transition pathway for these demonstrator programs to a Service is largely unclear at this time. The committee recommends a reduction of \$7.0 million for the Triple Target Terminator program. The committee believes that there are higher priority threats that can be addressed with technology development

activities than engaging counter air, countering cruise missile, and destroying enemy air defense targets.

Integrated Sensor is Structure

The budget request included \$338.4 million in PE 63286E for Advanced Aerospace Systems. Of that amount, \$180.5 million supports persistent or responsive intelligence, surveillance, and reconnaissance (ISR) programs, including Rapid Eye, Vulture, and Integrated Sensor is Structure (ISIS). The committee notes that the Defense Advanced Research Projects Agency (DARPA), the Office of the Secretary of Defense, and the military departments have numerous persistent or responsive ISR capabilities in development. The committee recommends a decrease in PE 63286E of \$90.0 million for these efforts at DARPA. The committee directs the Director of Defense Research and Engineering, with assistance from the Director of DARPA and the military department science and technology acquisition executives, to review the portfolio of programs across the Department to ensure that the highest priority science and technology challenges in persistent unmanned capability are being addressed with limited available resources.

The committee further recommends a reduction of \$35.0 million in PE 35205F for activities related to the support of the ISIS program. The committee notes that ISIS is a science and technology program and its funding should be derived from such accounts, and also that there is no clear indication of an Air Force transition strategy for the ISIS capability.

Joint capability technology demonstrations

The budget request included \$198.4 million in PE 63648D8Z for Joint Capability Technology Demonstrations (JCTD). The committee recommends a reduction of \$25.0 million from JCTD new starts. The committee is concerned that the JCTD program record of transitioning technologies to operational forces or programs of record is limited. Often, a large investment of resources in a JCTD program results in only the delivery of a limited residual capability to a Service, defense agency, or operational unit, and no formal transition into a program of record or procurement for operational use. The committee believes that limited JCTD resources should be focused on fewer, higher priority concept and technology demonstration and development efforts, which have stronger support and greater cost-share from sponsoring Services or defense agencies, in order to increase the effectiveness of the program.

High performance defense manufacturing technology program

The budget request included \$14.6 million in PE 63680D8Z for manufacturing science and technology programs. In title II, subtitle D of the National Defense Authorization Act for Fiscal Year 2006 (Public Law 109-163), the committee established the High Performance Defense Manufacturing Technology Program to promote the use of information technologies, enhance manufacturing efficiency, undertake technology roadmapping efforts to coordinate research and manufacturing efforts, and to accelerate the dissemination of manufacturing innovations into the defense industrial base.

To continue efforts under the program, the committee recommends an increase of \$10.0 million for the High Performance Defense Manufacturing Technology Program.

Defense Logistics Agency energy research

The budget request included \$19.0 million in PE 63712S for generic logistics technology demonstrations. The Defense Logistics Agency (DLA) is responsible for acquiring and managing all of the fuel required by the military. The DLA energy readiness research and development program has thrust areas that include research on alternative energy, including fuel cells and the conversion of waste and biomass into fuels. In support of these objectives, the committee recommends an additional: \$4.0 million for biofuels research; \$2.5 million on research on the conversion of biomass into logistics fuels; \$8.0 million to continue the vehicle fuel cell and logistics program; \$3.0 million for development and demonstrations of microgrids at forward operating bases; and \$3.75 million for research on the manufacturing of fuel cells for defense missions.

High performance computing

The budget request included \$221.3 million in PE 63755D8Z for the high performance computing modernization program. The 2007 report from the President's Council of Advisors on Science and Technology recommended that a plan be developed to support the use of high-end computing assets to conduct long-term research on important national problems. Consistent with that recommendation, the committee recommends an increase of \$3.0 million for research on high performance computational design of novel materials for defense applications.

Deep green

The budget request included \$293.5 million in PE 63760E for command, control, and communications systems. The committee recommends a reduction of \$10.0 million for the Deep Green program. The program's technologies are intended to transition into Army command and control systems. The committee notes that Army current and future command and control systems, such as the Global Command and Control Systems-Army and the Net Enabled Command Capability, are undergoing significant restructuring, thereby reducing the priority of this research investment.

Small unmanned aerial vehicle detection system

The budget request included \$243.1 million in PE 63767E for sensor technology development. The committee recommends a reduction of \$7.5 million for the development of the small unmanned aerial vehicle detection system. The committee believes that these funds can be better used addressing high priority threats.

Quick Reaction Fund

The budget request included \$29.2 million in PE 63826D8Z for the Quick Reaction Fund. The committee recommends a reduction of \$15.0 million for this effort. The committee commends efforts of the Department of Defense to transition promising technologies into programs of record and deploying them into operational use.

The committee is concerned that the funds appropriated for the Quick Reaction Fund have been invested in technologies which are not close to transitioning, as well as to support studies and analyses efforts that are more properly supported by other accounts. Further, the committee is concerned about the lack of coordination between the activities of the Quick Reaction Fund and those of the Services and defense agencies. The Services and defense agencies should be encouraged to leverage the fund in order to accelerate the transition of promising technologies into their programs or into the hands of their operational organizations.

Special warfare situational awareness systems

The budget request included \$108.0 million in PE 63826D8Z for Quick Reaction Special Projects. The committee supports the Navy's efforts to integrate advanced threat awareness technology into all facets of small craft operations. To continue these efforts, the committee recommends an increase of \$1.8 million for development of integrated situational awareness systems for special warfare missions.

Joint Forces Command activities

The budget request included \$124.5 million in PE 63828D8Z for joint experimentation. The committee recommends a reduction of \$5.0 million for efforts related to space control and global positioning system experimentation. The committee believes these are redundant to activities underway in both the Air Force and United States Strategic Command.

Lithium ion battery safety research

The budget request included \$31.7 million in PE 1160402BB for the demonstration and evaluation of advanced technologies that, among other things, enhance the performance of mobility platforms. Lithium ion technology has shown promise for reducing the size of batteries while also improving their performance characteristics. The committee recommends an increase of \$1.6 million for the development of monitoring techniques and battery management systems that will allow early detection and control of impending failures in lithium ion batteries.

Defense Advanced Research Projects Agency execution issues

The budget request included \$3,248.1 million for the research and management activities of the Defense Advanced Research Projects Agency (DARPA). The committee notes that DARPA has had significant difficulty over the last few fiscal years in executing all of its authorized funds in a timely fashion. The committee also notes that, on average, since fiscal year 2005, DARPA has executed over \$300.0 million less per year than the agency's annual appropriated budget. The funds have either been used as sources for re-programming actions, Congressional rescissions, or have expired. The committee believes that this slow execution of funds reflects a combination of DARPA's program management style and a shortage of program managers within the agency. The committee recommends a reduction of \$150.0 million from DARPA's overall budg-

et to reflect continuing concerns about timely and effective execution of funds by the agency.

Real-time non-specific viral agent detector

The budget request included \$206.0 million in PE 63884BP for chemical and biological defense advanced component development and prototypes, but included no funds for development of a mobile non-specific viral agent detector. The committee recommends an increase of \$2.0 million in PE 63884BP for development of a mobile real-time non-specific viral agent detector that would improve current detection capabilities. This could be a significant upgrade to the Joint Biological Agent Identification and Diagnostic System.

Airborne infrared surveillance technology

The budget request included \$636.9 million in PE 63884C for ballistic missile defense sensors. The Missile Defense Agency has initiated an ascent-phase intercept program that will benefit from improved infrared sensor technology. The committee recommends an increase of \$5.0 million in PE 63884C for airborne infrared surveillance technology development to improve the capability for precision tracking data on ballistic missiles, particularly in their ascent phase.

Aegis ballistic missile defense

The budget request included \$1.7 billion in PE 63892C for research and development of the Aegis Ballistic Missile Defense (BMD) program and its Standard Missile-3 (SM-3) interceptor.

The committee notes with satisfaction that the budget request would increase substantially the planned inventory of SM-3 interceptors, from a previously planned inventory of 147 to 329, and would increase by six the number of Aegis BMD ship conversions. As indicated by Secretary of Defense Robert Gates, this increase in planned capability represents a fundamental shift in focus of the ballistic missile defense program to capabilities for protecting our forward-deployed forces, allies, and other friendly nations against the large number of existing short- and medium-range theater missile threats.

This shift is consistent with the guidance provided by Congress over the last few years and with the findings of the Joint Capabilities Mix studies conducted by the Joint Staff over the last 3 years. Those studies concluded that the Department of Defense was planning to procure fewer than half of the minimum inventory of SM-3 and Terminal High Altitude Area Defense (THAAD) interceptors that would be needed to meet the operational requirements of the regional combatant commanders against existing and expected short- and medium-range missile threats.

In the report to accompany the National Defense Authorization Act for Fiscal Year 2009 (Public Law 110-417), the committee stated the following: "The committee notes that the Joint Capabilities Mix (JCM) study, conducted by the Joint Staff, concluded that U.S. combatant commanders need about twice as many SM-3 and THAAD interceptors as currently planned to meet just their minimum operational requirements for defending against the many hundreds of existing short- and medium-range ballistic missiles.

The committee is deeply disappointed that the Missile Defense Agency (MDA) has not planned or budgeted to acquire more than a fraction of the SM-3 interceptors needed to meet the warfighters' minimum operational needs. The committee believes that achieving at least the JCM levels of upper tier interceptors in a timely manner should be the highest priority for MDA, and expects the Agency to modify its plans and budgets to meet our combatant commanders' current operational needs."

The committee welcomes the shift in focus toward providing effective near-term capabilities against existing regional missile threats, and commends the Department of Defense for this shift.

The budget request would also begin the development of a land-based variant of the SM-3 missile. The committee believes such a capability could provide a significant enhancement to U.S. missile defense capabilities in a number of circumstances. It is being developed, in part, as a relatively low-risk and near-term option as a component of an Israeli upper tier missile defense system, as a risk mitigation path for the possibility that the development of the Arrow-3 interceptor will take longer than planned, or might not achieve technical success. A land-based SM-3 could also provide regional defense capability in Europe and Asia, and could be a crucial element of the ascent-phase/early intercept capability initiative included in the budget request. In this regard, a land-based SM-3 has the potential, if deployed in the European theater, to defend Europe and the United States from a potential future long-range Iranian ballistic missile threat. The committee commends the Department for initiating this land-based SM-3 development effort. The committee sees this program as a high priority, and considers it an item of special interest to the committee.

The budget request of \$1.7 billion in PE 63892C for the Aegis BMD system is nearly \$600.0 million more than the level of funding provided in fiscal year 2009, a 34 percent increase. Although the committee strongly supports the Aegis BMD program, and the Department's shift in focus toward meeting the current needs of the regional combatant commanders against the thousands of existing short- and medium-range ballistic missiles, the committee believes that the proposed level of increased funding will be too high to execute. The committee therefore recommends, without prejudice, a reduction of \$30.0 million to PE 63892C for the Aegis BMD program.

Short-range ballistic missile defense

The budget request included \$119.7 million in PE 63913C for cooperative U.S.-Israeli missile defense programs, including \$45.8 million for joint development of a short-range ballistic missile defense system known as "David's Sling." This system is intended to defend Israel against short-range missiles and rockets of the type fired from Lebanon. The United States is sharing the development of the system to ensure that it is compatible with U.S. missile defense systems, and to provide an option for the U.S. military to procure the system in the future, if needed. The committee recommends an increase of \$25.0 million in PE 63913C to accelerate the development of the David's Sling short-range ballistic missile defense system.

Corrosion control research

The budget request included \$4.9 million in PE 64400D8Z for corrosion programs. In support of Department of Defense efforts to reduce maintenance costs due to corrosion, the committee recommends an additional \$3.5 million in PE 64400D8Z for corrosion research activities.

Systems engineering and prototyping program

The budget request included \$19.7 million in PE 64787D8Z for the Joint Systems Integration Command. The committee notes that the budget request is inconsistent with the Department's rhetoric on encouraging systems engineering and prototyping activities. The budget request reduces funding for advanced component development and prototype programs by 12.8 percent (more than \$1.5 billion) relative to the fiscal year 2009 budget request. To encourage more prototyping where warranted and more robust systems engineering activities, the committee recommends an increase of \$50.0 million in PE 64787D8Z to be managed by the Under Secretary of Defense for Acquisition, Technology, and Logistics to initiate the systems engineering and prototyping program established elsewhere in this Act.

Test and evaluation programs

The budget request included \$145.1 million in PE 64940D8Z for test and evaluation investments. The 2007 Strategic Plan for Department of Defense Test and Evaluation Resources noted, "Outdated threat missile fly-out models reduced the effectiveness of both active and passive countermeasures testing." To help address this shortfall, the committee recommends an additional \$4.0 million for development of surface-to-air missile hardware simulators.

Cyber test range

The budget request included \$50.0 million in PE 35103E for the Cyber Security Initiative. The committee recommends a reduction of \$19.6 million for investment related development of a cyber test range. The committee notes that the Department of Defense is investing in the development of a number of cyber security related developmental and operational test ranges, in addition to currently operating a number of advanced ranges in this area. The committee also notes that the Director of the Test Resource Management Center is currently assessing the Department's overall capabilities for network systems testing, including for cyber security capabilities. The committee believes that the Defense Advanced Research Projects Agency's investment in this area should be limited to developing advanced tools for testing cyber security technologies, and should not expand into the wholesale development of operational test ranges or the management of such capabilities.

Technology applications for security enhancement

The budget request for PE 35884L, Research, Development, Test, and Evaluation, for the Defense Intelligence Agency's Intelligence Planning and Review Activities is classified. An effective national bio-security plan must address prevention, preparedness, response, and attribution. The committee recommends an authorization of

\$4.0 million for the Center for the Mitigation of Evolving Threats for research and development of early detection capabilities, impact mitigation, and forensic analysis.

Policy decision point technology

The budget request included \$24.2 million in PE 33140N for the Information Systems Security Program (ISSP), but no funds for the development of a policy decision point capability for the Navy's Consolidated Afloat Networks and Enterprise Services (CANES).

The secure discovery function of CANES requires a policy decision point capability for access control that cannot be satisfied with available commercial or government-owned technology. The committee recommends an authorization of \$27.7 million for the Navy's ISSP, an increase of \$3.5 million above the request.

Software assurance courseware development

The budget request included \$408.3 million in PE 33140G for Research, Development, Test, and Evaluation, Defense-Wide, for the Information Systems Security Program, but no funds for the continued development of information assurance instructional materials, curricula, and courseware reflecting best practices for institutes of higher education. Such instructional materials are essential for community colleges, colleges, and universities to educate students to produce secure software to protect government and commercial information systems from attack.

The National Security Agency has conducted this activity at a designated National Center of Academic Excellence in Information Assurance Education for 2 years. An additional \$1.8 million will allow the completion of this capability. Accordingly, the committee recommends an authorization of \$410.1 million, an increase of \$1.8 million above the request.

Policy research, development, test, and evaluation

The budget request included \$6.9 million in PE 35186D8Z for policy research and development. The committee recommends a reduction of \$6.0 million for this account. The committee is concerned that many of the international cooperation, linguistics, and wargaming activities that are planned for this funding are already being undertaken by other organizations within the Department of Defense, including the United States Joint Forces Command, service laboratories, and defense agencies. Further, the justification materials provided to Congress for the account are unclear and inconsistent. The committee directs that policy research and development activities be more closely coordinated with efforts in research, development, and acquisition programs under the oversight of the Under Secretary of Defense for Acquisition, Technology, and Logistics.

Logistics manufacturing research

The budget request included \$20.5 million in PE 78011S for Defense Logistics Agency (DLA) manufacturing technology efforts. The DLA Advanced Microcircuit Emulation program develops continuing technical capability for providing military specification equivalent integrated circuits to mitigate electronic parts obsoles-

cence in new and legacy defense systems. To support these efforts, the committee recommends an additional \$4.5 million for micro-circuit emulation efforts.

DLA has a stated research thrust to improve casting procurement processes at its Defense Supply Centers in order to reduce lead times, improve reliability, and strengthen the defense supply chain. To enhance these efforts the committee recommends an additional \$3.0 million for castings research.

The Department of Defense has established a policy of increasing the use of insensitive munitions in all weapons applications. To support the production of these systems, the committee recommends an increase of \$2.5 million for insensitive munitions manufacturing research.

Finally, the committee recommends an additional \$30.0 million to continue the Industrial Base Innovation Fund program. The committee directs that DLA, jointly with the Deputy Undersecretary of Defense for Industrial Policy, continue to make investments in manufacturing research that address defense industrial base shortfalls especially related to surge production requirements and diminishing sources of defense material.

Long endurance unattended ground sensor technologies

The budget request included \$21.2 million in PE 1160405BB for identification, development, and testing of intelligence equipment for special operators to provide timely exchange of intelligence and threat warning to all organizational echelons. The committee recommends an increase of \$5.0 million for the development of long endurance unattended ground sensor technologies to provide special operators with enhanced situational awareness; target detection, imaging, tagging and tracking; and high bandwidth communication of data, voice, and video.

Items of Special Interest

Ballistic missile defense overview

The budget request included \$7.8 billion for Missile Defense Agency (MDA) missile defense programs, including research, development, test and evaluation, procurement, and military construction funds. The committee notes a number of positive developments with the ballistic missile defense program of MDA included in the budget request.

The budget request includes a shift in focus on increasing capabilities needed by regional combatant commanders to defend our forward deployed forces, allies, and other friendly nations against the many existing short- and medium-range threats. As announced by Secretary of Defense Robert Gates, the budget would increase funding by \$900.0 million to increase the inventory of Terminal High Altitude Area Defense (THAAD) and Standard Missile-3 (SM-3) interceptors, and to convert an additional six Aegis Ballistic Missile Defense (BMD) ships for deployment in the Atlantic Fleet. In accordance with the budget request, the Department of Defense would plan to increase the SM-3 interceptor inventory from 147 to 329, and increase the THAAD interceptor inventory from 96 to 289. These numbers are consistent with the level of THAAD and SM-

3 interceptors recommended by the Joint Capabilities Mix (JCM) studies conducted by the Joint Staff, and are consistent with the guidance of the committee and Congress.

For the Ground-based Midcourse Defense (GMD) system, the budget request would continue to procure all 44 Ground-Based Interceptors (GBIs), with 14 of them planned for testing and spares. The budget request would cap the deployment of GBIs in Alaska and California at 30, and focus on further development and robust testing to improve the capability of this system to defend against the limited threat to our country from nations such as North Korea and possibly Iran in the future. This decision was supported by the Joint Chiefs of Staff and the relevant combatant commanders. Senior Department of Defense officials explained that the Department conducted an assessment, involving the Joint Chiefs of Staff and the combatant commands, of the long-range missile threat to the United States and determined that, according to Secretary Gates, 30 GBIs “are fully adequate to protect us against a North Korean threat for a number of years.”

The committee welcomes the emphasis on improving the capability of the GMD system, including through robust and operationally realistic testing and evaluation. In December 2008, the Director of Operational Test and Evaluation (DOT&E) reported that “GMD flight testing to date will not support a high degree of confidence in its limited capabilities.” In January 2009, DOT&E issued an annual assessment of the Ballistic Missile Defense System (BMDS), which included a number of concerns about the GMD system. The committee notes that MDA has worked for half a year with DOT&E and the operational test elements of the military departments to establish a comprehensive test and evaluation plan for the BMDS, and expects that plan to be completed by the end of the summer. The committee expects that plan to guide a long-term test plan for GMD, including operationally realistic tests that provide a high degree of confidence in the capability of the system, including its ability to perform its mission for the duration of its operational life. If such testing requires additional interceptors, the committee notes that senior Department officials testified that it would be possible to buy more GBIs in the future if they are needed.

The budget request includes an initiative to develop a new capability for ascent-phase (or early) intercepts, relying on improved use of existing and new sensors and interceptors such as the SM-3, whether on ships or on land. According to senior Department officials, such a capability would allow U.S. forces to engage threat missiles early in their flight, including long-range missiles, thus providing multiple opportunities to destroy the missiles in flight. In the case of long-range threat missiles, such a capability could also permit destruction of the threat missile before the GMD system would be needed to defend the Nation. If the initiative proves successful, such a capability could, if deployed in the European theater, provide defense of Europe and the United States against a potential future long-range missile threat from Iran. The committee supports this initiative, and commends the Department for conceiving of the concept for a cost-effective and operationally effective

system that relies, to a large extent, on existing or near-term technologies.

The committee notes that Secretary of Defense Gates decided to terminate a number of long-term research and development programs for missile defense that had technical, conceptual, cost, or operational problems. These decisions include the termination of the Multiple Kill Vehicle program, the Kinetic Energy Interceptor program, and cancellation of the second Airborne Laser (ABL) aircraft, and shifting the ABL program to a research and development effort. The Director of MDA testified that he recommended these changes, and Secretary Gates' decision was supported by the Joint Chiefs of Staff and the combatant commanders. The committee supports the Secretary's decision.

Finally, the committee notes that MDA has initiated a number of significant acquisition reform initiatives that are consistent with the Weapons System Acquisition Reform Act of 2009 (Public Law 111-124), and are intended to increase the accountability and effectiveness of MDA acquisition programs. The committee welcomes these acquisition initiatives, and believes they are long overdue.

Federally funded research and development centers

The committee notes that the Department of Defense's federally funded research and development centers (FFRDC) play an important role undertaking studies, analyses, research, and systems engineering projects to support defense missions. The committee believes that the requirement to make use of defense FFRDCs will be increased by the initiatives being undertaken by the Department to reform the acquisition process, and also by the urgent demands for technical and analytic support related to current operations. The committee urges the Department to maintain a stable and consistent investment in defense FFRDCs, including in core programs funded directly by research, development, test, and evaluation appropriations.

Ground/air task oriented radar

The budget request included \$63.9 million in PE 26313M, Marine Corps Communications Systems, for Research, Development, Test, and Evaluation, for the Ground/Air Task oriented Radar (GATOR). The committee understands that this program is being restructured, and has been designated as an item of special interest by the Under Secretary of Defense for Acquisition, Technology, and Logistics, who will retain milestone decision authority. The committee further understands that the Marine Corps leadership is reviewing the program for affordability and for possible joint development of a mobile ground multi-mode radar capability with the Army. The committee expects to be kept informed as these deliberations progress. In particular, the committee expects to be informed of any decision affecting fiscal year 2010 program plans or budgets prior to conference on the National Defense Authorization Act for Fiscal Year 2010.

Israeli upper tier missile defense

The budget request included \$119.7 million in PE 63913C for cooperative U.S.-Israeli missile defense programs, including \$37.5

million for joint development of an upper tier interceptor to replace the Arrow-2 interceptor, known as the Arrow-3. The committee supports the joint U.S.-Israeli development of the Arrow-3 interceptor, but is concerned that the program has risks that may take significantly longer to resolve than the timeline envisioned, and not in time to meet Israel's required schedule.

According to the testimony of Lieutenant General Patrick O'Reilly, Director of the Missile Defense Agency, the Arrow-3 development program is "deemed to have very high schedule and technical risk." The Missile Defense Agency is currently negotiating an Upper Tier Project Agreement that is intended to ensure that the Arrow-3 program is managed according to sound acquisition and management principles, including a requirement for accomplishing technology knowledge points according to a schedule.

According to Lieutenant General O'Reilly, to "mitigate the Arrow-3 development schedule risk, we are ensuring that the development of a land-based variant of the proven Aegis SM-3 missile is available to meet Israel's upper tier requirements." The committee agrees with this management and risk mitigation approach, and commends the Department for ensuring there will be a relatively low-risk and near-term upper tier option, based on the operationally effective SM-3, to meet Israel's upper tier missile defense needs in a timely manner. The committee requests that the Missile Defense Agency keep the congressional defense committees apprised of developments in the Israeli upper tier missile defense program, including both the Arrow-3 and land-based SM-3 development programs.

KC-X tanker replacement program

The committee regards the need to modernize the current fleet of KC-135 aerial refueling tanker aircraft as a vital national security priority and supports the KC-X tanker recapitalization program, as well as efforts by the Air Force both to maintain the existing fleet and augment capability with aerial fee-for-service, if it proves cost-effective under the pending pilot program. Given the troubled history of the program, the committee expects that the Department of Defense will pursue a process of procuring replacement tankers that will ensure that the joint warfighter receives the best capability at the best price. The committee believes that this can only be achieved by an acquisition strategy that does not pre-determine the outcome of the competition and a competition that is fair and open. In addition, the committee believes that, in accordance with the principles of the Weapon Systems Acquisition Reform Act of 2009 (Public Law 111-23) and as a means of improving contractor performance, the Department of Defense must ensure that the acquisition strategy of the KC-X program includes measures that ensure competition, or the option of competition, throughout the life cycle of the program, where appropriate and cost-effective.

Laboratory recapitalization and sustainment issues

The committee is aware that Department of Defense laboratories have chronically been underfunded for upgrade and modernization requirements that use military construction and facility sustainment funds. The unique mission of Department laboratories

requires an aggressive and proactive investment strategy to support emerging technologies and state-of-the art systems and equipment. The average rate of investment for recapitalization, as well as for sustainment restoration and modernization (SRM) funding, has been appreciably below industry standards and other governmental laboratories, despite special authorities provided by Congress in recent years to use Research, Development, Testing, and Evaluation funds for military construction activities at higher thresholds than other types of facilities. In addition, the committee is concerned that the military departments do not have processes in place to obtain quantitative data to assess the overall ability of the laboratory infrastructure to support existing missions and emerging requirements.

Therefore, the committee directs the Secretary of Defense, through the Director of Defense Research and Engineering and the Deputy Under Secretary of Defense for Installations and Environment, to report to the congressional defense committees, not later than 180 days after enactment of this Act, on the health of the Department's laboratory infrastructure. The report should include a list and description of unfunded laboratory military construction and major repair projects for the Army, Navy, and Air Force research labs, including the Army research, development and engineering command laboratories, corps of engineers laboratory facilities, and naval warfare centers, and an investment plan required to modernize defense laboratories to meet current mission and known future mission requirements, as well as data on funding for military construction projects and SRM at the defense laboratories from fiscal years 2008 and 2009.

Net-Enabled Command Capability

The committee is deeply disappointed that the Department has been unable to come to grips with ongoing dissent within the Department regarding sorely needed modernization in the area of joint command and control. It is apparent that the Department's management and governance construct for the Net-Enabled Command Capability (NECC) program has delayed the Department's ability to develop and field the next generation of joint command and control capabilities.

Due to the unwillingness of the Services and others to agree to a joint command and control modernization that is centrally managed, the committee directs the termination of the NECC system. The committee directs that any remaining Service NECC funds be moved into their respective Global Command and Control System (GCCS) programs, while the Defense Information Systems Agency (DISA) funding programmed for NECC should be aligned to Global Command and Control System-Joint program.

The committee supports the need for a joint command and control architecture and standards to be used in the development of the Department's command and control modernization effort. The committee further expects the GCCS program to be modernized into a Department-wide joint command and control program and expects the Department to appropriately fund this activity so that it will transform and incorporate the most advanced technologies and capabilities possible. The committee expects that the Services,

DISA, and the Assistant Secretary for Network and Information Integration will jointly work together to determine the best governance and funding structure to achieve these results efficiently and effectively.

Test and evaluation workforce

The committee directs the Director of the Test Resource Management Center (TRMC) to provide a report to the congressional defense committees within 120 days of enactment of this Act on the extent to which contractor positions in the Major Range and Test Facility Base should be converted to Department of Defense civilian employee positions. The report should identify any actions the military departments and defense agencies plan to take to convert such positions between fiscal year 2010 to fiscal year 2015, including any funding and manpower adjustments needed to make the conversions. The report should also make an assessment of the impact that the conversion process will have on acquisition programs that require the use of affected test facilities. To assist in the development of this report, the committee directs the secretaries of the military departments and the heads of the appropriate defense agencies to provide TRMC with any information required for this report within 90 days of enactment of this Act.

Third Generation Infrared Surveillance

The budget request included \$143.2 million for Third Generation Infrared Surveillance (3GIRS). The committee supports technology risk reduction and demonstration efforts to develop the next generation infrared capability to enable the Air Force to launch a successor to the Spaced-based Infrared Satellite (SBIRS) when needed. At the same time the committee recognizes that the program of record, SBIRS, continues to struggle. While the first two highly elliptical orbit sensors are on orbit and are performing the first of the geosynchronous earth orbit (GEO), SBIRS has slipped yet another year due to continuing software issues. The committee urges the Air Force to continue to improve the wide field of view focal plane array technology, including the digital focal plane arrays, so that when the technology is sufficiently mature the Air Force can make the transition to a less costly, more capable infrared satellite system. The committee notes that the plan for next-generation overhead persistent infrared architecture is due to Congress in July 2009.