

TITLE II—RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, ARMY

Items of Special Interest

Accelerating Army Aircraft Cleaning and Deicing Systems for rotary-wing aircraft

The committee has long expressed concern about the impact of corrosion on aviation assets and supported efforts to improve aircrew safety, aircraft availability, and aircraft and unit readiness through cost-effective corrosion mitigation. The committee understands that an aircraft cleaning and deicing system (ACDS) capability would help prevent and control corrosion of aviation assets through development and testing of an aircraft washing system. The committee remains concerned by the Army's current plans for ACDS which moves ACDS development and demonstration further into the future years defense program despite a persistent requirement to mitigate corrosion on aircraft. The committee is aware that existing commercial-off-the-shelf aircraft cleaning systems are currently available for test and evaluation and expects the Army to consider these systems as a potential option to rapidly address corrosion mitigation issues for aviation assets.

The committee directs the Secretary of the Army to provide a briefing to the House Committee on Armed Services by December

15, 2020, on the Army's plan to prevent and control the impact of corrosion on rotary- and fixed-wing aircraft. The briefing shall include, but not be limited to a detailed description of policies, programs, funding, and investment strategy to address corrosion prevention and control on Army aircraft, a plan to accelerate ACDS efforts, evaluations of commercial off the shelf systems, and consideration given to creating a program of record for this capability.

Auxiliary power units for armored and tactical vehicles

The committee is aware that armored and tactical vehicles may lack enough electrical power to accommodate the weapons, sensors, and payloads needed for effective operations in current and future combat environments. The committee understands that some of these power generation shortfalls could be addressed using auxiliary power units (APU), however, existing APUs are often impractical for use on Army vehicles due to their large size and weight.

The committee understands that there are research and development efforts to develop innovative small generators and APUs that could provide significant improvements in size, weight, and fuel efficiency. The committee encourages the Army to explore these innovative systems for potential use on current armored and tactical vehicles as well as the next generation combat vehicles, such as the Optionally Manned Fighting Vehicle and Robotic Combat Vehicles.

Accordingly, the committee directs the Secretary of the Army to provide a briefing to the House Committee on Armed Services by October 30, 2020, on efforts to address power generation requirements for its current and future ground combat and tactical vehicle fleets. The report shall include, but not be limited to:

(1) an overview of current ground combat and tactical vehicles demonstrating significant power generation problems, and the resulting operational impacts;

(2) an analysis of expected power generation requirements for the systems contemplated as part of the Next Generation Combat Vehicle Program; and

(3) any current or planned efforts to explore innovative small form factor auxiliary power units for armored or tactical vehicles.

Briefing on Army's Carbine Magazine Development Strategy

The committee supports the Department of the Army's Next Generation Squad Weapons (NGSW) program and commends the service for continuously assessing new and advanced materials, such as polymer compounds, to provide warfighters with the best equipment necessary for mission success. As the Army proceeds with the NGSW program, the committee believes that the service should seek the highest-performing 6.8mm magazine composed of modern materials to maximize soldier lethality and improve soldier survivability.

The committee notes that the Army has completed several 5.56mm magazine tests, the results of which led the Departments of the Air Force, Marine Corps, Coast Guard, and Special Operations Command to formally adopt a high-performing polymer magazine that the Army has authorized for its own acquisition. The committee views synchronization in magazine selection between the services as a positive development that advances force interoperability and increases military preparedness. The committee be-

believes that these outcomes should inform the Army's magazine selection process under the NGSW program.

The committee expects the Army to implement lessons learned from previous magazine procurement and testing and require that the highest-performing magazines be used in NGSW rifles. The committee therefore directs the Secretary of the Army to provide a briefing to the congressional defense committees not later than October 30, 2020, on the Army's comprehensive strategy on NGSW magazine procurement. The briefing shall include a description of the Army's expected requirements for the NGSW magazines, such as performance metrics, materials, and visual indicators for rounds remaining.

Carbon composite materials for helicopter wheels and brakes

The budget request included \$46.1 million in PE 0607137A for the Chinook Product Improvement program.

The committee has previously supported research efforts to develop lightweight carbon composite materials and notes that such materials could also be used in manufacturing aircraft brake housings, wheels, and associated components. Traditional aluminum aircraft braking components add substantial weight to aircraft, reducing payload capacity and increasing fuel consumption. The committee understands that replacing aluminum with high temperature carbon composites could significantly reduce the weight of a brake or wheel part by up to 30–50 percent, depending on the aircraft. Incorporating carbon composite materials in certain components could potentially improve operational capabilities for the CH–47 Chinook helicopter, the Army's primary heavy-lift aircraft. The committee also notes that development conducted for the CH–47 Chinook helicopter in these materials could be applied to other helicopter programs.

Therefore, the committee recommends \$51.1 million, an increase of \$5.0 million, in PE 0607137A, for development of lightweight carbon composite materials for CH–47 Chinook helicopter brake housings and wheels.

Carbon fiber and graphite foam for combat and tactical vehicles

The committee notes that the Army's Ground Vehicle Systems Center and U.S. Special Operations Command (USSOCOM) are conducting developmental research on the potential wider application of carbon fiber composite wheels and graphitic carbon foam in support of the Army Next Generation Combat Vehicle (NGCV) cross-functional team's (CFT) lines of effort and the special operations forces tactical vehicle programs. The committee understands that graphite and carbon fiber components could reduce total vehicle weight and fuel consumption, while at the same time increase payload capacity and extend service life for a wide variety of combat and tactical vehicles. The committee recognizes the potential versatility and broad application that graphite and carbon fiber technology could provide for the military services and expects that the NGCV CFT and USSOCOM will continue the development and testing of carbon fiber and graphitic carbon foam components. In this regard, the committee encourages the NGCV CFT and USSOCOM to engage and communicate with the combat and tactical vehicle industrial base to ensure awareness of their interest

in new graphite and carbon fiber technologies as well as to continue to assess their potential application to future combat and tactical vehicles.

Electrification of Army combat and tactical vehicles

The committee understands that electric or hybrid-electric powertrains could increase performance, allow relatively silent operation, generate significant on-board power generation, and reduce the logistical burden associated with transporting and storing fuel. The committee notes the Army has for several years been working on electrification and has experimented with hybrid-electric tactical wheeled vehicles to include successful efforts to integrate on-board vehicle electric power through a Transmission Integral Generator for the Army's Terminal High Altitude Air Defense launcher. The committee is not aware, however, of any plans for the further development or integration of electrification technologies into combat and tactical vehicles and believes the Army should continue to invest and consider the potential military applications of this technology given rapidly advancing commercial industry developments.

Accordingly, the committee directs the Secretary of the Army to provide a briefing to the House Committee on Armed Services by December 15, 2020, on the status of its electrification research and development strategy for combat and tactical vehicles. The briefing should include, but not be limited to:

(1) current and future requirements and opportunities for electrification of combat and tactical vehicles, including such vehicle capabilities that could be related and necessary based on the 2018 National Defense Strategy, operational plans, or to satisfy concepts for Multi-Domain Operations;

(2) the current and future priorities for electrification of combat and tactical vehicles including plans, if any, to spiral hybrid-electric powertrains into existing combat and tactical vehicles;

(3) a description and assessment of potential Army timelines for initial, partial, and full electrification of existing and future combat and tactical vehicles; and

(4) details of ongoing science and technology initiatives that involve hybrid-electric propulsion and full-electric drive of combat and tactical vehicles to include plans, if any, to further develop integrated electric axle technology, motors and generators, power electronics, inverters, converters, energy storage systems, and transmissions.

Extended Range Cannon Artillery Program

The committee has consistently supported Army modernization of long-range precision fires. However, the committee has recently learned of technical issues affecting the Extended Range Cannon Artillery program with respect to auto-loader technology. The committee understands these technical issues have resulted in excess funds for the program. Accordingly, the committee directs the Secretary of the Army, not later than December 20, 2020, to provide a briefing to the House Armed Services Committee that identifies potential solutions to the technical issues impacting the Extended Range Cannon Artillery program and the steps that the Army has taken or will take to address the technical issues discovered. The committee encourages the Army, in restructuring this program, to

consider directing available resources to other technical solutions that could accomplish this same purpose and to include those considerations in the above directed briefing. Finally, the Secretary of the Army is directed to include in the briefing a description of how the funding for the Extended Range Cannon Artillery has been executed for the past two years, and the Army's plans to properly fund this effort over the next five fiscal years.

Future Vertical Lift sensor payloads

The committee expects the Army's Future Vertical Lift (FVL) program to field advanced sensor payloads capable of detecting, tracking, and countering threats in the future operational environment. The committee notes that the Army has yet to define the acquisition strategy for FVL mission equipment payloads and sensors, despite an accelerated platform development schedule. The committee understands that fielding mission equipment that is as advanced and capable as the platforms themselves will require investment and development in the coming years. The committee is concerned that without a well-defined acquisition strategy and risk reduction effort for mission equipment payloads and sensors, industry will be unable to make the investments necessary to deliver advanced capabilities on time for FVL programs.

Therefore, the committee directs the Secretary of the Army to submit a report to the Committees on Armed Services of the Senate and the House of Representatives by December 1, 2020, on Future Vertical Lift mission equipment payloads and sensors. The report should include:

- (1) the acquisition strategy for FVL mission equipment payloads and sensors, including radar, electronic warfare, 360 degree distributed aperture, missile warning, and advanced electro-optical infrared;
- (2) planned risk reduction activities for the sensor payloads; and
- (3) an estimate of the cost and schedule for the development and production of required sensor payloads.

Instrumental Synthetic Training Environment and Modeling and Simulation Capabilities

The committee is aware of potential adversaries' investments in leap-ahead technologies, including dual-use commercial technologies, to gain an asymmetric advantage over the United States. The committee urges the Department to use its alternative acquisition mechanism authorities provided by Congress to enable prototyping of emerging technologies and engage with the private sector to continue driving vital innovation in these critical areas.

The committee therefore directs the Assistant Secretary of the Army for Acquisition, Logistics and Technology to submit a briefing to the House Committee on Armed Services by January 31, 2021 on the Army's plan to continue to integrate virtual training and simulations into its future force design decisions. The briefing shall include how the Army is partnering with the Navy and Marine Corps to further integrate advanced simulation and virtual training technologies to inform future force design and foster force development through expanded wargaming, live-virtual-constructive training, and scalable realistic simulations.

Modeling and Simulation for Ground Vehicle Development and Sustainment

The Committee recognizes the importance and value of modeling and simulation (M&S) in supporting digital design, experimentation, and developmental and operational test and evaluation for military ground vehicle systems. When used appropriately, modeling and simulation can help save money and time delivering affordable technology to soldiers faster. The Committee notes that the Army's Ground Vehicle Systems Center (GVSC) has been using available funds to improve and expand its M&S capabilities through public-private partnerships and finding M&S tools developed by entities outside the military and brought to the Center's attention through their innovative outreach program. The Committee understands that partnerships with industry, academia, and non-profit science, technology, engineering, and math organizations could increase the likelihood of success for technology development and transfers between GVSC and non-traditional defense industry and organizations. In this regard, the committee directs the Assistant Secretary of the Army for Acquisition, Logistics, and Technology, not later than December 21, 2020, to provide a briefing to the House Armed Services Committee that outlines the Army's plans, if any, to support the improvement and expansion of GVSC's internal and external M&S capabilities and their relationship to the Army's high priority programs for combat and tactical vehicle modernization and sustainment.

Next generation Integrated Visual Augmentation System

The committee is aware that the Integrated Visual Augmentation System (IVAS) is due to begin delivering first units to the Army in the fourth quarter of fiscal year 2021. The committee is further aware that a decision point for second generation of IVAS (IVAS 2.0) development is due to occur early in fiscal year 2023. Following the IVAS 2.0 decision point, development of the next generation of the program is projected to start at the beginning of fiscal year 2024.

However, due to the large quantity of hardware, software, and funds allocated for the program, as well as an aggressive development schedule, the committee expects the Army to utilize this technology in developing any new heads-up displays for air and ground vehicles. Therefore, the committee directs the Secretary of the Army to provide a briefing to the House Committee on Armed Services not later than December 1, 2020, on how the Army plans to integrate IVAS technology across major Army platforms, including but not limited to air and ground vehicle operators.

Next Generation Squad Weapons and Small Business Innovation Research

The committee recognizes the Department of the Army's ongoing effort to enhance soldier lethality and battlefield connectivity through its Next Generation Squad Weapons (NGSW) and Next Generation Squad Weapon Fire Control (NGSW-FC) programs, as well as its programs to strengthen the battlefield network and support cooperative engagements. The committee encourages the Department of the Army to continue to integrate proven solutions for power, data energy efficiency, increased accuracy, and improved

situational awareness in partnership with small businesses through the Small Business Innovation Research Program (SBIR). Therefore, the committee directs the Secretary of the Army to provide a briefing to the congressional defense committees not later than February 1, 2021, on the SBIR efforts within the NGSW and NGSW-FC programs.

Pragmatic Artificial Intelligence and New Technology (PAINT)

The committee notes that artificial intelligence and machine learning are being leveraged by the Army to help solve complex problems, including designing testing scenarios for missile defense systems. The committee is encouraged by the use of this technology by the Army's Space and Missile Defense Command and believes an opportunity exists to continue leveraging artificial intelligence and machine learning techniques as the Army's Integrated Air and Missile Defense Program continues to integrate current and future air and missile defense sensors and weapons.

Therefore, the committee directs the Secretary of the Army to brief the House Committee on Armed Services not later than January 15, 2021, on the Army's plans to incorporate artificial intelligence techniques in its efforts to continue development of near-term engineering solutions to improve existing missile defense systems to keep pace with current and anticipated missile threats.

Report on the Future Tactical Unmanned Aerial System Program

The committee understands the Army's Future Tactical Unmanned Aircraft System (FTUAS) would serve as a replacement for the RQ-7B Shadow in Army brigade combat teams. Further, the committee notes the FTUAS would be a Group 2/3 unmanned aircraft system (UAS) with a point take-off and landing capability to provide the BCT commander with a joint all-domain operations capable, runway independent, reconnaissance, surveillance, and target acquisition capability. The committee is pleased the Department of Army is taking steps to advance the development and procurement of next generation tactical UAS programs. However, recognizing the need to grow the domestic UAS industry and the rapid pace of technological innovation, the committee expects the Army would fully evaluate and consider all domestic UAS proven technologies already fielded under a Small Business Innovation Research grant phase 2 or 3 contract, before issuing a production award under the Army's FTUAS program.

The committee directs the Secretary of the Army to provide a briefing to the House Committee on Armed Services by February 15th, 2021, that includes but is not limited to: (1) the FTUAS program's progress to date; (2) the current acquisition strategy and schedule for FTUAS prototyping and development; (3) planned funding and resources required for FTUAS across the future years defense program.

Stryker weapons station commonality

The committee is aware of and supports current Army efforts to modify Stryker infantry carriers to improve anti-armor and air defense capabilities and capacities. These programs include integration of a 30mm cannon in a Medium Caliber Weapon System (MCWS) for anti-armor and Stinger missiles, as well as other

weapons, in an Initial Maneuver Short-Range Air Defense (IM-SHORAD) system for air defense. The committee notes and supports that the Army is currently conducting a full and open competition for the MCWS. The committee also notes both of these systems would be based upon an unmanned but accessible turreted vehicle weapons station. In this regard, the committee is interested to know what advantages, if any, the Army could gain by developing as much commonality as possible between both systems with turret hardware and fire control software. Commonality has the potential to reduce the overall acquisition and life cycle management costs of both weapons systems.

Accordingly, the committee directs the Secretary of the Army to provide a briefing to the House Committee on Armed Services not later than February 1, 2021, on the potential and plans, if any, for achieving commonality of the MCWS and IM-SHORAD weapons stations.

Supercavitating ammunition

In the committee reports (H. Rept 115-200 and H. Rept 115-70) to accompany the National Defense Authorization Acts for Fiscal Years 2018 and 2019 the committee has shared its interest in supercavitating ammunition technologies and supported the Department's efforts to evaluate and field this capability. The committee understands that a solution has been identified and is ready for procurement pending final evaluations.

Therefore, the committee directs the Secretary of the Army to provide to the Committees on Armed Services of the Senate and the House of Representatives, no later than September 30, 2020, an update to the briefing provided pursuant to the committee reports accompanying the National Defense Authorization Act for Fiscal Year 2018 and Fiscal Year 2019. This briefing shall include an overview of the current status of the project and an estimated plan for procurement.

Thermoplastic drive shafts for helicopter tail rotor drive systems

The budget request included \$11.2 million in PE 0607136A for the Blackhawk Product Improvement Program.

The committee is aware that helicopter tail rotor drive systems typically require frequent maintenance and often affect aircraft maneuverability due to their significant weight. The committee is also aware that thermoplastic drive shafts could potentially improve helicopter performance while reducing operations and sustainment costs by providing lighter weight components with greater ballistic tolerances. The committee notes that the Army's UH-60 Blackhawk program could potentially benefit from additional development and engineering of thermoplastic drive shafts for a lighter weight, more reliable system.

Accordingly, the committee recommends \$16.2 million, an increase of \$5.0 million, in PE 0607136A for the Blackhawk Product Improvement Program for thermoplastic drive shaft development and engineering.

RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, NAVY

Items of Special Interest

Advanced Low Cost Munition Ordnance

The committee continues to support development of the Advanced Low Cost Munition Ordnance, a guided 57mm projectile, with fire-and-forget capability that requires no Littoral Combat Ship fire control system changes, to counter the growing threats posed by small boat swarms, unmanned aerial systems, and other emerging threats.

Advanced Submarine Countermeasures

The committee notes that Navy is proposing a new advanced submarine countermeasures that incorporates sophisticated acoustic decoy capabilities to counter the growing threats of modern acoustic homing torpedoes. These new countermeasures must also incorporate advanced mobility functionality to enhance tactics in littoral waters. The ADC MK 5 incorporates these new acoustic and mobility capabilities at the same physical size as the current ADC MK 2 devices to maintain compatibility with existing submarine launch devices and support systems. The integration of the new ADC MK 5 acoustic and mobility capabilities into the existing device form factor represents a significant technological advancement of the Navy's submarine countermeasures, and this technology can be applied to other countermeasure needs across the fleet. The committee supports the continued development of this advanced submarine countermeasure system and the eventual award of a production MK5 variant. Therefore, the committee directs the Secretary of the Navy to brief the House Committee on Armed Services by February 1, 2021 as to advanced submarine kinetic and non-kinetic countermeasures and the associated acquisition timelines to deploy these capabilities.

Aviation Survivability of Marine Corps, Navy, and Air Force Rotary Wing Aircraft

The committee recognizes the importance of the Distributed Aperture Infrared Countermeasure System (DAIRCM) and the Department of Defense's efforts to integrate an aircraft protection system to protect small to medium rotary wing aircraft from increased threats. These protection systems have been combat deployed by the Air Force. The committee is aware of enhanced capabilities that can provide light and medium rotary aircraft a dual-warning and defeat capability, able to counter surface-to-air missiles, small arms fire, and other anti-aircraft or laser-directed weapons threats confronting our forward-deployed forces. The committee recognizes there is a future gap in this aircraft survivability capability for both the Air Force and Marine Corps in the coming fiscal years and supports the efforts by these services to rapidly transition to a production capability. This transition will ensure all Marine Expeditionary Units and forward deployed Air Force rotary wing aircraft are properly equipped to meet this threat.

Therefore, the committee directs the Secretary of the Navy in coordination with the Commandant of the Marine Corps and Chief of Staff of the Air Force, to provide a briefing to the House Committee

on Armed Services by March 1, 2021, on the effective integration of DAIRCM into additional light and medium rotary wing aircraft and the long-term strategy for aircraft survivability of the Marine Corps and Air Force rotary wing fleet.

Conformal Acoustic Velocity Sonar

The committee notes that the Conformal Acoustic Velocity Sonar project was developed to provide an affordable “smart-skin” acoustic sonar receive array to the *Virginia*-class submarine. Replacing traditional spherical sonar arrays with a conformal bow array would significantly improve submarine structural design and improve the submarine’s stealth characteristics. The committee is also aware of the improved sonar performance observed in large vertical arrays which have been tested on various submarines during at-sea operations.

Considering the many benefits of this new technology used in large vertical arrays, the committee remains supportive of an acoustic sonar in a bow conformal array configuration. The committee urges continued Navy’s effort to develop this technology in a bow configuration, continued test to prove out this technology and the insertion of the Large Vertical Array and conformal bow array into the submarine fleet. Finally, the committee directs the Secretary of the Navy to prepare a brief to the House Committee on Armed Services by February 15, 2021 as to current programming associated with the continued introduction of the large vertical arrays and conformal bow arrays; operational tests associated with these capabilities; and, industrial base implications associated with continued production.

Expeditionary Fast Transport conversion to an unmanned surface vessel

The committee recognizes that unmanned surface vessels will play an essential role in future fleets of the Navy and supports the development of this capability in a manner that responsibly fields this new capability. The committee continues to believe that the Navy’s current acquisition strategy incorporates an excessive amount of concurrency and is overly focused on the hull. The desire to move immediately from development into serial production will only yield similar misfortunes as past shipbuilding programs with similar strategies. The committee believes the Navy should be primarily focused on the autonomy piece of this capability and ensuring that technologies that will need to be developed to support autonomous operations are mature before being incorporated on a purpose built vessel. A strategy that includes prototyping and test-of-ship systems such as propulsion, Command, Control, Communications, Computers and Intelligence, and other major Hull, Mechanical and Engineering systems prior to hull form decisions is a more prudent strategy that may actually field this capability sooner. The committee is also concerned with what level of manning if any will be required for these vessels. In briefings, the Navy has stated that initially these vessels will need to be minimally manned rather than fully unmanned in order to maximize Concept of Operations (CONOPS) development. The committee believes that the Navy should modify existing mature manned ships to support autonomous operations in order to develop CONOPS rather than

procuring new ships that will need to support manned operations, but will eventually be fully unmanned.

Therefore, the committee recommends \$45.0 million in PE 0603178N for the conversion of two Expeditionary Fast Transport (EPF) ships to support autonomous operations and accelerate CONOPS development.

Medium Range Interceptor Capability

The committee notes the Marine Corps' effort to take advantage of existing capabilities and components, including, but not limited to, the AN/TPS-80 G/ATOR radar system, the common aviation command and control system, and the Iron Dome battle management and weapons control and Tamir missiles, to rapidly field a Medium Range Interceptor Capability (MRIC) under the Ground Based Air Defense family of systems. The committee understands the MRIC is intended to provide a critically needed capability to defend Marine Air Ground Task Force (MAGTF) sites primarily against cruise missiles and secondarily against manned and unmanned aircraft and other aerial threats. The committee is aware that missile, rocket, mortar threats have become increasingly prevalent with attacks on both U.S. forces and our allies in Iraq.

Therefore, the committee directs the Commanding General of the Marine Corps Combat Development Command to provide a briefing to the House Committee on Armed Services no later than December 21, 2020 on the timeline and funding plan to develop, test, and procure MRIC, including costs, requirements, and any opportunities or challenges associated with accelerating the program to respond to increased threats to deployed U.S. Marine forces.

Medium unmanned undersea vehicles

The committee understands that the new medium unmanned undersea vehicle (MUUV) program will consolidate the MUUVs to a common but open architecture vehicle of between 10 and 21 inches in diameter, which will allow it to perform a wide range of missions, depending on the sensor. This includes being deployed from expeditionary, surface, and submarine platforms. The new MUUV program represents a significant step forward to putting out a new generation of unmanned undersea vehicles (UUVs), which will also include a more modular open software architecture allowing for spiral developments and the deployment of a variety of sensors from this common platform. Existing MK 18 mod 2 UUVs have been very reliable and have exceeded the availability and reliability requirements. The committee understands that they are also heavily used as the fleet's only operational mine countermeasure UUV. The committee encourages the Navy to continue making technology advances utilizing a common architecture with MUUVs.

Report on the Navy's Long-Range Ocular Interrupter Program

The committee is concerned with the ongoing development of the Navy's Long-Range Ocular Interrupter (LROI) Program. The committee understands that the LROI is intended to provide the Navy with the capability to deliver a bright light producing a dazzling or glare effect on a closing target to warn and/or suppress potential threats through increasing levels of visual degradation. According to the Navy, LROI will generate controlled, high-intensity output,

providing warning and suppression effects and will enhance Joint Force operations in assessing the intent of personnel and controlling the potential threat as early as possible.

The committee agrees with the military utility of this capability, and the need for the Navy to move forward to field a materiel solution. However, the committee is troubled by the continued schedule slippage of LROI in the Engineering and Material Development (EMD) acquisition phase. For example, the committee is concerned that the Navy is continuing to develop the LROI system when existing commercial-off-the-shelf capabilities are already being fielding by other military services. The committee is further concerned that there are ongoing disputes over the intellectual property of the LROI system.

Therefore, the committee directs the Secretary of the Navy, not later than February 1, 2021, to provide a report to the congressional defense committees on the LROI acquisition strategy, past development contracts and costs, past test and evaluation strategy and results, market research efforts to identify LROI COTS solutions, and currently fielded ocular interrupter systems used by other military services.

Research opportunities in cloud-aerosol effects and atmospheric sunlight reflection

The United States faces a complex array of threats to our national security, as highlighted in a December 2018 GAO Report (GAO-19-204SP) which identified emerging threats of high consequence that will evolve as adversaries develop militarily, weapons and technology advances, and as environmental changes occur, including threats arising through extreme weather events—such as hurricanes, floods and droughts, that could intensify and affect energy resources, critical infrastructure and military installations.

The Committee is aware of basic research opportunities in cloud-aerosol effects and atmospheric sunlight reflection and believes this research has the potential to benefit the military by providing improvements to short-term prediction of operationally relevant weather behavior and by reducing uncertainty in medium and long-term forecasting of extreme weather and climate conditions affecting military infrastructure, tactical operations and readiness. This research also has the potential to expand the portfolio of options for reducing risks to military infrastructure, operations and readiness and to ensure U.S. leadership in an area of innovation with significant implications for national security. The Committee also understands that other nations have established research programs on the physical, chemical, and optical properties of atmospheric aerosols and to study, among other things, their impact on climate.

Furthermore, temperature data shows that the Arctic is getting warmer faster than any other region of the world, making it a bellwether for future climate damages and a major driver of tipping points with the potential to cause rapid and geopolitically destabilizing environmental changes. It is also a domain of renewed great power competition, as other nations position themselves to exploit the increasing accessibility of the Arctic even as US investment in Arctic-ready platforms has lagged. The United States has the world's greatest concentration of military and civilian assets and technology to observe, assess, and predict changing conditions

in the Arctic, but has not adequately invested in maintaining its northernmost scientific and national security infrastructure. The US capability to forecast near and long-term weather and environmental conditions in the Arctic underwrites technical and tactical advantages essential for maintaining strategic security guarantees, and provides crucial intelligence essential to anticipate, prioritize, and counter suspicious patterns of activity in airborne and maritime traffic passing through or within the Arctic. At the same time, decadal projections of Arctic conditions are essential for prioritizing investments into Arctic-capable vessels and exercises to prepare personnel for the unique challenges of operating in the Arctic environment. Improving these forecasts will depend on increasing our scientific understanding of processes driving Arctic changes.

Therefore, to improve the Department's ability to forecast operationally relevant weather behavior, better understand climate risk, and ensure U.S. leadership in this field, the Committee directs the Chief of Naval Research to review research opportunities in cloud-aerosol effects and atmospheric sunlight reflection, and to report back to the Committee not later than 90 days after the enactment of this Act on the capabilities the Office of Naval Research can provide to the Department and the National Laboratories to support this critical research.

RF and EMP defense technology solutions

The committee is concerned that the United States faces an increasing and serious threat from hostile entities and state-sponsored terrorist organizations employing malicious Radio Frequency (RF) energy devices to actively interrogate, interfere, and compromise sensitive United States military assets and operational capabilities. The United States Navy has had no durable repeat-use solution to shield against RF energy that is flexible enough to be draped over sensitive equipment and could be formed into a practical cover. The committee understands through Cooperative Research and Development Agreements, the Naval Surface Warfare Center has developed cost effective and easily deployable RF shielding materials that mitigate or prevent the use of the RF spectrum by adversaries. The material developed through the Navy's efforts is also being researched as a defensive shield against Electro-Magnetic Pulse (EMP) signals from both natural and hostile sources and other tactical solutions. The committee recognizes the significance of technology to defend against RF and EMP threats. Therefore, the committee directs the Assistant Secretary of the Navy for Research, Development and Acquisition to provide a report to the congressional defense committees by February 15th, 2021 on the progress of the research, development, and deployment of cost-effective, easily deployable RF and EMP defense technology solutions. The report shall include recommendations for funding continued research and deployment of RF and EMP shielding cover technology.

Shipboard Information Warfare Exploit

The committee notes that the Spectral program is an incremental acquisition, Government Off-The-Shelf/Commercial Off-The-Shelf program that provides cryptologic signals exploitation capabilities designed to meet the requirements for shipboard cryptologic oper-

ations within the Ship's Signal Exploitation Space (SSES) aboard a variety of ship classes and shore facilities. The Spectral system is programmed to provide a mobile, passive capability to detect, classify, track, and determine the intent of enemy units through exploitation of their command and control emissions. The system will be scalable, reconfigurable to mission, modular, remotable and dynamically reprogrammable in response to new threats and capabilities. The committee believes that the Secretary of the Navy should expedite the development of this critical capability and supports decoupling the hardware from the software so that capability enhancements are delivered by software as soon as they are developed. To achieve maximum competition and to solicit the most current technologies, the committee further believes that the Secretary should continue to prioritize an open architecture approach so that the new system can readily integrate emerging third-party capabilities. Therefore, the committee directs the Secretary of the Navy to prepare a brief to the House Committee on Armed Services by January 30, 2021 as to implementation of the Spectral Program to include both program capabilities and timelines.

SSN(X) future propulsion and power requirements

The committee supports the efforts of the Navy to develop a new class of attack submarine capable of meeting future threats posed by near peer competitors through the end of the century. The Next Generation Attack Submarine, SSN(X), will counter threats posed by peer adversary submarines, future unmanned underwater vehicles, and emerging persistent threats to U.S. undersea supremacy that already utilize the benefits of electric propulsion. Critical to the success of the Next Generation Attack Submarine is the ability to combine stealth and speed while maintaining the power needed to operate future sensors and weapons to prosecute undersea warfare. The Navy's prior investments and advancements achieved in the *Columbia* class program have led to a superior quiet acoustic propulsion system capable of meeting current and future threats while also providing the power architecture and flexibility needed to enable future weapons and sensors. The committee supports efforts by the Navy to seek designs and technologies that will provide the future SSN(X) with greater warfighting capabilities combined with total reduced costs through leveraging prior investments from the *Columbia* class program. The committee encourages the Navy to balance superior technological capability with affordability by evaluating non-developmental electric power and propulsion solutions. These solutions have demonstrated superior quiet operational capabilities and lethality and will ensure the future SSN(X) can meet the essential operational and mission requirements within an accelerated submarine build cycle.

Surface Navy Laser Weapon System Briefing

The Committee commends the Department of the Navy's recent success with the Laser Weapons System Demonstrator (LWSD) from an LPD. In addition, the Committee is encouraged that SNLWS Increment 1, the High Energy Laser with Integrated Optical-Dazzler and Surveillance (HELIOS) is on schedule to begin integration and land-based testing later this year. In addition, the Committee recognizes that both the Navy and industry have in-

vested in this technology and understand the need to take incremental steps since there is no one-size fits all solution. However, the Committee is concerned with both the fragility of the supply base and that the protracted time between development, test and installation for an at-sea trial will cause the Navy to reprogram outyear funding to other needs. Therefore, the committee directs the Secretary of the Navy to brief the committee no later than October 1, 2020 on an updated acquisition timeline that illustrates its path forward on SNLWS Increment 1 and allows for an efficient fielding of SNLWS Increment 2.

Transformational Reliable Acoustic Path System

The Navy's Theatre Anti-Submarine Warfare Offset Strategy responds to an urgent requirement for additional maritime intelligence, surveillance, and reconnaissance capabilities. The Defense Advanced Research Projects Agency Transformational Reliable Acoustic Path System (TRAPS) program was transitioned into a rapid prototyping program to meet this requirement. TRAPS is a passive, long duration, deep-sea anti-submarine warfare (ASW) technology that provides cost effective acoustic surveillance in a rapidly deployable manner. TRAPS was phased into the Theater ASW Initiative, as a means to provide a best in class sensor system deployable in deep ocean waters in areas previously not exploitable. The effort has advanced to a Program of Record with Spiral 1 underway, and anticipated Spiral 2 beginning at the end of fiscal year 2021. The committee encourages the Navy to continue fielding and deploying the TRAPS.

RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, AIR FORCE

Items of Special Interest

Air Force Advanced Technology Development Report

The committee recognizes that our service members and military leaders face evolving challenges that will require integration of the Air Force's science and technology development efforts in order to reassert the United States' competitive advantage across every warfighting domain. The committee is aware of the consolidation of thirteen Advanced Technology Development (ATD) Program Elements (PE) into five new PE lines within the Air Force's Research Development Test and Evaluation (RDT&E) funding in section 4201. The committee is concerned about losing insight and transparency during the Air Force's transition and implementation phase. Therefore, the committee directs the Secretary of the Air Force to submit an initial report to the congressional defense committees no later than October 30, 2021 on the amount of funding allocated to each Air Force Research Laboratory (AFRL) Directorate from the ATD RDT&E Budget Activity 03 (BA03) lines in Fiscal Year (FY) 2021. For transparency and consistency, the committee directs the Secretary of the Air Force to submit a final report to the congressional defense committees no later than October 30, 2022 on the amount of funding allocated to each AFRL Directorate from the ATD RDT&E BA03 lines in FY 2022.

Air Force Institute of Technology research, development, test, and evaluation

The committee recognizes the valuable contributions of the Air Force Institute of Technology (AFIT) to the professional development and technical expertise of the U.S. Air Force. The committee is aware of the continuing efforts of AFIT to provide cutting edge, specialized education to officer and enlisted U.S. military personnel and civilian employees in technical fields, including Aeronautics and Astronautics, Engineering Physics, and Systems Engineering. Despite the significant academic research that occurs at AFIT, it does not maintain a dedicated research, development, test, and evaluation (RDTE) program line. The committee is interested in understanding how AFIT may benefit from a dedicated RDTE line and what additional flexibility this may provide, including opportunities for expanded partnerships with other institutions of higher education and more influence over research topics that are of interest to the Department of Defense. Therefore, the committee directs the Secretary of the Air Force to provide a briefing to the House Committee on Armed Services not later than October 30, 2020, on the benefits and drawbacks of having a dedicated RDTE program line for the Air Force Institute of Technology.

Air Force Small Business Innovation Research (SBIR) Program

The committee is aware of the Air Force's alterations to its Small Business Research Innovation (SBIR) and Small Business Technology Transfer (STTR) program through the Air Force Ventures process, as well as the alignment of the program to the AF technology accelerator, AFWERX. The committee is encouraged by the Department's inclusion of the SBIR/STTR funding in its technology development strategy and budget plans, and looks forward to closer collaboration with Service acquisition executives to harness the innovation opportunities of the SBIR/STTR program.

The committee appreciates the Air Force's continued engagement as it establishes performance metrics and monitors lessons learned from the new approach's challenges and successes. The committee agrees with the Air Force that this new approach should be assessed according to the letter and intent of the SBIR statute as written in Chapter 638 of title 15, United States Code, including:

(1) Tracking commercialization of companies by monitoring growth in Phase II or later funding commitments from private sector or non-SBIR (other Government) sources (15 U.S.C. 638(e)(4)(b)(ii) and (iii));

(2) Expanding SBIR access to more small businesses across the country by tracking the total number of companies that are new to government or to the SBIR program that submit proposals and are awarded contracts (15 U.S.C. 638(a));

(3) Ensuring small businesses are financially secure and able to perform critical research quickly by reducing the time from solicitation to contract award (2019 NDAA Sec 854(b)(2)(A)(ii) and (iii)); and

(4) Expanding SBIR access to diverse businesses across the United States that are women owned and socially and economically disadvantaged (15 U.S.C. 638(j)(2)(F)), as well as diverse geographically and by size (15 U.S.C. 638(jj)(4)(B)(iii)).

The committee therefore directs the Comptroller General to review and assess the Air Force's Ventures Process and SBIR/STTR effort on the above criteria. The reports shall also include trend analysis for no less than five years of:

- (1) Funding awarded to Open Topics versus traditional SBIR topics;
- (2) Entry and exit Technology Readiness Levels (TRL) for Phase I and II awards;
- (3) Process and capability to measure technical merit; and
- (4) Which Air Force missions are receiving SBIR funding.

The committee directs the Comptroller General to provide a briefing to the congressional defense committees by March 1, 2021 on preliminary findings and submit a final report to the congressional defense committees at a date agreed to at the time of the briefing.

Airborne Augmented Reality Systems

The committee is concerned with the time and resources required to produce and develop fully qualified pilots and believes that airborne augmented reality systems could mitigate some of the resource constraints. The committee also acknowledges the potential cost savings and environmental benefit of implementing augmented reality systems. Use of synthetic entities reduces fuel consumption; maintenance; airframe degradation; and environmental impact while increasing training repetitions per hour and enabling pilots to fly against synthetic adversaries that mirror the appearance and performance of actual strategic rival aircraft.

Therefore, the committee directs the Assistant Secretary of the Air Force for Acquisition, Technology, and Logistics to submit a report to congressional defense and intelligence committees by January 31, 2021 detailing the potential cost savings; maintenance benefits; environmental benefits; counter-intelligence benefits; pilot readiness improvements; benefits of service life extension through reduced hours on key airframes; and any funding required to enable the use of airborne augmented reality systems by the Combat Air Forces. The report shall include any Air Force Program Executive Office efforts to take existing airborne augmented reality systems that have completed Phase II of the Small Business Innovative Research program by March 31, 2021 and explain how those efforts are resourced over the Fiscal Year Defense Plan to maximize benefit to the warfighters and taxpayers. The report shall be submitted in unclassified form. If necessary, a classified annex shall also be provided.

Assessment of the Air Force Test Center enterprise

The committee recognizes the importance of the Air Force Test Center (AFTC) and the invaluable developmental test and evaluation of air, space, and cyber systems conducted throughout the AFTC enterprise. The committee understands that as threats evolve and the complexity of integrating technology increases, the AFTC faces unique and unprecedented challenges in fulfilling its mission. These challenges include funding for critical sustainment, restoration, and modernization of relevant test capabilities; development and growth of hypersonic infrastructure and sufficient testing capabilities; and, increasing workforce recruitment, retention

and expertise. The committee identified several of these challenges in the committee report accompanying the National Defense Authorization Act for Fiscal Year 2018 (H. Rept. 115–200) and directed an assessment of the AFTC enterprise by the Secretary of the Air Force. Accordingly, the committee acknowledges that given the current growth of requirements and advanced weapon system development capabilities needed, the previous AFTC assessment should be updated to provide relevant information on the challenges confronting the AFTC enterprise.

Therefore, the committee directs the Secretary of the Air Force to provide a report to the congressional defense committees not later than December 1, 2020, that updates the information contained in the report submitted by the Secretary that was required by H. Rept. 115–200.

Briefing on Air Force Vanguard Programs

The committee understands that the Air Force’s 2019 “Science and Technology Strategy: Strengthening USAF Science and Technology for 2030 and Beyond” report designated three programs as “Vanguard programs” that are meant to quickly demonstrate the viability of emerging technology. Therefore, the committee directs the Assistant Secretary of the Air Force (Acquisition, Technology and Logistics) to provide a briefing to the House Committee on Armed Services by December 15, 2020 with details on its Vanguard programs and how the Air Force plans to transition these programs to ensure proven technology has the best chance of successfully and expeditiously transitioning into hands of the warfighter.

Flight test air refueling support

The committee recognizes the importance of air refueling to flight test aircraft and the many requirements for tanker aircraft. The committee is concerned with the impact of the Air Force’s tanker reductions and with unintended consequences of insufficient tanker support for test programs, such as program delays and increased costs. The committee directs the Secretary of the Air Force to provide a briefing to the House Committee on Armed Services by February 1, 2021, that explains the plan to support flight test requirements with air refueling. The brief should determine the overall test requirements and consider the effectiveness and efficiency of tanker aircraft assigned to the test community versus augmenting tanker support with aircraft from other bases.

Report on Counter-Radar Electronic Warfare and Signal Processing Capabilities

The committee understands that advances in foreign anti-access and electronic warfare technologies require commensurate advances in technologies designed to ensure the comparative advantage and dominance in U.S. electromagnetic spectrum operations capability. The committee understands there is a potential requirement and need to identify advanced mobile threats within milliseconds, to negate their operational effectiveness and nearly simultaneously provide technical electronic battle damage assessment.

The committee is aware the Department of Defense has demonstrated a high fidelity open-air scene target generator capability. The committee understands this capability would provide a suite of

active operations options for dominance in contested radio frequency spectrum environments. The committee notes this capability has completed initial free-space testing at a government range and understands that this is a unique capability in that it can operate within the adversary system sensor processing cycle and is not readily detectable as an electronic warfare technique.

Therefore, the committee directs the Assistant Secretary of the Air Force for Acquisition, Technology and Logistics, in coordination with the Secretary of the Air Force, to submit to the congressional defense and intelligence committees a report by March 1, 2021 detailing the efforts required to integrate high fidelity open-air scene target generator capability into appropriate platforms and electronic warfare command and control systems and how integration is resourced over the future years defense program. The report shall be submitted in unclassified form, with an accompanying classified annex, if necessary.

University Consortium to Address Research Needs Unique to the Space Force

The committee acknowledges the importance of a strong U.S. presence in the space domain and the foundational role of the newly established U.S. Space Force in providing for our national security. The committee also notes the historical importance of academic support in the research, development, test, and evaluation efforts of the established military services. The committee supports the creation of a university consortium for National Space Research to provide for the unique research and technological needs of the Space Force. The committee encourages the Department to consider for inclusion universities with established expertise and competencies in relevant research and engineering disciplines. The committee therefore directs the Chief of Space Operations to provide a briefing to the committee no later than January 31, 2021 on the Space Force's strategy to establish a consortium of institutions of higher education to lead foundational research in areas that the Chief determines to be critical to the mission of the Space Force.

Wide area motion imagery

The budget request contained \$121.5 million in PE 0305206F, Airborne Reconnaissance Systems, but no funding for continued development of Gorgon Stare (GS) wide area motion imagery (WAMI) surveillance capabilities. The committee is aware that the GS WAMI system supports multiple daily orbits in the U.S. Central Command area of operations with critical intelligence, surveillance, and reconnaissance (ISR). Other combatant commands have requested WAMI capability, but the Air Force lacks enough systems to satisfy all combatant command requirements.

The committee is concerned that, despite daily operational tasking, and despite GS WAMI having been designated as a program of record in 2014, there is still no budget request for modernization of this combat-proven ISR system. The committee notes that prior year congressional funding has helped GS develop beyond-line-of-sight communications, near vertical direction finding, and multi-intelligence capabilities. Additional funding is needed to modernize sensor tip and cue, sensor field of view, and to optimize machine learning in support of Project MAVEN.

Therefore, the committee recommends \$131.5 million, an increase of \$10 million, in PE 0305206F for WAMI enhancements. The committee further directs the Chairman of the Joint Chiefs of Staff to provide a report to the House Committee on Armed Services by March 1, 2021, on the plan for apportionment of Gorgon Stare to meet geographic combatant commanders' requirements worldwide.

RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, DEFENSE-WIDE

Items of Special Interest

Alliance innovation partnerships

The committee believes that to keep pace with competitors' investments in emerging technologies, the Department of Defense should develop deeper technology partnerships with key U.S. allies. The committee supports the efforts of the Foreign Comparative Testing program in the Office of the Under Secretary of Defense for Research and Engineering that facilitates the use of foreign allies' developed technologies to solve the Department's challenges and achieve the Secretary of Defense's priorities. The program provides a unified U.S. relationship with allied partner nation government organizations and industrial associations, and helps support the National Defense Strategy through leveraging allied technology investments and innovation to improve lethality; strengthening alliances and partnerships through support of reciprocal defense procurement; and promoting competition to reduce Department costs and deliver performance at the speed of relevance.

Similarly, the committee supports the efforts of the Office of Naval Research Global, which provides worldwide science and technology-based solutions for current and future naval challenges, and reaches out to the global technical community and the operational fleet and force commands to foster cooperation in areas of mutual interest to bring the full range of allied possibilities to the Navy and Marine Corps.

The committee believes the Department should expand existing mechanisms for international partnerships in research, development, test, and evaluation for emerging science and technology projects. The committee urges the Secretary of Defense to consider:

- (1) opportunities for increasing international partnerships in research, development, test, and evaluation for emerging science and technology projects;
- (2) expanding current development partnerships and technology scouting programs with allied partners;
- (3) leveraging U.S. Defense Attaché offices in U.S. embassies in allied countries with robust innovation ecosystems to scout for technology;
- (4) internationalizing startup-focused engagements, such as through the Defense Innovation Unit;
- (5) improving information sharing with allied governments to promote broad-based awareness of competitor nations' actions;
- (6) building ally capacity to protect technology;
- (7) any other innovative opportunities the Secretary deems useful; and

(8) what new authorities the Department would need from Congress to increase partnerships with allied countries.

Assessment of High-Powered Microwave Systems

The committee recognizes that directed energy technologies such as high-powered microwave (HPM) systems are being developed by the Department in order to provide non-lethal alternatives in combat and to maintain pace with our adversaries. The committee notes that as these technologies transition from the laboratory to an operational environment, it is critical that the Department assess and prepare for the maturation of these capabilities. Therefore, the committee directs the Under Secretary of Defense for Research and Engineering, in consultation with the heads of the military departments, to provide a briefing to the House Committee on Armed Services no later than January 15, 2021 on the development plan for HPM systems including the maturity of current research and development efforts, conformance to electromagnetic environmental effects requirements such as military standard 464 (MIL-STD-464), the status of the test capabilities required for verification and validation for all expected operational environments, the concept of operation of such systems, and potential vulnerabilities of Department systems to a HPM attack.

Bio-engineering roadmap for the Department of Defense

The committee notes that synthetic biology will be a transformative industry, providing significant opportunities across all economic sectors as well as national security benefits and defense-related applications. The committee also understands that large-scale strategic investments in this field by great power competitors, especially China, threaten to erode American leadership in the global bio-economy. These significant investments, both in funding and the development of high-profile national strategies, are in stark contrast to current U.S. efforts. Accordingly, the committee supports the Department of Defense's nascent efforts relating to bio-engineering, but finds them insufficient. The committee is also concerned by our competitors' and adversaries' ability to compromise control over critical foundational technologies, such as DNA sequencing and DNA synthesis, through predatory economic practices. Further, many of the Department's lessons learned related to microelectronics supply-chain vulnerabilities are directly applicable to this new field and should be a proactive component of any bio-engineering related strategies. The committee urges the Department to include in its bio-engineering roadmap plans to resource and expand its bio-engineering efforts and collaboration with the bio-industrial manufacturing base for defense applications.

Classified ready engineering workforce

The committee is aware of the current challenges the Department of Defense experiences when recruiting and retaining a diverse, high-skilled science, technology, engineering, and math workforce. Department hiring is still constrained by security clearance and human resource processing delays. With existing workforce shortfalls and the challenges of recruiting and retaining scientists and engineers, the Department must enhance its relation-

ships with academic institutions to promote and incentivize service at Department of Defense major ranges and test facility bases, science and technology research laboratories, and other related installations, especially those in remote and isolated locations.

Further, the committee recognizes the Department's efforts to invest in science, technology, engineering, and math workforce outreach and education programs, not only for undergraduate and graduate programs but also for those in elementary and secondary education. However, a more systematic, scalable approach is needed, especially for engaging underrepresented populations in rural communities. Hispanic representation in the Department, for example, falls behind the rest of the civilian labor force and the Federal Government.

Therefore, the committee urges the Secretary of Defense to better partner with Hispanic-serving, land-grant institutions to create a talent development program that provides experiential learning through internships and co-ops with Department agencies, while improving access to science, technology, engineering, and math education and careers for underrepresented populations. The committee believes the Department should review possible pathways to shorten security clearance and hiring process timelines to reduce the gap between education and full-time employment. The Department should also review how this partnership can help engage elementary and secondary education students to encourage participation in science, technology, engineering, and math education and prepare students for higher education and national security career opportunities.

Department of Defense chemical and biological emerging threats response efforts

The U.S. Government Accountability Office's December 2018 report on Emerging Threats highlighted a range of potential threats and opportunities that cover a broad spectrum of science and technology. These threats include synthetic biology and bioengineering, artificial intelligence, and natural biological threats. The committee notes that the current coronavirus pandemic is precisely the kind of threat identified in that report that has been of concern to planners throughout the government for years. At a time when the United States is struggling to respond to the spread of a highly infectious new virus, the committee is concerned about the preparedness of the U.S. Armed Forces to respond to significant state-level weapons of mass destruction events.

The committee recognizes the valuable work done by key elements of the defense research enterprise, such as the Defense Advanced Research Projects Agency. However, the committee remains concerned about the Department's capacity and planning for research on science and technology, and conversion to development to capitalize on opportunities, address emerging threats early, and respond in a flexible manner to those threats that materialize rapidly, such as the coronavirus pandemic. Ensuring that the Department's science and technology and research and development enterprises are coordinated is important in building flexibility for the broad range of associated capabilities to respond to emerging threats. Similarly, ensuring that the Department has the structure in place to plan and exercise for potential responses to these poten-

tially catastrophic emerging threats is critical for military and national preparedness.

The committee therefore directs the Comptroller General to assess the Department's strategy and planning for research and development and for emerging threats, and particularly biological threats, and for incorporating those threats into broader planning and exercise mechanisms. The assessment should include:

(1) The Department's strategy and planning for research and development, including plans for prioritizing efforts to address emerging threats;

(2) The Department's visibility and coordination of capabilities and capacity in all elements of the research and development portfolio, including:

(a) DOD science and technology research laboratories;

(b) the Chemical Biological Defense Program;

(c) the Defense Threat Reduction Agency;

(d) DOD-sponsored research in academia;

(e) Manufacturing Innovation Institutes,

(f) small business innovation research and technology transfer; and

(g) other efforts;

(3) The Department's coordination with other federal and non-governmental organizations to plan and conduct research and development activities;

(4) The Department's plans, capacity, and authorities, for drawing upon the extensive research and development enterprise to respond to the coronavirus pandemic or similar rapidly occurring threats;

(5) Department-wide tabletop exercises and wargames;

(6) Medical countermeasures and stockpile completeness; and

(7) Any other matters the Comptroller General deems appropriate.

The committee directs the Comptroller General to provide a briefing to the congressional defense committees by March 1, 2021, on preliminary findings and submit a final report to the congressional defense committees at a date agreed to at the time of the briefing.

Development of technology to increase the resiliency in mitigating viral pandemics

The committee commends the Department of Defense's response effort to COVID-19 to ensure the safety of military and civilian personnel in the United States and around the world. The committee is aware of maturing sensor capabilities that instantly screen and identify individuals infected with COVID-19 that are both presymptomatic or asymptomatic. As such, the committee encourages the Department of Defense to engage in research and development of detection approaches that are scalable, deployable, and provide detection for pre-symptomatic, symptomatic, and asymptomatic individuals. Furthermore, the committee understands that capabilities developed by the Department, such as infrared laser technology to detect trace explosives, can be applied to viral detection. The Department should consider a variety of technologies that would provide active remote viral detection capabili-

ties and employ all means to fast-track research and development of promising technologies and approaches.

Therefore, the committee directs the Deputy Assistant Secretary of Defense for Chemical and Biological Defense to provide a briefing to the House Committee on Armed Services by March 15, 2021 on the development of technology to increase the resiliency in mitigating viral pandemics, including an assessment of the gaps in the Department's viral pandemic detection and surveillance capabilities, a summary of current viral pandemic research and development response efforts focused on remote or standoff testing of potentially infected individuals, an analysis of existing chemical or biological detection capabilities developed by the Chemical Biological Defense Program and the Defense Threat Reduction Agency to address gaps in viral pandemic detection and surveillance, a description of current advanced development efforts for improved disease detection, and an estimated time to delivery of functional capabilities for such technologies.

Enhancing research into human performance and resilience technologies in support of special operations force personnel

The budget request for fiscal year 2021 contained \$42.4 million in PE 1160401BB for special operations forces technology development.

The committee is aware that high operational tempo deployments with little recovery time, combined with increasing operational load requirements affect emotional resilience and physical mobility, which can compound the potential for mental and physical health injuries. The committee notes that in 2009, U.S. Special Operations Command (USSOCOM) implemented a human performance program to enable special operations forces (SOF) to attain and sustain peak cognitive and physical performance by developing technologies that enhance psychological and physical recovery. The committee is encouraged by USSOCOM's use of machine learning and artificial intelligence to facilitate development of neurocognitive mapping capabilities to more accurately capture the psychological data of SOF, with the intention of aligning proper emotional care to the exquisite physical therapy capabilities, broadly designed to rehabilitate and maintain SOF as they maneuver throughout the special operations enterprise.

The committee supports additional emphasis on efforts such as neurocognitive mapping, and recognizes that additional funding would augment development of capabilities to enhance SOF psychological and physical performance. Therefore, the committee recommends \$47.4 million, an increase of \$5.0 million, in PE 1160401BB for SOF technology development.

Establishing a research consortium of excellence for irregular warfare and advanced analytics

The budget request contained \$35.6 million in PE 0601110D8Z for Basic Research Initiatives.

The committee recognizes the importance of basic research and academic engagement as critical to shaping the effectiveness of current and future national security policies and strategy. The committee understands that there is currently a wide range of social science research in the areas of irregular warfare that should be

leveraged, including the better use of, and integration with, existing research by organizations maintaining public repositories of incidents related to acts of terrorism, societal responses, and trends of sympathies towards violent extremist ideologies. The committee believes that it is within the purview of the Department of Defense, and specifically the Under Secretary of Defense for Research and Engineering (USD(R&E)) to foster academically rigorous studies of these strategic challenges facing the Department.

Academic research activities provide a foundational understanding for how to assess the effectiveness of strategic and operational irregular warfare activities and programs as the Department enhances non-kinetic efforts below the level of armed conflict to compete with near-peer adversaries, while balancing existing capabilities and efforts postured to counter violent extremist organizations. The committee therefore believes that the USD(R&E) Basic Research Office should establish a research consortium of excellence for irregular warfare and advanced analytics.

The committee is aware the Department has been investing in the National Consortium for the Study of Terrorism and Responses to Terrorism (START) and is the largest consumer of data from this program. START is a university-based research and education center that provides an effective resource that has informed current counterterrorism policies and strategy.

The committee therefore recommends \$40.6 million, an increase of \$5.0 million, in PE 0601110D8Z for Basic Research Initiatives to establish and fund the START consortium as a research consortium of excellence for irregular warfare and advanced analytics. Further, the committee directs the Under Secretary of Defense for Research and Engineering to provide a briefing to the House Committee on Armed Services by January 29, 2021, on the processes and procedures to establish and fund the START consortium as a research consortium of excellence for irregular warfare and advanced analytics.

Evaluation of emergent technologies in support of special operations forces in great power competition

The budget request contained \$137.2 million in PE 1160408BB for the Operational Enhancements program.

The committee recognizes that continued investment and research in emerging technologies such as Machine Learning/Artificial Intelligence (ML/AI) is critical to securing the competitive advantage of the United States. The committee remains committed to ensuring the Department of Defense continues to prioritize the development of such capabilities, and is aware of a recent Government Accountability Office report on long-range emerging threats facing the United States that highlighted the aggressive pursuit of ML/AI technologies by our adversaries.

The committee appreciates the substantial efforts by the Joint Artificial Intelligence Center to establish standards, manage development, and integrate ML/AI technologies for the benefit of the Joint Force, and the close coordination with U.S. Special Operations Command (USSOCOM). The committee notes the importance of demonstrating the operational use of these capabilities in semi- and non-permissive environments, such as those forces deployed from USSOCOM. The committee is interested in better un-

derstanding the application of such capabilities in strategically dynamic environments with near-peer adversaries.

Therefore, the committee directs the Director of the Joint Artificial Intelligence Center, in coordination with Commander, USSOCOM, to provide a briefing to the House Committee on Armed Services by November 1, 2020, on an assessment of ML/AI technologies to enable operational maneuver, autonomous or otherwise, in highly-contested environments with near-peer adversaries.

The committee recommends \$147.2 million, an increase of \$10.0 million, in PE 1160408BB for the Operational Enhancements program.

Feasibility assessment of establishing large and open defense based data sets

The committee believes that the Secretary of Defense should work with the Office of Science and Technology Policy (OSTP), the Office of Management and Budget (OMB), and the National Institute of Standards and Technology (NIST) to expand the number of open-source, high-quality data sets within Project Open Data to increase the availability of open data and foster research and innovation in data analytics, artificial intelligence, and machine learning. Therefore, the committee directs the Secretary of the Defense, in coordination with the Under Secretary of Defense for Research and Engineering, to perform an assessment of large data sets maintained by the Department that could be publicly released for improved analytics and training of artificial intelligence and machine learning applications. The assessment shall include:

(1) a survey of the data sets maintained by the Department of Defense, to which artificial intelligence and machine learning is applicable, including but not limited to, health records; employment records; weather data; geospatial data; utilities; and logistics;

(2) necessary actions for the data sets identified in (1) to anonymize, sanitize, or otherwise remove sensitive information to make the data sets suitable for public consumption;

(3) the feasibility of releasing the resulting data sets of (2) through a public facing webpage;

(4) an assessment of the benefits resulting from the public availability of the data sets in (2), to include commercial, research, and government uses;

(5) an assessment of the benefit in developing the national security workforce resulting from the public availability of the data sets in (2) for use by K-12 and university education programs;

(6) a recommendation on the public release of the data sets in (2); and

(7) any other matters the Secretary determines appropriate.

The committee further directs the Secretary to submit a report to the Committees on Armed Services of the Senate and the House of Representatives not later than January 1, 2022, on the results of the assessment, and what engagement the Department has had with OSTP, OMB, and NIST on increasing the availability of open data.

Forecasting and modeling partnerships for countering infectious diseases

The committee believes that emerging viral threats such as the novel 2019 Coronavirus highlight the need for innovative and real-time forecasting and monitoring techniques to ensure our military and civilians are best positioned to respond to emerging public health and national security threats. The committee encourages the Department of Defense to leverage emerging infectious disease forecasting and monitoring data developed by institutions of higher education and private partners. The committee encourages the Department to prioritize funding and explore partnerships to improve our ability to respond to public health and national security threats through emerging infectious disease modeling and forecasting.

GPS-based precision approach and landing system

The committee is encouraged by the Navy's success in procuring a global positioning system (GPS)-based, all-weather, precision approach and landing system for eventual deployment on all Navy aircraft carriers and amphibious assault ships for its F-35-B, F-35C, and MQ-25 aircraft. The committee understands that the Navy and Marine Corps are currently conducting feasibility studies to determine whether the F/A-18E, F/A-18F, EA-18G, and all variants of the V-22 can also be integrated into its precision approach and landing system.

The committee believes that expanding the sea-based joint precision approach and landing system capability to other U.S. military aircraft that operate in expeditionary environments would permit such aircraft to safely land at remote, forward-deployed airbases, even in situations involving difficult terrain or extremely low visibility. The committee directs the Secretary of Defense to provide a report to the House Committee on Armed Services by February 1, 2021, on the feasibility and advisability of integrating a common expeditionary GPS-based, all-weather, precision approach and landing system capability into its aircraft that are most likely to serve in forward-deployed environments, the C-130, F-16 and H-60.

High energy laser endless magazine definition

The committee supports investments across the Department of Defense in directed energy systems capable of countering the full array of incoming threats, from unmanned air systems to cruise missiles. Additionally, the committee understands that magazine depth is but one of the system variables that need to be considered in delivering required mission effectiveness within the size and weight constraints of the platform within which the system is integrated or with which it is otherwise deployed. The committee also supports development of systems with endless, or near endless, magazines to ensure capability to counter salvos or swarms of any size. The committee is concerned that while the Department has included reference to a near endless magazine in its budget justifications for high energy laser systems, it has not defined the term sufficiently to facilitate predictable requirements development and guide investment by industry.

The committee directs the Assistant Director for Directed Energy within the Office of the Under Secretary of Defense for Research and Engineering to submit a report to the House Committee on

Armed Services by December 1, 2020, on the definition of an “endless magazine” to sufficiently facilitate predictable requirements development and guide investment by industry. The Assistant Director for Directed Energy shall assess whether, for high energy laser systems, an “endless magazine” shall be defined as an ability to engage at the rate necessary to counter highly complex, nearly simultaneous incoming threats, of the type for which the system was designed to counter, without temporary cessation of fire for battery recharge or exchange, thermal management, or other predictable technical limitations. The AD for DE shall provide a recommendation as to whether, except in the case of airborne applications, an endless magazine shall be provided as a stand-alone capability within the envelope of the platform, without the need for external devices or trailers.

Hydrogen safety for battery use

The committee recognizes that the Army continues to work on fuel cell advancements through projects at the Ground Vehicle Systems Center and the Navy is continuing to make progress through ongoing programs within the Office of Naval Research. The committee is concerned that misconceptions surrounding hydrogen as a fuel have caused undue delays in the further development of this technology. The commercial industry has developed safe handling processes to advance fuel cell technology in numerous industrial applications. As the Department strives to enable hydrogen fuel cell technology, safety standards and processes must be developed simultaneously. Hydrogen fuel cells promise the benefits of an electric vehicle with the rapid refueling capability of a traditional diesel platform, providing extended silent operations without the need for battery recharging.

The committee therefore urges the Under Secretary of Defense for Research and Engineering to review:

- (1) the safety concerns of hydrogen on the battlefield;
- (2) the methods to mitigate hydrogen safety concerns regarding generation, distribution, and use;
- (3) potential methods to field hydrogen in austere environments;
- (4) each military service’s use case for hydrogen fuel cells; and
- (5) planned timelines to move from research and development initiatives to procurement programs of record.

Implementation of Department of Defense Inspector General recommendations on additive manufacturing

The committee is concerned with the Department of Defense’s existing level of coordination of additive manufacturing efforts and encourages the use of additive manufacturing whenever possible to save both the Department and taxpayer valuable cost and time.

In October 2019, the Department of Defense Inspector General produced a report titled, “Audit of the DoD’s Use of Additive Manufacturing for Sustainment Parts (DODIG-2020-003),” and provided a set of recommendations. The committee directs the Under Secretary of Defense for Research and Engineering, in coordination with the Under Secretary of Defense for Acquisition and Sustainment and the Service Acquisition Executives, to submit a report to the Committees on Armed Services of the Senate and the House of Representatives by February 15, 2021, outlining the De-

partment's plan to address each of the recommendations listed in the Inspector General report. Further, if the Under Secretary of Defense for Research and Engineering decides not to implement any of the Inspector General recommendations, they must include the justification for that decision in the report, as well what actions the Department will take to address the conditions underlying the recommendation.

Infrastructure to support research, development, test, and engineering at China Lake

The committee is aware of the significant research, development, test, and evaluation (RDT&E) infrastructure requirements across the Department of Defense. Section 252 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92) requires the Secretary of Defense, in coordination with the Secretaries of the military departments, to complete a master plan of the current infrastructure needs of the Major Range and Test Facility Base not later than January 1, 2021. However, several Major Range and Test Facilities, including Naval Air Weapons Station (NAWS) China Lake, have more immediate requirements. NAWS China Lake performs a critical function for the Department of Defense, but was determined to be not mission capable after a 7.1 magnitude earthquake on July 5, 2019. In light of the importance of the mission and the investments made to date to repair NAWS China Lake, it is prudent that the committee fully understand the complete RDT&E infrastructure requirements before major construction commences. Therefore, the committee directs the Secretary of Defense to provide a briefing to the House Committee on Armed Services not later than October 30, 2020, on the RDT&E infrastructure master plan for NAWS China Lake.

Investment in research and development for decontamination technology to support civilian applications

The committee recognizes the valuable contribution of the Department of Defense in developing decontamination technologies against biological threats. In response to the COVID–19 pandemic, the Chemical and Biological Defense Program quickly funded the Joint Biological Agent Decontamination System Lite (JBADS Lite), which adapts biothermal decontamination technology from the original JBADS program of record to decontaminate platforms after transport of COVID–19 positive personnel.

The committee believes JBADS Lite is critical for the military to maintain operations during a pandemic while ensuring the safety of passengers and crew; and that this has applications in the civilian sector to support the decontamination of civilian transportation systems (i.e. rail, buses, aircraft). Therefore, the committee directs Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs to provide a briefing to the House Committee on Armed Services by February 15, 2021 on how JBADS Lite could aid in the pandemic preparedness of civilian transportation systems in the United States.

Investment in research and development for technology to test treatments for nuclear, chemical, and biological exposure

As biological threats continue to advance, the committee encourages the Department of Defense to prioritize building on existing research and development to detect and model treatments for the potential aerosol dissemination of biological weapons. Areas for increased investment include, but are not limited to, the development of battlefield instrumentation and aerosol capabilities. The committee therefore directs the Deputy Assistant Secretary of Defense for Chemical and Biological Defense to provide a briefing to the House Committee on Armed Services not later than January 15, 2021, on the Department's assessment of organ-on-chips technology as a platform for threat assessment and for rapidly developed treatments (medical countermeasures) for biological, chemical, and radiological threats, and what plans the Department has to use this technology going forward.

Joint vaccine acquisition program

The committee recognizes that botulism or plague have been identified as potential biological weapons against service members or the general public. The committee further recognizes that there are currently no available vaccines to protect against these threats. The committee notes that the Department of Defense has invested \$300M in developing a plague vaccine and \$375M in developing a botulism vaccine. The committee further notes the impact the current viral pandemic has had on national security, to include economic and military readiness, and that reductions to research and development of vaccines reduces the Department's ability to respond to pandemic outbreaks. The committee believes that the continuation of these existing projects under the Joint Vaccine Acquisition Program is necessary to ensure that a deployable vaccine for these agents is available to protect our warfighters and to provide continuity for capabilities under a scenario in which these agents are utilized in a combat environment. Therefore, the committee encourages the Secretary of Defense to continue the development of botulinum and plague vaccines and directs the Secretary of Defense to provide a briefing to the House Committee on Armed Services no later than November 1, 2020 on the acquisition strategy for the botulinum and plague vaccines, to include the status of the development, the cost to complete the development, and the risks if development is discontinued.

Modular Open Systems common data standards

The committee continues to be encouraged by the development, demonstration, and validation of common data standards and implementation of the Modular Open Systems Approach. However, the committee is concerned that access to these standards by the general academic population and technology industry remains limited. The committee notes that while a subset of the components of these standards are based on sensitive or classified information, that the data standards and interfaces used by the Department are predominantly based on publicly available sources such as foundational science and engineering principles. The committee further notes that restricting public access to the portion of the standards based on public knowledge unnecessarily increases cost

for the conversion of commercial products to defense applications and limits the experimentation and innovation available to the Department of Defense. The committee is concerned that barriers to accessing these standards have an outsized impact in the fields of artificial intelligence, autonomy, and unmanned air vehicles.

Accordingly, the committee directs the Secretary of Defense to provide a report to the House Committee on Armed Services not later than February 15, 2021, on:

(1) which components of the common data standards used by the Department are based on publicly available knowledge, to include, at a minimum: Open Mission Systems developed by the Air Force; the Future Airborne Capabilities Environment developed by the Navy; and the VICTORY Initiative, developed by the Army;

(2) the applicability of these components to artificial intelligence-based technologies, including autonomous ground vehicles or unmanned air vehicles;

(3) the feasibility of releasing a public subset of the data standards to reduce the barriers to research with, and adoption by, academia and technology companies;

(4) an assessment of the cost savings to the Department attributable to the public release of a subset of the data standards; and

(5) an assessment of the benefit in developing the national security workforce by releasing a public subset of the data standards.

Next generation semiconductor development and manufacturing

The committee believes that the Department of Defense declaration of 5th generation (5G) communications information technology as a modernization priority, as well as the global proliferation of 5G communications technology, provides an opportunity to fully assess the security of all 5G components, to include semiconductors. The committee is aware that the commercial demand for 5G technology is stimulating foreign investment, particularly by China, to develop advanced Gallium Nitride (GaN) and Gallium Arsenide (GaAs) radio frequency integrated circuit (RFIC) technology at a pace faster than the U.S. industrial base can sustain. RFIC technology is a key enabler to high performance military radar, secure communication, electronic warfare platforms and 5G infrastructure, providing a strategic technology advantage for the Department of Defense to maintain national security and warfighter viability. Commercial volumes for next generation RFICs to support a 5G roll-out will far outstrip Department of Defense demand, providing foreign competitors with motivation to fund research and development and effectively establish themselves as global leaders in a mission-critical industry. The committee is concerned that if the commercial economies of scale for these critical technologies are lost to foreign competitors, the United States's ability to maintain technology superiority will be directly compromised. The committee supports the Department of Defense's efforts to prioritize the development and procurement of both GaN and GaAs technology that can deliver next generation RFIC technology supporting both strategic Department of Defense priorities and 5G commercial demands.

Nuclear micro reactors

The budget request included \$730.5 million in PE 0604250D8Z for Advanced Innovative Technologies.

The committee believes energy will be a critical enabler of future military operations and is concerned that the intermittent characters of many alternative energy sources are unable to keep pace with the growth of the Department of Defense's energy needs. The committee supports the development of a reliable, abundant, and continuous energy source provided by a mobile nuclear reactor.

The committee is aware that Project Pele is on track to design, build, and demonstrate a prototype mobile nuclear reactor capability by calendar year 2024, and that the Joint Requirements Oversight Council recently agreed to establish requirements for a mobile nuclear reactor capability. The committee is encouraged by this progress and encourages the Director of the Strategic Capabilities Office to refine the program's objectives and work with the Services to provide programmatic and transition planning in advance of the planned 2024 initial operating testing date.

Further, the committee directs the Secretary of Defense to provide a briefing to the House Committee on Armed Services by January 1, 2021, on the following:

- (1) the Department's plans to employ mobile nuclear reactors to meet the Department's priorities in areas such as multi-domain operations, advanced weaponry, and force modernization/electrification initiatives;
- (2) the Department's strategy for deploying mobile nuclear reactors at domestic strategic support areas;
- (3) the Department's plan to work with the Department of Energy to identify and develop the procurement strategy to acquire feed material for microreactor fuel; and
- (4) the status of pilot programs for micro-reactors.

The committee recommends an increase of \$50.0 million in PE 0604250D8Z, Advanced Innovative Technologies, for the Strategic Capabilities Office to further develop and prove out its mobile nuclear reactor concept through Project Pele.

Public-Private Partnerships for Product Support on software-intensive government systems

The committee notes the work of the Department of Defense in codifying Public-Private Partnerships for Product Support through Department of Defense Instruction 4151.21. This instruction requires that public-private partnerships (PPP) for depot-level maintenance be employed whenever it is cost-effective in providing improved support to the warfighter. The goal is to maximize the utilization of the government's facilities, equipment, and personnel at Department of Defense depot-level maintenance activities as a way to facilitate innovative and creative thinking.

However, it is evident that maintaining a conventional PPP as it relates to software-intensive systems further complicates the partnership and hinders the goal of a PPP to "ensure effective and timely response to mobilization, national defense contingency situations, and other emergency requirements." This is because risk is induced as software crosses multiple subsystems and can lead to complications for a program. Requiring different groups to perform routine updates on software that may have a commercial origin can

cause system anomalies and duplication of effort. The current requirements from the Department of Defense Instruction 4151.21 appear ill-suited for application to the Department's software usage.

The committee supports the Department's efforts to prioritize partnerships between public and private entities to achieve critical, yet cost-effective support to the warfighter. However, the Department should reevaluate the requirements for the PPP as relates to software systems. Therefore, the committee directs the Secretary of Defense to provide a briefing to the House Committee on Armed Services not later than August 1, 2021, on how the Department of Defense can adjust requirements to make these more applicable to software systems.

Quantum research efforts

The committee is pleased that the Under Secretary of Defense for Research and Engineering has established an Assistant Director for Quantum Sciences with the responsibility of producing a technology road map aligning quantum research and information science across the Department of Defense and each of the military services. The committee urges the Assistant Director for Quantum Sciences to consider the Department's quantum workforce gaps, and what science, technology, engineering, and math related education is required to develop the necessary future quantum workforce in the Quantum Sciences road map for the Department.

Report on Department of Defense university research COVID-19 recovery

The committee is aware that most academic research has been suspended or slowed down due to the pandemic. With these setbacks, the university's workforce is also impacted, especially postdoctoral fellows, graduate students, and technical support staff. Recognizing that many of the technologies the nation uses today were derived from Department of Defense-funded fundamental research, the committee directs the Under Secretary of Defense for Research and Engineering, in collaboration with the research directors of the military services, to submit a report to the Committees on Armed Services of the Senate and the House of Representatives by January 1, 2021, addressing research impacts due to COVID-19, including, at a minimum, (1) the total number of grants and cooperative agreements that would need cost extensions to complete their original award scope fully funded; (2) total cost of providing cost extensions for such grants and cooperative agreements; (3) a best estimate taken from information on the number of grants affected of the total number of Department-funded postdoctoral fellows and graduate students unable to reach their desired academic or professional level because of a lack of research funding; and (4) any other negative impacts to the defense science and technology program as determined by the Under Secretary.

Report on employing and strengthening the United States' hypersonics research and development workforce

The committee commends the Department of Defense's increased attention on and strong investment in hypersonic weapons development to rapidly achieve operational capability. However, the com-

mittee is concerned that the Department's investments focus on near-term integration of existing capabilities and may fail to advance next-generation technologies at the pace needed to sustain or extend the nation's hypersonics technological advantage. The committee directs the Under Secretary of Defense for Research and Engineering to brief the congressional defense committees no later than January 31st 2021 on lower technology readiness level (6.1, 6.2, 6.3, and 6.4) investments being made in next generation hypersonic capabilities; the lack of test facilities accessible to the hypersonics industrial base, and specifically the lack of hypersonic wind tunnels; the number and status of hypersonics contracts in place with small businesses; and a comprehensive inventory of U.S. hypersonic test assets, including those owned and/or operated by universities, government laboratories, Federally-Funded Research and Development Centers, and industry.

Report on waterjet demilitarization technology

The committee remains concerned that insufficient attention has been placed on the development of technology to safely demilitarize chemical or biological weapons in situ as today the detonation of these weapons is not always feasible without dispersing the agents. The committee understands high pressure waterjet technology systems have proven their capability to safely demilitarize munitions on land and have demonstrated the ability to demilitarize munitions in shallow water. Despite this, the committee remains concerned that munitions in waters greater than 120 feet pose a threat that has not been addressed. Therefore, the committee directs the Secretary of Defense to provide a report to the congressional defense committees no later than January 31, 2021 outlining a plan to continue the development and implementation of a fully integrated transportable high-pressure waterjet system for the demilitarization of chemical and biological weapons and to further fund waterjet technology systems for the removal of constituents in munitions located in deep water environments.

Report to Congress on High Mach and Hypersonic Aircraft Capabilities

The committee continues to be concerned about the threats posed by hypersonic weapons and the imperative to develop offensive and defensive hypersonic weapons systems. Further, report language accompanying the House Department of Defense Appropriations Act for Fiscal Year 2020 encouraged Air Force research into reusable hypersonic propulsion technologies including high Mach turbines. The committee is aware of ongoing efforts to mature technologies necessary to develop aircraft capable of high Mach and hypersonic flight, and believes these aircraft have the potential to greatly expand operational capability and flexibility in intelligence, surveillance, and reconnaissance, responsive space access, payload delivery, and transport. Therefore, the committee directs the Under Secretary of Defense for Research and Engineering to provide a briefing to the House Committee on Armed Services no later than the February 1, 2021 on current capability gaps that will be filled by high Mach and hypersonic aircraft, the Department's acquisition strategy for these programs, and an updated road map.

Tactical training range instrumentation

The committee understands that existing Air Force and Navy air combat training systems are nearing the end of their service-life. There exists a common requirement to develop and field replacement technologies that ensures combat aircrew training remains uninterrupted for Active, Guard, and Reserve Component aviation forces during the transition to next generation aircraft and data-relay technologies.

The committee notes that air combat training systems and associated technologies provide combat air forces with the opportunity to improve their readiness by providing experience through advanced simulation techniques prior to actual combat. The committee believes the next generation of air combat training systems needs to support Department of Defense and foreign partner air forces with collaborative training for both fourth and fifth generation aircraft representing high fidelity combat environments. Training systems should also integrate capabilities that provide aircrews with real-time, threat-representative training and efficient post-mission debriefing that enables aircrews to reconstruct training events in less time and provides higher fidelity modeling to assess weapons fly-out data for simulated air-to-air and air-to-ground weapons employed during training.

The committee is aware that the Air Force and Navy recently conducted a joint assessment of future training capability requirements and entered into a memorandum of understanding to begin the design and development of a joint training system. As part of this ongoing collaboration, the committee encourages the Air Force and Navy to consider leveraging, fielding, and integrating new training aid systems at land or over-water training ranges utilized by Active, Guard, or Reserve Component forces with an assigned mission to provide friendly or threat representative training capabilities to combat air forces.

Testing of lithium ion batteries

The committee recognizes that the Navy serves as the technology warrant holder for the Department of Defense on lithium-ion battery testing and certification. The Navy's Lithium Battery Safety Program establishes the safety guidelines for the selection, design, testing, evaluation, use, packaging, storage, transportation, and disposal of lithium batteries.

The automotive industry is making rapid advancements in lithium-ion battery technologies and leading battery development in the commercial space. In order to innovate at the pace of commercial industry, the Department must streamline its processes for battery testing and certification. This streamlined approach is crucial to technology demonstration and prototype projects where timeline and budget are limited.

The committee therefore urges the Secretary of the Navy to:

- (1) review the current testing of Department of Defense lithium-ion batteries, including the size and scale of test chambers, staffed personnel to run the test chambers, and the physical limitations of the quantity of test chambers;

- (2) examine the capacity of the lithium-ion battery testing, to include details on the volume of testing, and any limitations on the

size, weight, power wattage, and voltage able to be tested inside Department of Defense facilities;

(3) evaluate the overall speed of the certification process and note delays or impacts on current battery projects and new, evolving battery technologies entering the certification process; and

(4) identify any commercial facilities that could supplement or replace current Department of Defense processes, and leverage commercial expertise in this field.

Use of artificial intelligence to analyze beneficial ownership of defense contractors

The Committee remains concerned with the threat of peer and near-peer competitors acquiring critical technology developed by American companies via shell corporations that hide their true ownership in order to circumvent review by the Committee on Foreign Investment in the United States. The Committee, therefore, directs the Director of the Defense Innovation Unit to provide a briefing to the House Committee on Armed Services by April 30, 2021 on commercial capabilities, current challenges, and required resources necessary to develop artificial intelligence for analyzing beneficial ownership of defense contractors or corporations seeking Department of Defense contracts. The artificial intelligence and related capabilities reviewed should be capable of identifying organizations or individuals that hide ownership or investments in companies that contract with the Department of Defense for critical technology.

LEGISLATIVE PROVISIONS

SUBTITLE A—AUTHORIZATION OF APPROPRIATIONS

Section 201—Authorization of Appropriations

This section would authorize appropriations for research, development, test, and evaluation at the levels identified in section 4201 of division D of this Act.

SUBTITLE B—PROGRAM REQUIREMENTS, RESTRICTIONS, AND LIMITATIONS

Section 211—Modification of Science, Mathematics, and Research for Transformation (SMART) Defense Education Program

This section would amend section 2192a of title 10, United States Code, by establishing a scholarship for service pilot subprogram under the Department's Science, Mathematics, and Research for Transformation (SMART) Defense Education Program for students at minority institutions to diversify and strengthen the national security workforce. This section would require the Secretary of Defense to submit an initial report to the congressional defense committees by December 31, 2022, on the establishment of the pilot subprogram, and a final report by September 30, 2024, on the success of the pilot program in recruiting individuals for scholarships under this section and hiring and retaining those individuals in the public sector workforce.

This section would also require the Secretary to pay participants at a rate that is comparable to the private sector and include a

paid internship requirement with defense industry, and it would require that not less than 20 percent of SMART program scholarship awards go to individuals pursuing degrees in computer science or a related field of study.

Section 212—Enhanced Participation of Department of Defense Contractors in Science, Technology, Engineering, and Mathematics Activities

This section would amend chapter 111 of title 10, United States Code, to establish a new section, 2192c program to enhance contractor participation in science, technology, engineering, and mathematics activities. This section would also direct the Secretary of Defense to carry out a program under which the Secretary shall seek to enter into partnerships with Department of Defense contractors to carry out community service activities to promote interest in careers in science, technology, engineering, and math disciplines, and allow those activities to be considered as allowable costs on a government contract.

Section 213—Modification of Requirements Relating to Certain Cooperative Research and Development Agreements

This section would amend section 2350a of title 10, United States Code, by allowing the Secretary of Defense to delegate his or her authority to make a determination to enter into a cooperative research and development project to only one party. It would also allow for cooperative research and development projects when cost sharing is unequal in cases that provide strategic value to the United States or partner country. This section would also allow the Secretary, or designee, to procure qualified services from the foreign entity with the requirement that written notice must be sent to the congressional defense committees, the Committee on Foreign Affairs of the House of Representatives, and the Committee on Foreign Relations of the Senate no later than 30 days before issuing a waiver.

Section 214—Pilot Program on Talent Optimization

This section would direct the Under Secretary of Defense for Research and Engineering, acting through the Director of the Defense Innovation Unit, to conduct a pilot program to develop a talent optimization marketplace for military personnel in the Reserve and Guard Components.

Section 215—Codification of the National Security Innovation Network

This section would amend chapter 139 of title 10, United States Code, by inserting a new section 2358c, National Security Innovation Network. This new section would establish a program office to be known as the National Security Innovation Network (formerly the MD5 National Security Technology Accelerator) as a permanent office within the Under Secretary of Defense for Research and Engineering or another organization at the discretion of the Secretary of Defense. This section would require the Secretary of Defense to submit a report no later than 180 days after the date of

the enactment of this Act on the Department's plan to establish this office. This section would require the Comptroller General of the United States to submit a review of the report to the congressional defense committees not later than 180 days after the Secretary's implementation report. Finally, this section would require the Comptroller General to review and submit an evaluation of the program to the appropriate congressional committees not later than 3 years after the date of the enactment of this Act.

Additionally, the committee notes that Hacking for Defense (H4D) is authorized as a National Security Innovation and Entrepreneurial Education Program in the National Defense Authorization Act for Fiscal Year 2018 (Public Law 115–91) to enable Department of Defense innovation. H4D is a university course developed by U.S. military combat veterans and private sector entrepreneurs taught at universities across the United States in which students apply cutting-edge problem-solving techniques to real-world national security and defense problems. The committee finds that H4D supports solution development directly for the warfighter, improves U.S. military readiness, and stimulates growth within the National Security Innovation Base, consistent with the 2018 National Defense Strategy. Further, the committee believes H4D fosters the growth of an emerging generation of national security leaders and mission-driven entrepreneurs by improving and expanding the science, technology, engineering, and math skill sets within the U.S. workforce. The committee believes that the Department should fully resource H4D and its growing ecosystem of national security innovators and entrepreneurs through the provision of the annual funding required to enhance existing H4D university courses.

Section 216—Modification of Pilot Program on Enhanced Civics Education

This section would amend section 234 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92) to include in the pilot program the improvement of critical thinking and media literacy among students. This section would require the Secretary of Defense to implement the pilot program not later than 90 days after the date of the enactment of this Act. This section would also require the Secretary to submit a report to the congressional defense committees not later than 30 days after the date of the enactment of this Act on the Secretary's efforts to implement the pilot program.

Section 217—Modification of Joint Artificial Intelligence Research, Development, and Transition Activities

This section would amend section 238 of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Public Law 115–232) by assigning responsibility for the Joint Artificial Intelligence Center (JAIC) to the Deputy Secretary of Defense and ensure data access and visibility for the JAIC.

Section 218—Modification of National Security Innovation Activities and Manufacturing Pilot Program

This section would amend section 2358 of title 10, United States Code, by realigning the National Security Innovation Capital (NSIC) program under the Defense Innovation Unit and establishing an advisory board to provide recommendations on defense innovation priority investments once NSIC funding is available. This section would also amend section 2505 of title 10, United States Code, by extending the Defense Manufacturing pilot program.

Section 219—Extension of Pilot Program for the Enhancement of the Research, Development, Test, and Evaluation Centers of the Department of Defense

This section would extend the termination date by 5 years for the pilot program for the enhancement of the research, development, test, and evaluation centers of the Department of Defense established in section 233 of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114–328). The new pilot termination date would be September 30, 2027. This section would require the Secretary of Defense to submit a report to the congressional defense committees not later than 1 year after the date of the enactment of this Act on the status of the pilot program, to include: (1) which military departments are not participating in the program; (2) any issues that are preventing their participation; and (3) any offices or elements of the Department that may be responsible for their delay in implementation. This section would also correct the title of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology.

The committee believes in the importance of demonstrating methods for the more effective development of technology and management of functions at the Department's science and technology reinvention laboratories, test and evaluation centers part of the Major Range and Test Facility Base, and at the Defense Advanced Research Projects Agency. The committee urges each of the military services and the Office of the Secretary of Defense to make the most of the extended timeframe for this important pilot program.

Section 220—Digital Data Management and Analytics Capability

This section would direct the Secretary of Defense to develop and implement an advanced digital data and analytics capability to digitally integrate all elements of the Department of Defense's acquisition process; digitally record and track all relevant data generated during the research, development, testing, and evaluation of systems; and maximize the use of such data to inform the further development and improvement of both acquisition systems and the acquisition process for those systems.

The committee is aware that several U.S. Government Accountability Office reports have cited the need for improved data management processes surrounding the Department's overall management framework. While most relevant data is government owned and authorized for Department-wide use, there is no enterprise mechanism facilitating the discovery, access, correlation or integration, and use of acquisition-related data across organizational

boundaries. Each functional organization has established and locally optimized its own data and analytic processes for its own needs, and in many cases even these local practices are highly manual and inefficient.

To this end, this section would direct the Secretary of Defense to conduct a significant review of data content and requirements to support management functions; implement demonstration activities to develop lessons learned and inform the way forward; conduct a comparative analysis that assesses the risks and benefits of the digital management and analytics capability relative to the Department's traditional data collection, reporting, exposing, and analysis approaches; and update the Department's policy and guidance based on the results of the demonstration activities.

This section would also require the Defense Innovation Board, in consultation with the Defense Digital Service, to conduct an independent assessment and submit a report to both the Secretary and the congressional defense committees no later than 180 days from enactment of this Act on recommended approaches for implementation of the capability. This section would then require the Secretary to submit an implementation report to the congressional defense committees not later than 90 days after the Defense Innovation Board's assessment. Finally, it would require the Defense Innovation Board and the Defense Science Board to submit an independent joint assessment on the Department's progress by March 15, 2022.

Section 221—Social Science, Management Science, and Information Science Research Activities

This section would direct the Secretary of Defense to carry out a social, management, and information science research and development program to ensure the Department of Defense has access to innovation and expertise in social, management, and information science necessary for improving the effectiveness and efficiency of executing Department of Defense operational and management activities. This section would require the Secretary to submit a report by December 31, 2022, to the congressional defense committees on the program, in both a classified and unclassified format.

The committee recognizes that all national security challenges facing the United States require an understanding of the causes and consequences of human behavior and has supported the Department's efforts to expand collaboration with the academic social science community through the Minerva Research Initiative since its establishment in 2008. Maintaining the Nation's technological superiority in the face of threats from great powers, state and non-state actors, and individuals requires not only investing in physical sciences but also the integration of knowledge from cross-disciplinary research that explores the social, cultural, behavioral, political, historic, and religious drivers and impacts of today's increasingly complex global security environment.

At a time when peer and near-peer adversaries are increasingly employing elements of malign influence, disinformation, and predatory economics in concert with technological capabilities, the Department should be increasing its investment in social science research programs, not ending it. Three recent reports from the National Academies assessing social science programs and their im-

pacts on national security and intelligence noted the ongoing contributions of Minerva, and recommended ways to increase outreach and dissemination of results to enhance the success of the program.

The committee urges the Department of Defense to implement the recommendations of the National Academies to strengthen ties between grantees and potential users of their research and increase visibility, tracking, and dissemination of the research results to the broader national security community. All military services should participate in the program and highlight their specific plans and outcomes in annual budget documentation, further increasing visibility of Minerva-funded research to the user community.

Section 222—Measuring and Incentivizing Programming Proficiency

This section would direct the Secretary of Defense to leverage existing civilian software development and software architecture certification programs to implement coding language proficiency and artificial intelligence competency tests within the Department of Defense. This would measure an individual's competency in using machine learning tools, in a manner similar to the way the Defense Language Proficiency Test measures competency in foreign language skills, and enable the identification of members of the Armed Forces and civilian employees of the Department of Defense who have varying levels of quantified coding comprehension and skills and a propensity to learn new programming paradigms, algorithms, and data analytics.

Section 223—Information Technology Modernization and Security Efforts

This section would direct an interagency information technology spectrum modernization effort, led by the Assistant Secretary of Commerce for Communications and Infrastructure and the National Telecommunications and Information Administration, to synchronize development and coordination of standards and Federal spectrum management. This section would also require the Secretary of Defense to establish a program to identify and mitigate vulnerabilities in the telecommunications infrastructure of the Department of Defense.

Section 224—Board of Directors for the Joint Artificial Intelligence Center

This section would direct the Secretary of Defense to create and resource a Board of Directors for the Joint Artificial Intelligence Center (JAIC), comprised of senior Department of Defense officials, as well as civilian directors not employed by the Department of Defense. The objective would be to have a standing body over the JAIC that can bring governmental and non-governmental experts together for the purpose of assisting the Department of Defense in correctly integrating and operationalizing artificial intelligence technologies.

Section 225—Directed Energy Working Group

This section would establish a Directed Energy Working Group inside the Department of Defense to coordinate directed energy efforts across the military services, leverage shared research and development, eliminate redundant efforts, and expedite the operationalization of directed energy programs.

Section 226—Program Executive Officer for Autonomy

This section would create a Program Executive Officer for autonomy within the Navy.

Section 227—Accountability Measures Relating to the Advanced Battle Management System

This section would require the Secretary of the Air Force to provide additional information on the Advanced Battle Management System (ABMS) family of systems. This section would amend section 147(g) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Public Law 115–232) to include as part of the quarterly briefings a detailed briefing on each on-ramp demonstration conducted during that quarter, to encompass: objectives achieved; the realism of the exercise, including which portions were scripted and which were not, and the technical workarounds or substitute technologies employed; composition of and sustainment plan for leave-behind interim capabilities provided to a combatant commander; and the costs spent on technology solutions, range access and testing resources, personnel, and logistics, including travel costs.

This section would also require the Secretary to report on planned ABMS capabilities, technologies needed to implement and achieve these capabilities, and a timeline for technology maturation and notional fielding schedule across the future years defense program. The committee expects this report to outline how ABMS intends to transition demonstrated capabilities into sustainable Programs of Record. This section would further require reports on ABMS acquisition authorities, coordination between the ABMS Architect Office and the Common Mission Control Center, and the ABMS security plan. Finally, this section would require the Director of Cost Assessment and Program Evaluation to conduct an independent cost estimate of any ABMS cost estimate prepared by the Air Force.

Section 228—Measures to Address Foreign Talent Programs

This section would direct the Secretary of Defense to maintain a list of foreign talent recruitment programs that present a threat to the United States, and publish the list in the Federal Registrar for not less than 60 days.

Section 229—Disclosure of Foreign Funding Sources in Applications for Federal Research Awards

This section would require Federal research agencies to require any principal investigator or co-principal investigator under a grant or cooperative agreement to disclose all current and pending

support and the sources of such support at the time of the application.

Section 230—Limitations Relating to Large Unmanned Surface Vessels and Associated Offensive Weapon Systems

This section would prohibit the procurement of any large unmanned surface vessels in fiscal year 2021 until a certification regarding technology maturity has been submitted to Congress. This section also includes a prohibition on the inclusion of offensive weapons systems until the Secretary of Defense certifies how these systems will comply with the Law of Armed Conflict.

Section 231—Limitation on Availability of Funds Pending Review and Report on Next Generation Air Dominance Capabilities

This section would limit the Secretary of the Air Force and the Secretary of the Navy from obligating more than 85 percent of funding authorized to be appropriated for fiscal year 2021 for the Next Generation Air Dominance capabilities until the Director, Cost Assessment and Program Evaluation performs a non-advocate review and submits a report to the congressional defense committees that assesses the separate efforts of the U.S. Air Force and the U.S. Navy regarding the Next Generation Air Dominance portfolio of capabilities being developed by each Secretary.

SUBTITLE C—EMERGING TECHNOLOGY AND ARTIFICIAL INTELLIGENCE MATTERS

Section 241—Steering Committee on Emerging Technology

This section would establish a steering committee on emerging technology and national security threats.

Section 242—Training for Human Resources Personnel in Artificial Intelligence and Related Topics

This section would direct the Secretary of Defense to develop and implement a program to provide human resources personnel with training in the fields of software development, data science, and artificial intelligence, as such fields relate to the duties of such personnel, not later 1 year after the date of the enactment of this Act.

Section 243—Unclassified Workspaces for Personnel with Pending Security Clearances

This section would direct the Secretary of Defense to issue guidance not later than 180 days after the date of the enactment of this Act to ensure, to the extent practicable, that all Department of Defense facilities have unclassified workspaces for employees who have applied for, but have not yet received, a security clearance.

Section 244—Pilot Program on the Use of Electronic Portfolios to Evaluate Applicants for Certain Technical Positions

This section would direct the Secretary of Defense to carry out a pilot program to evaluate applicants for technical positions within the Department of Defense, in part, on electronic portfolios of the applicant's work.

Section 245—Self-Directed Training in Artificial Intelligence

This section would direct the Secretary of Defense to provide a list of approved online courses relating to artificial intelligence that may be taken by employees and military members on a voluntary basis outside work hours not later than 180 days after the date of the enactment of this Act. The section would also require the Secretary to develop a system to reward those who complete the courses.

Section 246—Part-Time and Term Employment of University Professors and Students in the Defense Science and Technology Enterprise

This section would direct the Secretary of Defense to establish a program under which qualified professors and students may be employed on a part-time or term basis in an organization of the Defense science and technology enterprise for the purpose of conducting a research project. This section would require the Secretary to submit to the congressional defense committees not later than 30 days after the completion of each of the first 3 years of the program a report on the status of the program.

Section 247—Microelectronics and National Security

This section would amend section 231 of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114–328) directing a strategy for assured access to trusted microelectronics by extending the report deadline to December 30, 2020, and adding new requirements to the strategy and implementation plan.

This section would also establish an Advisory Panel on Microelectronics Leadership and Competitiveness to develop a national strategy to accelerate the development and deployment of state-of-the-art microelectronics and ensure that the United States is a global leader in the field. This section would direct the Secretary of Defense and the Assistant to the President for National Security Affairs to provide briefings to the congressional defense committees within 90 days after the date of the enactment of this Act on the progress of the Secretary in developing the strategy and implementation plan required, and the progress of the Advisory Panel in developing its strategy, respectively.

Section 248—Acquisition of Ethically and Responsibly Developed Artificial Intelligence Technology

This section would direct the Secretary of Defense, acting through the Board of Directors of the Joint Artificial Intelligence Center, to conduct an assessment to determine whether the Department of Defense has the ability to ensure that any artificial intelligence technology acquired by the Department is ethically and responsibly developed.

Section 249—Enhancement of Public-Private Talent Exchange Programs in the Department of Defense

This section would amend the Public-Private Talent Exchange agreement requirements of section 1599g of title 10, United States Code, and would direct the Secretary of Defense to take steps to

ensure that the authority for the Department of Defense to operate a public-private talent exchange program pursuant to section 1599g of title 10, United States Code, is used to exchange personnel with private sector entities working on artificial intelligence applications. The section would direct the Secretary to provide a briefing to the Committees on Armed Services of the Senate and the House of Representatives not later than 180 days after the date of the enactment of this Act, and annually thereafter, on the efforts undertaken to expand existing public-private exchange programs of the Department of Defense.

SUBTITLE D—SUSTAINABLE CHEMISTRY RESEARCH AND
DEVELOPMENT

Section 251—Short Title

This section would establish the title of this subtitle as the Sustainable Chemistry Research and Development Act of 2020.

Section 252—Findings

This section would describe the findings of the Act.

Section 253—National Coordinating Entity for Sustainable
Chemistry

This section would direct the Director of the Office of Science and Technology Policy to convene an inter-agency entity under the National Science and Technology Council not later than 180 days after the date of the enactment of this Act to coordinate Federal programs and activities in support of sustainable chemistry.

Section 254—Strategic Plan for Sustainable Chemistry

This section would direct the interagency entity to develop a strategic plan in support of sustainable chemistry, and would direct the entity to submit a report to the Committee on Environment and Public Works, the Committee on Commerce, Science, and Transportation, and the Committee on Appropriations of the Senate, and the Committee on Science, Space, and Technology, the Committee on Energy and Commerce, the Committee on Appropriations of the House of Representatives, and to the Government Accountability Office not later than 2 years after enactment and every 3 years thereafter assessing Federal investments in sustainable chemistry.

Section 255—Agency Activities in Support of Sustainable
Chemistry

This section would direct participating agencies to carry out activities in support of sustainable chemistry, as appropriate to the specific mission and program of each agency.

Section 256—Partnerships in Sustainable Chemistry

This section would authorize participating agencies to facilitate and support the creation of partnerships that must include one private sector organization to aid in sustainable chemistry research,

development, demonstration, technology transfer, education, and job training.

Section 257—Prioritization

This section would direct the interagency entity to focus on activities that achieve the goals outlined in the Act.

Section 258—Rule of Construction

This section would direct that nothing in this Act shall be construed to alter or amend any State law or action with regard to sustainable chemistry or green chemistry, as defined by the State.

Section 259—Major Multi-User Research Facility Project

This section would amend chapter 16 of title 42, United States Code, to update the definition of the term “Major multi-user research facility project.”

SUBTITLE E—PLANS, REPORTS, AND OTHER MATTERS

Section 261—Modification to Annual Report of the Director of Operational Test and Evaluation

This section would amend section 139(h)(2) of title 10, United States Code, by removing the sunset date for the annual report submitted by the Director of Operational Test and Evaluation. This section does not change or alter any authorities of the Director of Operational Test and Evaluation.

Section 262—Repeal of Quarterly Updates on the Optionally Manned Fighting Vehicle Program

This section would repeal section 261 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92). The committee notes that the Optionally Manned Fighting Vehicle (OMFV) Program is delayed and the Army’s original solicitation has been cancelled making quarterly updates on the program unnecessary.

The committee appreciates the Army’s efforts over the last 20 years and current commitment to develop a next generation combat vehicle to replace the M2 Bradley Infantry Fighting Vehicle in armored formations today. Although the committee shares the Army’s disappointment with the recent cancellation of the solicitation for the OMFV, the committee is nonetheless encouraged that the Army appears better positioned to take a thoughtful, measured, and realistic approach to development of next generation armored fighting vehicle technology. This is evident in the Army’s efforts at this time to learn up-front from industry what new technologies could make a next generation combat vehicle significantly more capable than the M2 Bradley, and at the same time, achievable and affordable.

In this regard, the committee understands the Army’s new development concept includes three or more phases, of which the first is solicitation of digital engineering designs from up to five commercial vendors for production design review by a source selection evaluation board, followed by a down-select to three vendors for an engineering and manufacturing development, critical design re-

view, and production prototyping phase, and finally down-select to two offerors or possibly a single awardee for low-rate initial production. The committee is interested to see if this process, while taking somewhat longer, will attract the widest competitive field of offerors with the widest technological diversity, and at the same time achieve the benefits of such competition including enhanced technology, lower cost, and potentially an expanded armored vehicle industrial capacity.

Although this section would repeal the requirement for a quarterly update on the OMFV program, the committee expects that the Secretary of the Army or designee will, upon request, provide the committee with briefings that address the elements of the update as originally enacted in section 261 of Public Law 116–92.

Section 263—Independent Evaluation of Personal Protective and Diagnostic Testing Equipment

This section would direct the Director of Operational Test and Evaluation to independently evaluate any processes used to test the effectiveness of covered personal protective and diagnostic testing equipment and the results of such tests. This section would require the Director to submit to the congressional defense committees a report not later than 30 days after the completion of each evaluation on the results of the evaluation.

Section 264—Reports on F–35 Physiological Episodes and Mitigation Efforts

This section would require the Under Secretary of Defense for Acquisition and Sustainment to conduct a root cause analysis study of all physiological episodes (PEs) that have been reported by F–35 pilots as of the date of the enactment of this Act, and to provide a report to the congressional defense committees not later than 180 days after the date of the enactment of this Act. The report would describe:

- (1) all reported instances of F–35 PEs;
- (2) all findings and recommendations of the root cause analysis study; and
- (3) resources required to resolve issues contributing to F–35 PEs.

Finally, this section would require the Under Secretary to describe in the annual report required by section 224(d) of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114–328) what funding and corrective actions are being implemented to mitigate F–35 PEs.

Section 265—Study on Mechanisms for Attracting and Retaining High Quality Talent in the National Security Innovation Base

This section would direct the Secretary of Defense to conduct a study to determine the feasibility of establishing a program to attract and retain covered individuals for employment in the national security innovation base. This section would require the Secretary to submit a report to the congressional defense committees not later than February 1, 2021, on the results of the study.

TITLE XLII—RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

SEC. 4201. RESEARCH, DEVELOPMENT, TEST, AND EVALUATION.

SEC. 4201. RESEARCH, DEVELOPMENT, TEST, AND EVALUATION (In Thousands of Dollars)

Line	Program Element	Item	FY 2021 Request	House Change	House Authorized
RESEARCH, DEVELOPMENT, TEST & EVAL, ARMY					
BASIC RESEARCH					
002	0601102A	DEFENSE RESEARCH SCIENCES	303,257	5,000	308,257
		Counter-UAS Army research lab		[5,000]	
003	0601103A	UNIVERSITY RESEARCH INITIATIVES	67,148		67,148
004	0601104A	UNIVERSITY AND INDUSTRY RESEARCH CENTERS	87,877	9,000	96,877
		Automotive research center modeling and simulation		[5,000]	
		Biotechnology advancements		[4,000]	
005	0601121A	CYBER COLLABORATIVE RESEARCH ALLIANCE	5,077		5,077
		SUBTOTAL BASIC RESEARCH	463,359	14,000	477,359
APPLIED RESEARCH					
007	0602115A	BIOMEDICAL TECHNOLOGY	11,835		11,835
011	0602134A	COUNTER IMPROVISED-THREAT ADVANCED STUDIES	2,000		2,000
012	0602141A	LETHALITY TECHNOLOGY	42,425	5,000	47,425
		Next generation additive manufacturing and 3-D printed electronics		[5,000]	
013	0602142A	ARMY APPLIED RESEARCH	30,757		30,757
014	0602143A	SOLDIER LETHALITY TECHNOLOGY	125,435	7,000	132,435
		HEROES program increase		[5,000]	

015	0602144A	Syn-bio enabled functional materials for the soldier			[2,000]	
		GROUND TECHNOLOGY	28,047		17,000	45,047
		Cold weather military research			[2,000]	
		Materials recovery technologies for defense supply resiliency			[10,000]	
		Polymeric composites via cold spray additive manufacturing			[5,000]	
016	0602145A	NEXT GENERATION COMBAT VEHICLE TECHNOLOGY	217,565		15,000	217,565
017	0602146A	NETWORK C3I TECHNOLOGY	114,404		[5,000]	129,404
		Alternative positioning navigation and timing			[5,000]	
		Multi-drone/multi-sensor intelligence, surveillance, and reconnaissance capabilities			[2,000]	
		Program increase			[5,000]	
		Sensor and electronic network initiatives			[3,000]	
018	0602147A	LONG RANGE PRECISION FIRES TECHNOLOGY	60,553		5,000	60,553
019	0602148A	FUTURE VERTICLE LIFT TECHNOLOGY	96,484		[5,000]	101,484
		High density eVOTL power source research			20,000	
020	0602150A	AIR AND MISSILE DEFENSE TECHNOLOGY	56,298		[5,000]	76,298
		Advanced tracking and targeting capability			[5,000]	
		High energy laser technology			[5,000]	
		Radar research			[5,000]	
		UAS threat detection			[5,000]	
022	0602213A	C3I APPLIED CYBER	18,816			18,816
040	0602785A	MANPOWER/PERSONNEL/TRAINING TECHNOLOGY	20,766			20,766
042	0602787A	MEDICAL TECHNOLOGY	95,496			95,496
		SUBTOTAL APPLIED RESEARCH	920,881		69,000	989,881
		ADVANCED TECHNOLOGY DEVELOPMENT				
044	0603002A	MEDICAL ADVANCED TECHNOLOGY	38,896			38,896
049	0603007A	MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY	11,659			11,659
052	0603115A	MEDICAL DEVELOPMENT	27,723			27,723
053	0603117A	ARMY ADVANCED TECHNOLOGY DEVELOPMENT	62,663			62,663
054	0603118A	SOLDIER LETHALITY ADVANCED TECHNOLOGY	109,608		9,000	118,608
		Advanced AI/AA analytics for modernization and readiness			[5,000]	
		Anthropomorphic study for body armor modernization			[4,000]	

SEC. 4201. RESEARCH, DEVELOPMENT, TEST, AND EVALUATION
(In Thousands of Dollars)

Line	Program Element	Item	FY 2021 Request	House Change	House Authorized
055	0603119A	GROUND ADVANCED TECHNOLOGY	14,795	8,500	23,295
		Rapid entry and sustainment for the arctic		[5,000]	
		Survivability and energy reduction of hard shelters		[3,500]	
059	0603134A	COUNTER IMPROVISED-THREAT SIMULATION	25,000		25,000
063	0603457A	C3I CYBER ADVANCED DEVELOPMENT	23,357		23,357
064	0603461A	HIGH PERFORMANCE COMPUTING MODERNIZATION PROGRAM	188,024		188,024
065	0603462A	NEXT GENERATION COMBAT VEHICLE ADVANCED TECHNOLOGY	199,358	17,000	216,358
		Cyber security support for vehicle development		[2,000]	
		Fuel cell powered vehicle development		[15,000]	
066	0603463A	NETWORK C3I ADVANCED TECHNOLOGY	158,608	5,000	163,608
		Tactical geospatial information development		[5,000]	
067	0603464A	LONG RANGE PRECISION FIRES ADVANCED TECHNOLOGY	121,060	10,000	131,060
		Hypervelocity projectile		[10,000]	
068	0603465A	FUTURE VERTICAL LIFT ADVANCED TECHNOLOGY	156,194		156,194
069	0603466A	AIR AND MISSILE DEFENSE ADVANCED TECHNOLOGY	58,130	5,000	63,130
		Program acceleration		[5,000]	
077	0603920A	HUMANITARIAN DEMINING	8,515		8,515
		SUBTOTAL ADVANCED TECHNOLOGY DEVELOPMENT	1,203,590	54,500	1,258,090
078	0603305A	ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
		ARMY MISSILE DEFENSE SYSTEMS INTEGRATION	11,062	10,000	21,062
		Accelerated test and integration		[10,000]	
079	0603308A	ARMY SPACE SYSTEMS INTEGRATION	26,230		26,230
080	0603327A	AIR AND MISSILE DEFENSE SYSTEMS ENGINEERING	26,482		26,482
081	0603619A	LANDMINE WARFARE AND BARRIER—ADV DEV	64,092	2,000	66,092
		MICLIC replacement development		[2,000]	
083	0603639A	TANK AND MEDIUM CALIBER AMMUNITION	92,753		92,753

084	0603645A	ARMORED SYSTEM MODERNIZATION—ADV DEV	151,478	12,500	163,978
		Fuel cell powered vehicle development		[15,000]	
		Modeling and simulation support for vehicle development		[12,500]	
		Program decrease		[-15,000]	
085	0603747A	SOLDIER SUPPORT AND SURVIVABILITY	5,841		5,841
086	0603766A	TACTICAL ELECTRONIC SURVEILLANCE SYSTEM—ADV DEV	194,775		194,775
087	0603774A	NIGHT VISION SYSTEMS ADVANCED DEVELOPMENT	24,316		24,316
088	0603779A	ENVIRONMENTAL QUALITY TECHNOLOGY—DEM/VAL	13,387		13,387
089	0603790A	NATO RESEARCH AND DEVELOPMENT	4,762		4,762
090	0603801A	AVIATION—ADV DEV	647,937		647,937
091	0603804A	LOGISTICS AND ENGINEER EQUIPMENT—ADV DEV	4,761		4,761
092	0603807A	MEDICAL SYSTEMS—ADV DEV	28,520		28,520
093	0603827A	SOLDIER SYSTEMS—ADVANCED DEVELOPMENT	26,138		23,138
		IHPs program delays		-3,000	
094	0604017A	ROBOTICS DEVELOPMENT	121,207	[-3,000]	115,407
		Program reduction		-5,800	
		ELECTRONIC WARFARE TECHNOLOGY MATURATION (MIP)	22,840		22,840
096	0604021A	LOW EARTH ORBIT (LEO) SATELLITE CAPABILITY	22,678		22,678
097	0604035A	ANALYSIS OF ALTERNATIVES	10,082		10,082
098	0604100A	SMALL UNMANNED AERIAL VEHICLE (SUAV) (6.4)	1,378		1,378
099	0604101A	FUTURE TACTICAL UNMANNED AIRCRAFT SYSTEM (FTUAS)	40,083		40,083
100	0604113A	LOWER TIER AIR MISSILE DEFENSE (LTAMD) SENSOR	376,373		376,373
101	0604114A	TECHNOLOGY MATURATION INITIATIVES	156,834		156,834
102	0604115A	MANEUVER—SHORT RANGE AIR DEFENSE (M-SHORAD)	4,995		4,995
103	0604117A	ARMY ADVANCED COMPONENT DEVELOPMENT & PROTOTYPING	170,490		170,490
105	0604119A	ASSURED POSITIONING, NAVIGATION AND TIMING (PNT)	128,125		128,125
106	0604120A	SYNTHETIC TRAINING ENVIRONMENT REFINEMENT & PROTOTYPING	129,547		129,547
107	0604121A	COUNTER IMPROVISED-THREAT DEMONSTRATION, PROTOTYPE DEVELOPMENT, AND TESTING	13,831		13,831
108	0604134A	HYPERSONICS	801,417	10,000	811,417
109	0604182A	Program increase		[10,000]	
111	0604403A	FUTURE INTERCEPTOR	7,992		7,992
112	0604541A	UNIFIED NETWORK TRANSPORT	40,677		40,677

SEC. 4201. RESEARCH, DEVELOPMENT, TEST, AND EVALUATION
(In Thousands of Dollars)

Line	Program Element	Item	FY 2021 Request	House Change	House Authorized
115	0305251A	CYBERSPACE OPERATIONS FORCES AND FORCE SUPPORT	50,525		50,525
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	3,421,608	25,700	3,447,308
		SYSTEM DEVELOPMENT & DEMONSTRATION			
118	0604201A	AIRCRAFT AVIONICS	2,764		2,764
119	0604270A	ELECTRONIC WARFARE DEVELOPMENT	62,426		62,426
121	0604601A	INFANTRY SUPPORT WEAPONS	91,574	7,000	98,574
		Advanced gunner protection kit development		[2,000]	
		Soldier Enhancement Program		[5,000]	
122	0604604A	MEDIUM TACTICAL VEHICLES	8,523		8,523
123	0604611A	JAVELIN	7,493		7,493
124	0604622A	FAMILY OF HEAVY TACTICAL VEHICLES	24,792		24,792
125	0604633A	AIR TRAFFIC CONTROL	3,511		3,511
126	0604642A	LIGHT TACTICAL WHEELED VEHICLES	1,976		1,976
127	0604645A	ARMORED SYSTEMS MODERNIZATION (ASM)—ENG DEV	135,488		135,488
128	0604710A	NIGHT VISION SYSTEMS—ENG DEV	61,445		61,445
129	0604713A	COMBAT FEEDING, CLOTHING, AND EQUIPMENT	2,814		2,814
130	0604715A	NON-SYSTEM TRAINING DEVICES—ENG DEV	28,036		28,036
131	0604741A	AIR DEFENSE COMMAND, CONTROL AND INTELLIGENCE—ENG DEV	43,651	-4,000	39,651
		Army identified funds excess to need		[-4,000]	
132	0604742A	CONSTRUCTIVE SIMULATION SYSTEMS DEVELOPMENT	10,150		10,150
133	0604746A	AUTOMATIC TEST EQUIPMENT DEVELOPMENT	5,578		5,578
134	0604760A	DISTRIBUTIVE INTERACTIVE SIMULATIONS (DIS)—ENG DEV	7,892		7,892
135	0604768A	BRILLIANT ANTI-ARMOR SUBMUNITION (BAT)	24,975		24,975
136	0604780A	COMBINED ARMS TACTICAL TRAINER (CATT) CORE	3,568		3,568
137	0604798A	BRIGADE ANALYSIS, INTEGRATION AND EVALUATION	19,268		19,268
138	0604802A	WEAPONS AND MUNITIONS—ENG DEV	265,811		265,811

139	0604804A	LOGISTICS AND ENGINEER EQUIPMENT—ENG DEV	49,694	49,694
140	0604805A	COMMAND, CONTROL, COMMUNICATIONS SYSTEMS—ENG DEV	11,079	11,079
141	0604807A	MEDICAL MATERIEL/MEDICAL BIOLOGICAL DEFENSE EQUIPMENT—ENG DEV	49,870	49,870
142	0604808A	LANDMINE WARFARE/BARRIER—ENG DEV	9,589	9,589
143	0604818A	ARMY TACTICAL COMMAND & CONTROL HARDWARE & SOFTWARE	162,513	152,513
		Command post integrated infrastructure contract delay		[-10,000]
144	0604820A	RADAR DEVELOPMENT	109,259	109,259
145	0604822A	GENERAL FUND ENTERPRISE BUSINESS SYSTEM (GFEBs)	21,201	21,201
146	0604823A	FIREFINDER	20,008	16,808
		Prior year carry-over		-3,200
				[-3,200]
147	0604827A	SOLDIER SYSTEMS—WARRIOR DEMVAL	6,534	6,534
148	0604852A	SUITE OF SURVIVABILITY ENHANCEMENT SYSTEMS—EMD	82,459	109,380
		Prior year carry-over		26,921
		Program increase for vehicle protection systems		[-5,079]
149	0604854A	ARTILLERY SYSTEMS—EMD	11,611	11,611
150	0605013A	INFORMATION TECHNOLOGY DEVELOPMENT	142,678	137,678
		Reprioritization		-5,000
				[-5,000]
151	0605018A	INTEGRATED PERSONNEL AND PAY SYSTEM-ARMY (PPS-A)	115,286	115,286
152	0605028A	ARMORED MULTI-PURPOSE VEHICLE (AMPV)	96,594	76,594
		Army identified funds excess to need		-20,000
				[-20,000]
154	0605030A	JOINT TACTICAL NETWORK CENTER (JTNC)	16,264	16,264
155	0605031A	JOINT TACTICAL NETWORK (JTN)	31,696	31,696
157	0605033A	GROUND-BASED OPERATIONAL SURVEILLANCE SYSTEM—EXPEDITIONARY (GBOSS-E)	5,976	5,976
159	0605035A	COMMON INFRARED COUNTERMEASURES (CIRCM)	23,321	28,321
		AI virtual training environments		5,000
				[5,000]
161	0605038A	NUCLEAR BIOLOGICAL CHEMICAL RECONNAISSANCE VEHICLE (NBCRV) SENSOR SUITE	4,846	4,846
162	0605041A	DEFENSIVE CYBER TOOL DEVELOPMENT	28,544	28,544
163	0605042A	TACTICAL NETWORK RADIO SYSTEMS (LOW-TIER)	28,178	28,178
164	0605047A	CONTRACT WRITING SYSTEM	22,860	22,860
166	0605051A	AIRCRAFT SURVIVABILITY DEVELOPMENT	35,893	35,893
167	0605052A	INDIRECT FIRE PROTECTION CAPABILITY INC 2—BLOCK 1	235,770	187,970
		Army identified funds excess to need		-47,800
				[-47,800]

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Line	Program Element	Item	FY 2021 Request	House Change	House Authorized
168	0605053A	GROUND ROBOTICS	13,710		13,710
169	0605054A	EMERGING TECHNOLOGY INITIATIVES	294,739	-10,000	284,739
		Program decrease		[-10,000]	
170	0605145A	MEDICAL PRODUCTS AND SUPPORT SYSTEMS DEVELOPMENT	954		954
171	0605203A	ARMY SYSTEM DEVELOPMENT & DEMONSTRATION	150,201		150,201
172	0605205A	SMALL UNMANNED AERIAL VEHICLE (SUAV) (6.5)	5,999		5,999
174	0605450A	JOINT AIR-TO-GROUND MISSILE (JAGM)	8,891		8,891
175	0605457A	ARMY INTEGRATED AIR AND MISSILE DEFENSE (AIAMD)	193,929		193,929
176	0605625A	MANNED GROUND VEHICLE	327,732	-83,000	244,732
		Army identified funds excess to need		[-83,000]	
177	0605766A	NATIONAL CAPABILITIES INTEGRATION (MIP)	7,670		7,670
178	0605812A	JOINT LIGHT TACTICAL VEHICLE (JLTV) ENGINEERING AND MANUFACTURING DEVELOPMENT PH	1,742		1,742
179	0605830A	AVIATION GROUND SUPPORT EQUIPMENT	1,467	3,000	4,467
		Aircraft cleaning and deicing system development		[3,000]	
180	0303032A	TROJAN—RH12	3,451		3,451
183	0304270A	ELECTRONIC WARFARE DEVELOPMENT	55,855		55,855
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	3,199,798	-141,079	3,058,719
MANAGEMENT SUPPORT					
185	0604256A	THREAT SIMULATOR DEVELOPMENT	14,515		14,515
186	0604258A	TARGET SYSTEMS DEVELOPMENT	10,668		10,668
187	0604759A	MAJOR T&E INVESTMENT	106,270	5,000	111,270
		Program increase		[5,000]	
188	0605103A	RAND ARROYO CENTER	13,481		13,481
189	0605301A	ARMY KWAJALEIN ATOLL	231,824		231,824
190	0605326A	CONCEPTS EXPERIMENTATION PROGRAM	54,898		54,898
192	0605601A	ARMY TEST RANGES AND FACILITIES	350,359		350,359

193	0605602A	ARMY TECHNICAL TEST INSTRUMENTATION AND TARGETS	48,475	14,500	62,975
		Aviation component testing		[5,000]	
		Testing additive manufacturing technology		[9,500]	
194	0605604A	SURVIVABILITY/LETHALITY ANALYSIS	36,001		36,001
195	0605606A	AIRCRAFT CERTIFICATION	2,736		2,736
196	0605702A	METEOROLOGICAL SUPPORT TO RDT&E ACTIVITIES	6,488		6,488
197	0605706A	MATERIEL SYSTEMS ANALYSIS	21,859		21,859
198	0605709A	EXPLOITATION OF FOREIGN ITEMS	7,936		7,936
199	0605712A	SUPPORT OF OPERATIONAL TESTING	54,470		54,470
200	0605716A	ARMY EVALUATION CENTER	63,141		63,141
201	0605718A	ARMY MODELING & SIM X-CMD COLLABORATION & INTEG	2,572		2,572
202	0605801A	PROGRAMWIDE ACTIVITIES	87,472		87,472
203	0605803A	TECHNICAL INFORMATION ACTIVITIES	26,244		26,244
204	0605805A	MUNITIONS STANDARDIZATION, EFFECTIVENESS AND SAFETY	40,133	10,000	50,133
		Development of polymer-cased ammunition		[5,000]	
		Program acceleration		[5,000]	
205	0605857A	ENVIRONMENTAL QUALITY TECHNOLOGY MGMT SUPPORT	1,780		1,780
206	0605898A	ARMY DIRECT REPORT HEADQUARTERS—R&D - MHA	55,045		55,045
208	0606002A	RONALD REAGAN BALLISTIC MISSILE DEFENSE TEST SITE	71,306		71,306
209	0606003A	COUNTERINTEL AND HUMAN INTEL MODERNIZATION	1,063		1,063
210	0606105A	MEDICAL PROGRAM-WIDE ACTIVITIES	19,891		19,891
211	0606942A	ASSESSMENTS AND EVALUATIONS CYBER VULNERABILITIES	4,496		4,496
		SUBTOTAL MANAGEMENT SUPPORT	1,333,123	29,500	1,362,623
OPERATIONAL SYSTEMS DEVELOPMENT					
214	0603778A	MLRS PRODUCT IMPROVEMENT PROGRAM	10,157		10,157
216	0605024A	ANTI-TAMPER TECHNOLOGY SUPPORT	8,682		8,682
217	0607131A	WEAPONS AND MUNITIONS PRODUCT IMPROVEMENT PROGRAMS	20,409		20,409
219	0607134A	LONG RANGE PRECISION FIRES (LRPF)	122,733		122,733
		Program reduction		[-66,100]	
221	0607136A	BLACKHAWK PRODUCT IMPROVEMENT PROGRAM	11,236	5,000	16,236
		Thermoplastic drive shafts		[5,000]	

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Line	Program Element	Item	FY 2021 Request	House Change	House Authorized
222	0607137A	CHINOOK PRODUCT IMPROVEMENT PROGRAM	46,091	5,000	51,091
		Carbon composite materials for wheels and brakes		[5,000]	
224	0607139A	IMPROVED TURBINE ENGINE PROGRAM	249,257		249,257
225	0607142A	AVIATION ROCKET SYSTEM PRODUCT IMPROVEMENT AND DEVELOPMENT	17,155		17,155
226	0607143A	UNMANNED AIRCRAFT SYSTEM UNIVERSAL PRODUCTS	7,743		7,743
227	0607145A	APACHE FUTURE DEVELOPMENT	77,177		77,177
228	0607150A	INTEL CYBER DEVELOPMENT	14,652		14,652
229	0607312A	ARMY OPERATIONAL SYSTEMS DEVELOPMENT	35,851		35,851
230	0607665A	FAMILY OF BIOMETRICS	1,324		1,324
231	0607865A	PATRIOT PRODUCT IMPROVEMENT	187,840		187,840
232	0203728A	JOINT AUTOMATED DEEP OPERATION COORDINATION SYSTEM (JADOCs)	44,691		44,691
233	0203735A	COMBAT VEHICLE IMPROVEMENT PROGRAMS	288,919	-5,667	263,252
		CROWS-J program delay		[-5,667]	
234	0203743A	155MM SELF-PROPELLED HOWITZER IMPROVEMENTS	427,254	-136,291	290,963
		Prior year carry-over		[-6,291]	
		Program decrease		[-130,000]	
235	0203744A	AIRCRAFT MODIFICATIONS/PRODUCT IMPROVEMENT PROGRAMS	11,688	-4,000	7,688
		Early to need		[-4,000]	
236	0203752A	AIRCRAFT ENGINE COMPONENT IMPROVEMENT PROGRAM	80		80
237	0203758A	DIGITIZATION	4,516		4,516
238	0203801A	MISSILE/AIR DEFENSE PRODUCT IMPROVEMENT PROGRAM	1,288		1,288
239	0203802A	OTHER MISSILE PRODUCT IMPROVEMENT PROGRAMS	79,424	-60,000	19,424
		Program decrease		[-60,000]	
243	0205412A	ENVIRONMENTAL QUALITY TECHNOLOGY—OPERATIONAL SYSTEM DEV	259		259
244	0205456A	LOWER TIER AIR AND MISSILE DEFENSE (AMD) SYSTEM	166		166
245	0205778A	GUIDED MULTIPLE-LAUNCH ROCKET SYSTEM (GMLRS)	75,575		75,575
246	0208053A	JOINT TACTICAL GROUND SYSTEM	9,510		9,510

249	0303140A	INFORMATION SYSTEMS SECURITY PROGRAM	29,270		29,270
250	0303141A	GLOBAL COMBAT SUPPORT SYSTEM	86,908		86,908
251	0303142A	SATCOM GROUND ENVIRONMENT (SPACE)	18,684		18,684
256	0305179A	INTEGRATED BROADCAST SERVICE (IBS)	467		467
257	0305204A	TACTICAL UNMANNED AERIAL VEHICLES	4,051		4,051
258	0305206A	AIRBORNE RECONNAISSANCE SYSTEMS	13,283		13,283
259	0305208A	DISTRIBUTED COMMON GROUND/SURFACE SYSTEMS	47,204		47,204
264	0708045A	END ITEM INDUSTRIAL PREPAREDNESS ACTIVITIES	61,012	6,000	67,012
		6.8mm projectile development		[4,000]	
		Lightweight film armor development		[2,000]	
266A	9999999999	CLASSIFIED PROGRAMS	3,983		3,983
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	1,988,539	-256,058	1,742,481
SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS					
267	0608041A	DEFENSIVE CYBER—SOFTWARE PROTOTYPE DEVELOPMENT	46,445		46,445
		SUBTOTAL SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS	46,445		46,445
TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, ARMY					
			12,587,343	-204,437	12,382,906
RESEARCH, DEVELOPMENT, TEST & EVAL, NAVY					
BASIC RESEARCH					
001	0601103N	UNIVERSITY RESEARCH INITIATIVES	116,816	5,000	121,816
		Navy Defense University Research Instrumentation program increase		[5,000]	
002	0601152N	IN-HOUSE LABORATORY INDEPENDENT RESEARCH	19,113		19,113
003	0601153N	DEFENSE RESEARCH SCIENCES	467,158		467,158
		SUBTOTAL BASIC RESEARCH	603,087	5,000	608,087
APPLIED RESEARCH					
004	0602114N	POWER PROJECTION APPLIED RESEARCH	17,792		17,792
005	0602123N	FORCE PROTECTION APPLIED RESEARCH	122,281	25,000	147,281
		Additive manufacturing of unmanned maritime systems		[5,000]	
		Cyber physical security and resiliency research		[5,000]	

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Line	Program Element	Item	FY 2021 Request	House Change	House Authorized
		Expeditionary unmanned systems launch and recovery		[5,000]	
		Talent and technology for power and energy systems		[5,000]	
		Unmanned logistics technology		[5,000]	
006	0602131M	MARINE CORPS LANDING FORCE TECHNOLOGY	50,623		50,623
007	0602235N	COMMON PICTURE APPLIED RESEARCH	48,001		48,001
008	0602236N	WARFIGHTER SUSTAINMENT APPLIED RESEARCH	67,765		77,765
		High mobility ground robots		10,000	
		Robotics in complex unstructured environments		[5,000]	
009	0602271N	ELECTROMAGNETIC SYSTEMS APPLIED RESEARCH	84,994		84,994
010	0602435N	OCEAN WARFIGHTING ENVIRONMENT APPLIED RESEARCH	63,392		73,392
		Extreme weather events research		[5,000]	
		Program increase		[5,000]	
011	0602651M	JOINT NON-LETHAL WEAPONS APPLIED RESEARCH	6,343		6,343
012	0602747N	UNDERSEA WARFARE APPLIED RESEARCH	56,397		91,397
		Academic partnerships for undersea vehicle research		[10,000]	
		Autonomous undersea robotics		[10,000]	
		Cross-domain autonomy for persistent maritime operations		[10,000]	
		Expandable structures for operational effectiveness research		[5,000]	
013	0602750N	FUTURE NAVAL CAPABILITIES APPLIED RESEARCH	167,590		167,590
014	0602782N	MINE AND EXPEDITIONARY WARFARE APPLIED RESEARCH	30,715		30,715
015	0602792N	INNOVATIVE NAVAL PROTOTYPES (INP) APPLIED RESEARCH	160,537		160,537
016	0602861N	SCIENCE AND TECHNOLOGY MANAGEMENT—ONR FIELD ACTIVITIES	76,745		76,745
		SUBTOTAL APPLIED RESEARCH	953,175	80,000	1,033,175
		ADVANCED TECHNOLOGY DEVELOPMENT			
017	0603123N	FORCE PROTECTION ADVANCED TECHNOLOGY	24,410	5,000	29,410
		Additive manufacturing		[5,000]	

018	0603271N	ELECTROMAGNETIC SYSTEMS ADVANCED TECHNOLOGY	8,008		8,008
019	0603640M	USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)	219,045	30,000	249,045
		Expeditionary autonomous logistics		[5,000]	
		Heavy payload solar powered UAS		[20,000]	
		Modular Advanced Armed Robotic System		[5,000]	
020	0603651M	JOINT NON-LETHAL WEAPONS TECHNOLOGY DEVELOPMENT	13,301		13,301
021	0603673N	FUTURE NAVAL CAPABILITIES ADVANCED TECHNOLOGY DEVELOPMENT	246,054		246,054
022	0603680N	MANUFACTURING TECHNOLOGY PROGRAM	60,122		60,122
023	0603729N	WARFIGHTER PROTECTION ADVANCED TECHNOLOGY	4,851		4,851
024	0603758N	NAVY WARFIGHTING EXPERIMENTS AND DEMONSTRATIONS	40,709		40,709
025	0603782N	MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY	1,948		1,948
026	0603801N	INNOVATIVE NAVAL PROTOTYPES (INP) ADVANCED TECHNOLOGY DEVELOPMENT	141,948	20,000	161,948
		Accelerated railgun technology maturation		[20,000]	
		SUBTOTAL ADVANCED TECHNOLOGY DEVELOPMENT	760,396	55,000	815,396
ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES					
027	0603178N	MEDIUM AND LARGE UNMANNED SURFACE VEHICLES (USVS)	464,042	-193,600	270,442
		EPF conversion to LUSV prototype		[45,000]	
		Two additional Overlord vessels excess to need		[-238,600]	
028	0603207N	AIR/OCEAN TACTICAL APPLICATIONS	35,386		35,386
029	0603216N	AVIATION SURVIVABILITY	13,428		13,428
030	0603239N	ISO NAVAL CONSTRUCTION FORCES	2,350		2,350
031	0603251N	AIRCRAFT SYSTEMS	418		418
032	0603254N	ASW SYSTEMS DEVELOPMENT	15,719		15,719
033	0603261N	TACTICAL AIRBORNE RECONNAISSANCE	3,411		3,411
034	0603382N	ADVANCED COMBAT SYSTEMS TECHNOLOGY	70,218		70,218
035	0603502N	SURFACE AND SHALLOW WATER MINE COUNTERMEASURES	52,358		52,358
036	0603506N	SURFACE SHIP TORPEDO DEFENSE	12,816		12,816
037	0603512N	CARRIER SYSTEMS DEVELOPMENT	7,559		7,559
038	0603525N	PILOT FISH	368,757	-80,200	278,557
		Excess cost growth		[-25,000]	
		Program adjustment		[-55,200]	

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039	0603527N	RETRACT LARCH	12,562		12,562
040	0603536N	RETRACT JUNIPER	148,000		148,000
041	0603542N	RADIOLOGICAL CONTROL	778		778
042	0603553N	SURFACE ASW	1,161		1,161
043	0603561N	ADVANCED SUBMARINE SYSTEM DEVELOPMENT	185,356	-95,000	90,356
		Excessive accelerated development		[-28,200]	
		Project 1 insufficient budget justification		[-66,800]	
044	0603562N	SUBMARINE TACTICAL WARFARE SYSTEMS	10,528		10,528
045	0603563N	SHIP CONCEPT ADVANCED DESIGN	126,396	10,000	136,396
		Expeditionary sustainment and repair-related technologies		[5,000]	
		Polymorphic build farm for open source technologies		[5,000]	
046	0603564N	SHIP PRELIMINARY DESIGN & FEASIBILITY STUDIES	70,270		70,270
047	0603570N	ADVANCED NUCLEAR POWER SYSTEMS	149,188		149,188
048	0603573N	ADVANCED SURFACE MACHINERY SYSTEMS	38,449		38,449
049	0603576N	CHALK EAGLE	71,181		71,181
050	0603581N	LITTORAL COMBAT SHIP (LCS)	32,178		32,178
051	0603582N	COMBAT SYSTEM INTEGRATION	17,843		17,843
052	0603595N	OHIO REPLACEMENT	317,196		317,196
053	0603596N	LCS MISSION MODULES	67,875		67,875
054	0603597N	AUTOMATED TEST AND ANALYSIS	4,797		4,797
055	0603599N	FRIGATE DEVELOPMENT	82,309		82,309
056	0603609N	CONVENTIONAL MUNITIONS	9,922		9,922
057	0603635M	MARINE CORPS GROUND COMBAT/SUPPORT SYSTEM	189,603	-7,000	182,603
		Program delay		[-7,000]	
058	0603654N	JOINT SERVICE EXPLOSIVE ORDNANCE DEVELOPMENT	43,084		43,084
059	0603713N	OCEAN ENGINEERING TECHNOLOGY DEVELOPMENT	6,346		6,346
060	0603721N	ENVIRONMENTAL PROTECTION	20,601		20,601

061	0603724N	NAVY ENERGY PROGRAM	23,422	23,422	
062	0603725N	FACILITIES IMPROVEMENT	4,664	4,664	
063	0603734N	CHALK CORAL	545,763	520,763	-25,000
		Excess cost growth			[-25,000]
064	0603739N	NAVY LOGISTIC PRODUCTIVITY	3,884	3,884	
065	0603746N	RETRACT MAPLE	353,226	353,226	
066	0603748N	LINK PLUMERIA	544,388	519,388	-25,000
		Excess cost growth			[-25,000]
067	0603751N	RETRACT ELM	86,730	86,730	
068	0603764M	LINK EVERGREEN	236,234	236,234	
070	0603790N	NATO RESEARCH AND DEVELOPMENT	6,880	6,880	
071	0603795N	LAND ATTACK TECHNOLOGY	10,578	10,578	
072	0603851M	JOINT NON-LETHAL WEAPONS TESTING	28,435	28,435	
073	0603860N	JOINT PRECISION APPROACH AND LANDING SYSTEMS—DE/MVAL	33,612	33,612	
074	0603925N	DIRECTED ENERGY AND ELECTRIC WEAPON SYSTEMS	128,845	128,845	
		One additional system			88,000
		F/A -18 INFRARED SEARCH AND TRACK (IRST)			[88,000]
075	0604014N	DIGITAL WARFARE OFFICE	84,190	84,190	
076	0604027N	SMALL AND MEDIUM UNMANNED UNDERSEA VEHICLES	54,699	54,699	
077	0604028N	UNMANNED UNDERSEA VEHICLE CORE TECHNOLOGIES	53,942	53,942	
078	0604029N	RAPID PROTOTYPING, EXPERIMENTATION AND DEMONSTRATION	40,060	40,060	
079	0604030N	LARGE UNMANNED UNDERSEA VEHICLES	12,100	12,100	
080	0604031N	Early to need, phase 1 results needed first	78,122	42,122	-36,000
		GERALD R. FORD CLASS NUCLEAR AIRCRAFT CARRIER (CVN 78—80)			[-36,000]
081	0604112N	LITTORAL AIRBORNE MCM	107,895	107,895	
082	0604126N	SURFACE MINE COUNTERMEASURES	17,366	17,366	
083	0604127N	TACTICAL AIR DIRECTIONAL INFRARED COUNTERMEASURES (TADIRCM)	18,754	18,754	
084	0604272N	FUTURE VERTICAL LIFT (MARITIME STRIKE)	59,776	59,776	
086	0604292N	RAPID TECHNOLOGY CAPABILITY PROTOTYPE	5,097	5,097	
087	0604320M	LX (R)	3,664	3,664	
088	0604454N	ADVANCED UNDERSEA PROTOTYPING	10,203	10,203	
089	0604536N	XLUUV late test and evaluation award	115,858	105,858	-10,000
					[-10,000]

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090	0604636N	COUNTER UNMANNED AIRCRAFT SYSTEMS (C-UAS)	14,259		14,259
091	0604659N	PRECISION STRIKE WEAPONS DEVELOPMENT PROGRAM	1,102,387	-15,000	1,087,387
		Transition to DDG-1000—initial integration		[-15,000]	
092	0604707N	SPACE AND ELECTRONIC WARFARE (SEW) ARCHITECTURE/ENGINEERING SUPPORT	7,657		7,657
093	0604786N	OFFENSIVE ANTI-SURFACE WARFARE WEAPON DEVELOPMENT	35,750		35,750
094	0303354N	ASW SYSTEMS DEVELOPMENT—MIP	9,151		9,151
095	0304240M	ADVANCED TACTICAL UNMANNED AIRCRAFT SYSTEM	22,589	-15,600	6,989
		K-MAX		[7,000]	
		MUX uncertain acquisition strategy		[-22,600]	
097	0304270N	ELECTRONIC WARFARE DEVELOPMENT—MIP	809		809
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	6,503,074	-404,400	6,098,674
SYSTEM DEVELOPMENT & DEMONSTRATION					
098	0603208N	TRAINING SYSTEM AIRCRAFT	4,332		4,332
099	0604212N	OTHER HELO DEVELOPMENT	18,133		18,133
100	0604214M	AV-8B AIRCRAFT—ENG DEV	20,054		20,054
101	0604215N	STANDARDS DEVELOPMENT	4,237		4,237
102	0604216N	MULTI-MISSION HELICOPTER UPGRADE DEVELOPMENT	27,340		27,340
104	0604221N	P-3 MODERNIZATION PROGRAM	606		606
105	0604230N	WARFARE SUPPORT SYSTEM	9,065		9,065
106	0604231N	TACTICAL COMMAND SYSTEM	97,968		97,968
107	0604234N	ADVANCED HAWKEYE	309,373		309,373
108	0604245M	H-1 UPGRADES	62,310		62,310
109	0604261N	ACOUSTIC SEARCH SENSORS	47,182		47,182
110	0604262N	V-22A	132,624		132,624
111	0604264N	AIR CREW SYSTEMS DEVELOPMENT	21,445		21,445
112	0604269N	EA-18	106,134		106,134

113	0604270N	ELECTRONIC WARFARE DEVELOPMENT	134,194		134,194
114	0604273M	EXECUTIVE HELO DEVELOPMENT	99,321		99,321
115	0604274N	NEXT GENERATION JAMMER (NGJ)	477,680	10,000	487,680
		High band risk reduction		[10,000]	
116	0604280N	JOINT TACTICAL RADIO SYSTEM—NAVY (JTRS-NAVY)	232,818		232,818
117	0604282N	NEXT GENERATION JAMMER (NGJ) INCREMENT II	170,039		170,039
118	0604307N	SURFACE COMBATANT COMBAT SYSTEM ENGINEERING	403,712		403,712
119	0604311N	LPD-17 CLASS SYSTEMS INTEGRATION	945		945
120	0604329N	SMALL DIAMETER BOMB (SDB)	62,488		62,488
121	0604366N	STANDARD MISSILE IMPROVEMENTS	386,225	-27,000	359,225
		SM-6 excessive cost growth; program accountability		[-27,000]	
122	0604373N	AIRBORNE MCM	10,909		10,909
123	0604378N	NAVAL INTEGRATED FIRE CONTROL—COUNTER AIR SYSTEMS ENGINEERING	44,548		44,548
124	0604419N	ADVANCED SENSORS APPLICATION PROGRAM (ASAP)	13,673		13,673
125	0604501N	ADVANCED ABOVE WATER SENSORS	87,809		87,809
126	0604503N	SSN-688 AND TRIDENT MODERNIZATION	93,097	18,000	111,097
		Submarine electronic warfare capability improvement		[18,000]	
127	0604504N	AIR CONTROL	38,863		38,863
128	0604512N	SHIPBOARD AVIATION SYSTEMS	9,593		9,593
129	0604518N	COMBAT INFORMATION CENTER CONVERSION	12,718		12,718
130	0604522N	AIR AND MISSILE DEFENSE RADAR (AMDR) SYSTEM	78,319		78,319
131	0604530N	ADVANCED ARRESTING GEAR (AAG)	65,834		65,834
132	0604558N	NEW DESIGN SSN	259,443	23,500	282,943
		Accelerate design		[23,500]	
133	0604562N	SUBMARINE TACTICAL WARFARE SYSTEM	63,878		63,878
134	0604567N	SHIP CONTRACT DESIGN/ LIVE FIRE T&E	51,853	14,600	66,453
		Advanced Degaussing System		[14,600]	
135	0604574N	NAVY TACTICAL COMPUTER RESOURCES	3,853		3,853
136	0604601N	MINE DEVELOPMENT	92,607	-27,500	65,107
		Forward funded in FY20		[-27,500]	
137	0604610N	LIGHTWEIGHT TORPEDO DEVELOPMENT	146,012		146,012
138	0604654N	JOINT SERVICE EXPLOSIVE ORDNANCE DEVELOPMENT	8,383		8,383

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139	0604657M	USMC GROUND COMBAT/SUPPORTING ARMS SYSTEMS—ENG DEV	33,784		33,784
140	0604703N	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS	8,599		8,599
141	0604727N	JOINT STANDOFF WEAPON SYSTEMS	73,744		73,744
142	0604755N	SHIP SELF DEFENSE (DETECT & CONTROL)	157,490		157,490
143	0604756N	SHIP SELF DEFENSE (ENGAGE: HARD KILL)	121,761		121,761
144	0604757N	SHIP SELF DEFENSE (ENGAGE: SOFT KILL/EW)	89,373		89,373
145	0604761N	INTELLIGENCE ENGINEERING	15,716		15,716
146	0604771N	MEDICAL DEVELOPMENT	2,120	20,000	22,120
		Autonomous aerial distributed logistics		[10,000]	
		ETEC disease research		[10,000]	
147	0604777N	NAVIGATION/ID SYSTEM	50,180		50,180
148	0604800M	JOINT STRIKE FIGHTER (JSF)—EMD	561		561
149	0604800N	JOINT STRIKE FIGHTER (JSF)—EMD	250		250
150	0604850N	SSN(X)	1,000		1,000
151	0605013M	INFORMATION TECHNOLOGY DEVELOPMENT	974		974
152	0605013N	INFORMATION TECHNOLOGY DEVELOPMENT	356,173	-5,000	351,173
		Unjustified growth		[-5,000]	
153	0605024N	ANTI-TAMPER TECHNOLOGY SUPPORT	7,810		7,810
154	0605212M	CH-53K RDTE	406,406		406,406
155	0605215N	MISSION PLANNING	86,134		86,134
156	0605217N	COMMON AVIONICS	54,540		54,540
157	0605220N	SHIP TO SHORE CONNECTOR (SSC)	5,155		5,155
158	0605327N	T-AO 205 CLASS	5,148		5,148
159	0605414N	UNMANNED CARRIER AVIATION (UCA)	266,970		266,970
160	0605450M	JOINT AIR-TO-GROUND MISSILE (JAGM)	12,713		12,713
161	0605500N	MULTI-MISSION MARITIME AIRCRAFT (MMA)	24,424		24,424
162	0605504N	MULTI-MISSION MARITIME (MMA) INCREMENT III	182,870		182,870

163	0605611M	MARINE CORPS ASSAULT VEHICLES SYSTEM DEVELOPMENT & DEMONSTRATION	41,775	41,775
164	0605813M	JOINT LIGHT TACTICAL VEHICLE (JLV) SYSTEM DEVELOPMENT & DEMONSTRATION	2,541	2,541
165	0204202N	DDG-1000	208,448	223,448
		Transfer from CPS—initial integration	15,000	
			[15,000]	
169	0304785N	TACTICAL CRYPTOLOGIC SYSTEMS	111,434	111,434
170	0306250M	CYBER OPERATIONS TECHNOLOGY DEVELOPMENT	26,173	26,173
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	6,263,883	6,305,483
		MANAGEMENT SUPPORT		
171	0604256N	THREAT SIMULATOR DEVELOPMENT	22,075	22,075
172	0604258N	TARGET SYSTEMS DEVELOPMENT	10,224	10,224
173	0604759N	MAJOR T&E INVESTMENT	85,195	85,195
175	0605152N	STUDIES AND ANALYSIS SUPPORT—NAVY	3,089	3,089
176	0605154N	CENTER FOR NAVAL ANALYSES	43,517	43,517
179	0605804N	TECHNICAL INFORMATION SERVICES	932	932
180	0605853N	MANAGEMENT, TECHNICAL & INTERNATIONAL SUPPORT	94,297	94,297
181	0605856N	STRATEGIC TECHNICAL SUPPORT	3,813	3,813
183	0605863N	ROT&E SHIP AND AIRCRAFT SUPPORT	104,822	104,822
184	0605864N	TEST AND EVALUATION SUPPORT	446,960	446,960
185	0605865N	OPERATIONAL TEST AND EVALUATION CAPABILITY	27,241	27,241
186	0605866N	NAVY SPACE AND ELECTRONIC WARFARE (SEW) SUPPORT	15,787	15,787
187	0605867N	SEW SURVEILLANCE/RECONNAISSANCE SUPPORT	8,559	8,559
188	0605873M	MARINE CORPS PROGRAM WIDE SUPPORT	42,749	42,749
189	0605898N	MANAGEMENT HQ—R&D	41,094	41,094
190	0606355N	WARFARE INNOVATION MANAGEMENT	37,022	37,022
193	0305327N	INSIDER THREAT	2,310	2,310
194	0902498N	MANAGEMENT HEADQUARTERS (DEPARTMENTAL SUPPORT ACTIVITIES)	1,536	1,536
		SUBTOTAL MANAGEMENT SUPPORT	991,222	991,222
		OPERATIONAL SYSTEMS DEVELOPMENT		
199	0604227N	HARPOON MODIFICATIONS	697	697
200	0604840M	F-35 C2D2	379,549	341,649
			-37,900	

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201	0604840N	Block IV/TR3 upgrade delays	413,875	[-37,900]	372,475
		F-35 C2D2		-41,400	
		Block IV/TR3 upgrade delays		[-41,400]	
202	0607658N	COOPERATIVE ENGAGEMENT CAPABILITY (CEC)	143,667		143,667
204	0101221N	STRATEGIC SUB & WEAPONS SYSTEM SUPPORT	173,056		173,056
205	0101224N	SSBN SECURITY TECHNOLOGY PROGRAM	45,970		45,970
206	0101226N	SUBMARINE ACOUSTIC WARFARE DEVELOPMENT	69,190	5,000	74,190
		Next-generation countermeasure acoustic device		[5,000]	
207	0101402N	NAVY STRATEGIC COMMUNICATIONS	42,277		42,277
208	0204136N	F/A-18 SQUADRONS	171,030	4,000	175,030
		Jet noise reduction		[4,000]	
210	0204228N	SURFACE SUPPORT	33,482		33,482
211	0204229N	TOMAHAWK AND TOMAHAWK MISSION PLANNING CENTER (TMPC)	200,308		200,308
212	0204311N	INTEGRATED SURVEILLANCE SYSTEM	102,975		102,975
213	0204313N	SHIP-TOWED ARRAY SURVEILLANCE SYSTEMS	10,873		10,873
214	0204413N	AMPHIBIOUS TACTICAL SUPPORT UNITS (DISPLACEMENT CRAFT)	1,713		1,713
215	0204460M	GROUND/AIR TASK ORIENTED RADAR (G/ATOR)	22,205		22,205
216	0204571N	CONSOLIDATED TRAINING SYSTEMS DEVELOPMENT	83,956		83,956
218	0204575N	ELECTRONIC WARFARE (EW) READINESS SUPPORT	56,791		56,791
219	0205601N	HARM IMPROVEMENT	146,166		146,166
221	0205620N	SURFACE ASW COMBAT SYSTEM INTEGRATION	29,348		29,348
222	0205632N	MK-48 ADCAP	110,349		110,349
223	0205633N	AVIATION IMPROVEMENTS	133,953		133,953
224	0205675N	OPERATIONAL NUCLEAR POWER SYSTEMS	110,313		110,313
225	0206313M	MARINE CORPS COMMUNICATIONS SYSTEMS	207,662		207,662
226	0206335M	COMMON AVIATION COMMAND AND CONTROL SYSTEM (CAC2S)	4,406		4,406
227	0206623M	MARINE CORPS GROUND COMBAT/SUPPORTING ARMS SYSTEMS	61,381		61,381

228	0206624M	MARINE CORPS COMBAT SERVICES SUPPORT	10,421	10,421
229	0206625M	USMC INTELLIGENCE/ELECTRONIC WARFARE SYSTEMS (MIP)	29,977	29,977
230	0206629M	AMPHIBIOUS ASSAULT VEHICLE	6,469	6,469
231	0207161N	TACTICAL AIM MISSILES	5,859	5,859
232	0207163N	ADVANCED MEDIUM RANGE AIR-TO-AIR MISSILE (AMRAAM)	44,323	44,323
236	0303109N	SATELLITE COMMUNICATIONS (SPACE)	41,978	46,978
		Interference mitigation technology, test and verification		5,000
			[5,000]
237	0303138N	CONSOLIDATED AFLOAT NETWORK ENTERPRISE SERVICES (CANES)	29,684	29,684
238	0303140N	INFORMATION SYSTEMS SECURITY PROGRAM	39,094	39,094
239	0305192N	MILITARY INTELLIGENCE PROGRAM (MIP) ACTIVITIES	6,154	6,154
240	0305204N	TACTICAL UNMANNED AERIAL VEHICLES	7,108	7,108
241	0305205N	UAS INTEGRATION AND INTEROPERABILITY	62,098	62,098
242	0305208M	DISTRIBUTED COMMON GROUND/SURFACE SYSTEMS	21,500	21,500
244	0305220N	MQ-4C TRITON	11,120	11,120
245	0305231N	MQ-8 UAV	28,968	28,968
246	0305232M	RQ-11 UAV	537	537
247	0305234N	SMALL (LEVEL 0) TACTICAL UAS (STUASLO)	8,773	8,773
248	0305239M	RQ-21A	10,853	10,853
249	0305241N	MULTI-INTELLIGENCE SENSOR DEVELOPMENT	60,413	60,413
250	0305242M	UNMANNED AERIAL SYSTEMS (UAS) PAYLOADS (MIP)	5,000	5,000
251	0305251N	CYBERSPACE OPERATIONS FORCES AND FORCE SUPPORT	34,967	34,967
252	0305421N	RQ-4 MODERNIZATION	178,799	178,799
253	0307577N	INTELLIGENCE MISSION DATA (IMD)	2,120	2,120
254	0308601N	MODELING AND SIMULATION SUPPORT	8,683	8,683
255	0702207N	DEPOT MAINTENANCE (NON-IF)	45,168	45,168
256	0708730N	MARITIME TECHNOLOGY (MARITECH)	6,697	6,697
257	1203109N	SATELLITE COMMUNICATIONS (SPACE)	70,056	70,056
257A	9999999999	CLASSIFIED PROGRAMS	1,795,032	1,795,032
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	5,327,043	5,261,743
			-65,300	
SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS				
258	0608013N	RISK MANAGEMENT INFORMATION—SOFTWARE PILOT PROGRAM	14,300	14,300

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259	0608231N	MARITIME TACTICAL COMMAND AND CONTROL (MTC2)—SOFTWARE PILOT PROGRAM	10,868		10,868
		SUBTOTAL SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS	25,168		25,168
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, NAVY	21,427,048	-288,100	21,138,948
		RESEARCH, DEVELOPMENT, TEST & EVAL, AF			
		BASIC RESEARCH			
001	0601102F	DEFENSE RESEARCH SCIENCES	315,348		315,348
002	0601103F	UNIVERSITY RESEARCH INITIATIVES	161,861	5,000	166,861
		Solar block research		[5,000]	
003	0601108F	HIGH ENERGY LASER RESEARCH INITIATIVES	15,085		15,085
		SUBTOTAL BASIC RESEARCH	492,294	5,000	497,294
		APPLIED RESEARCH			
004	0602020F	FUTURE AF CAPABILITIES APPLIED RESEARCH	100,000		100,000
005	0602102F	MATERIALS	140,781	25,000	165,781
		Advanced materials manufacturing flexible biosensors		[5,000]	
		Metals affordability research		[15,000]	
		Thermal protection systems		[5,000]	
006	0602201F	AEROSPACE VEHICLE TECHNOLOGIES	349,225	25,000	374,225
		Advanced batteries for directed energy		[5,000]	
		High speed expendable turbine development		[5,000]	
		On-orbit propulsion technologies		[5,000]	
		Secure unmanned aerial vehicles		[10,000]	
007	0602202F	HUMAN EFFECTIVENESS APPLIED RESEARCH	115,222		115,222
009	0602204F	AEROSPACE SENSORS	211,301		211,301
011	0602298F	SCIENCE AND TECHNOLOGY MANAGEMENT—MAJOR HEADQUARTERS ACTIVITIES	8,926		8,926

400

012	0602602F	CONVENTIONAL MUNITIONS	132,425		132,425
013	0602605F	DIRECTED ENERGY TECHNOLOGY	128,113		128,113
014	0602788F	DOMINANT INFORMATION SCIENCES AND METHODS	178,668		208,668
		Counter UAS platform integration testbed		30,000	
		Quantum Innovation Center		[5,000]	
		Quantum network testbed		[10,000]	
		Trusted UAS traffic management and C-UAS testbed		[10,000]	
015	0602890F	HIGH ENERGY LASER RESEARCH	45,088		45,088
		SUBTOTAL APPLIED RESEARCH	1,409,749	80,000	1,489,749
		ADVANCED TECHNOLOGY DEVELOPMENT			
017	0603030F	AF FOUNDATIONAL DEVELOPMENT/DEMOS	103,280	7,000	110,280
		Agile composite manufacturing initiatives		[5,000]	
		Foam engine wash		[2,000]	
018	0603032F	FUTURE AF INTEGRATED TECHNOLOGY DEMOS	157,619	-30,000	127,619
		Inappropriate use of S&T funds for Golden Horde demonstration & validation		[-30,000]	
019	0603033F	NEXT GEN PLATFORM DEV/DEMO	199,556		199,556
020	0603034F	PERSISTENT KNOWLEDGE, AWARENESS, & C2 TECH	102,276		102,276
021	0603035F	NEXT GEN EFFECTS DEV/DEMOS	215,817		215,817
		SUBTOTAL ADVANCED TECHNOLOGY DEVELOPMENT	778,548	-23,000	755,548
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
038	0603260F	INTELLIGENCE ADVANCED DEVELOPMENT	4,320		4,320
039	0603742F	COMBAT IDENTIFICATION TECHNOLOGY	26,396		26,396
040	0603790F	NATO RESEARCH AND DEVELOPMENT	3,647		3,647
041	0603851F	INTERCONTINENTAL BALLISTIC MISSILE—DEMOVAL	32,959		32,959
043	0604002F	AIR FORCE WEATHER SERVICES RESEARCH	869		869
044	0604003F	ADVANCED BATTLE MANAGEMENT SYSTEM (ABMS)	302,323	-85,500	216,823
		Unjustified costs		[-85,500]	
045	0604004F	ADVANCED ENGINE DEVELOPMENT	636,495		636,495
046	0604015F	LONG RANGE STRIKE—BOMBER	2,848,410	-20,000	2,828,410
		Transfer to APA line 025A		[-20,000]	

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047	0604032F	DIRECTED ENERGY PROTOTYPING	20,964		20,964
048	0604033F	HYPERSONICS PROTOTYPING	381,862		381,862
050	0604257F	ADVANCED TECHNOLOGY AND SENSORS	24,747		24,747
051	0604288F	NATIONAL AIRBORNE OPS CENTER (NAOC) RECAP	76,417		76,417
052	0604317F	TECHNOLOGY TRANSFER	3,011		3,011
053	0604327F	HARD AND DEEPLY BURIED TARGET DEFEAT SYSTEM (HDBTDS) PROGRAM	52,921		52,921
054	0604414F	CYBER RESILIENCY OF WEAPON SYSTEMS-ACS	69,783		69,783
055	0604776F	DEPLOYMENT & DISTRIBUTION ENTERPRISE R&D	25,835		25,835
056	0604858F	TECH TRANSITION PROGRAM	219,252	30,000	249,252
		Program increase—LCAAT prototyping		[30,000]	
057	0605230F	GROUND BASED STRATEGIC DETERRENT	1,524,759		1,524,759
059	0207110F	NEXT GENERATION AIR DOMINANCE	1,044,089		1,044,089
060	0207455F	THREE DIMENSIONAL LONG-RANGE RADAR (3DELRR)	19,356		19,356
061	0207522F	AIRBASE AIR DEFENSE SYSTEMS (ABADS)	8,737		8,737
062	0208099F	UNIFIED PLATFORM (UP)	5,990		5,990
063	0305236F	COMMON DATA LINK EXECUTIVE AGENT (CDL EA)	39,293		39,293
065	0305601F	MISSION PARTNER ENVIRONMENTS	11,430		11,430
066	0306250F	CYBER OPERATIONS TECHNOLOGY DEVELOPMENT	259,823		259,823
067	0306415F	ENABLED CYBER ACTIVITIES	10,560		10,560
068	0401310F	C-32 EXECUTIVE TRANSPORT RECAPITALIZATION	9,908		9,908
069	0901410F	CONTRACTING INFORMATION TECHNOLOGY SYSTEM	8,662		8,662
074	1206427F	SPACE SYSTEMS PROTOTYPE TRANSITIONS (SSPT)	8,787		8,787
077	1206730F	SPACE SECURITY AND DEFENSE PROGRAM	56,311		56,311
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	7,737,916	-75,500	7,662,416
082	0604200F	SYSTEM DEVELOPMENT & DEMONSTRATION			
		FUTURE ADVANCED WEAPON ANALYSIS & PROGRAMS	25,161		25,161

083	0604201F	PNT RESILIENCY, MODS, AND IMPROVEMENTS	38,564		38,564
084	0604222F	NUCLEAR WEAPONS SUPPORT	35,033		35,033
085	0604270F	ELECTRONIC WARFARE DEVELOPMENT	2,098		2,098
086	0604281F	TACTICAL DATA NETWORKS ENTERPRISE	131,909		131,909
087	0604287F	PHYSICAL SECURITY EQUIPMENT	6,752		6,752
088	0604329F	SMALL DIAMETER BOMB (SDB)—EMD	17,280		17,280
090	0604602F	ARMAMENT/ORDNANCE DEVELOPMENT	23,076		23,076
091	0604604F	SUBMUNITIONS	3,091		3,091
092	0604617F	AGILE COMBAT SUPPORT	20,609		20,609
093	0604618F	JOINT DIRECT ATTACK MUNITION	7,926		7,926
094	0604706F	LIFE SUPPORT SYSTEMS	23,660		23,660
095	0604735F	COMBAT TRAINING RANGES	8,898		8,898
096	0604800F	F-35—EMD	5,423	-5,000	423
		Excess SDD funding		[-5,000]	
097	0604932F	LONG RANGE STANDOFF WEAPON	474,430		474,430
098	0604933F	ICBM FUZE MODERNIZATION	167,099		167,099
100	0605056F	OPEN ARCHITECTURE MANAGEMENT	30,547		30,547
102	0605223F	ADVANCED PILOT TRAINING	248,669		248,669
103	0605229F	COMBAT RESCUE HELICOPTER	63,169		63,169
105	0101125F	NUCLEAR WEAPONS MODERNIZATION	9,683		9,683
106	0207171F	F-15 EPANWS	170,679	-14,700	155,979
		Cost growth		[-14,700]	
107	0207328F	STAND IN ATTACK WEAPON	160,438	-17,700	142,738
		Unjustified cost increase		[-17,700]	
108	0207701F	FULL COMBAT MISSION TRAINING	9,422		9,422
110	0305176F	COMBAT SURVIVOR EVADER LOCATOR	973		973
111	0401221F	KC-46A TANKER SQUADRONS	106,262	-20,000	86,262
		Slow execution		[-20,000]	
113	0401319F	VC-25B	800,889		800,889
114	0701212F	AUTOMATED TEST SYSTEMS	10,673		10,673
115	0804772F	TRAINING DEVELOPMENTS	4,479		4,479
116	0901299F	AF AI SYSTEMS	8,467		8,467

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		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	2,615,359	-57,400	2,557,959
		MANAGEMENT SUPPORT			
131	0604256F	THREAT SIMULATOR DEVELOPMENT	57,725		57,725
132	0604759F	MAJOR T&E INVESTMENT	208,680		208,680
133	0605101F	RAND PROJECT AIR FORCE	35,803		35,803
135	0605712F	INITIAL OPERATIONAL TEST & EVALUATION	13,557		13,557
136	0605807F	TEST AND EVALUATION SUPPORT	764,606	-10,000	754,606
		Program decrease		[-10,000]	
142	0605831F	ACQ WORKFORCE- CAPABILITY INTEGRATION	1,362,038		1,362,038
143	0605832F	ACQ WORKFORCE- ADVANCED PRGM TECHNOLOGY	40,768		40,768
144	0605833F	ACQ WORKFORCE- NUCLEAR SYSTEMS	179,646		179,646
145	0605898F	MANAGEMENT HQ—R&D	5,734		5,734
146	0605976F	FACILITIES RESTORATION AND MODERNIZATION—TEST AND EVALUATION SUPPORT	70,985		70,985
147	0605978F	FACILITIES SUSTAINMENT—TEST AND EVALUATION SUPPORT	29,880		29,880
148	0606017F	REQUIREMENTS ANALYSIS AND MATURATION	63,381		63,381
149	0606398F	MANAGEMENT HQ—T&E	5,785		5,785
150	0303255F	COMMAND, CONTROL, COMMUNICATION, AND COMPUTERS (C4)—STRATCOM	24,564		24,564
151	0308602F	ENTERPRISE INFORMATION SERVICES (EIS)	9,883		9,883
152	0702806F	ACQUISITION AND MANAGEMENT SUPPORT	13,384		13,384
153	0804731F	GENERAL SKILL TRAINING	1,262		1,262
155	1001004F	INTERNATIONAL ACTIVITIES	3,599		3,599
		SUBTOTAL MANAGEMENT SUPPORT	2,891,280	-10,000	2,881,280
		OPERATIONAL SYSTEMS DEVELOPMENT			
163	0604233F	SPECIALIZED UNDERGRADUATE FLIGHT TRAINING	8,777		8,777
164	0604776F	DEPLOYMENT & DISTRIBUTION ENTERPRISE R&D	499		499

165	0604840F	F-35 C2D2	785,336	-78,500	706,836
		Block IV/TR3 upgrade delays		[-78,500]	
166	0605018F	AF INTEGRATED PERSONNEL AND PAY SYSTEM (AF-IPPS)	27,035		27,035
167	0605024F	ANTI-TAMPER TECHNOLOGY EXECUTIVE AGENCY	50,508		50,508
168	0605117F	FOREIGN MATERIEL ACQUISITION AND EXPLOITATION	71,229		71,229
169	0605278F	HC/MC-130 RECAP RDT&E	24,705		24,705
170	0606018F	NC3 INTEGRATION	26,356		26,356
172	0101113F	B-52 SQUADRONS	520,023	-181,500	338,523
		GPS-IU contract delays		[-10,000]	
		No acquisition strategy for AEHF		[-2,500]	
		Radar modernization program contract delays		[-40,000]	
		Virtual prototype contract delay		[-125,000]	
		VLF/LF contract delays		[-4,000]	
173	0101122F	AIR-LAUNCHED CRUISE MISSILE (ALCM)	1,433		1,433
174	0101126F	B-1B SQUADRONS	15,766		15,766
175	0101127F	B-2 SQUADRONS	187,399		187,399
		Airspace compliance contract delays		[-2,000]	
		JASSM-ER Milestone B delay		[-5,000]	
		Virtual training		[7,000]	
176	0101213F	MINUTEMAN SQUADRONS	116,569		116,569
177	0101316F	WORLDWIDE JOINT STRATEGIC COMMUNICATIONS	27,235		27,235
178	0101324F	INTEGRATED STRATEGIC PLANNING & ANALYSIS NETWORK	24,227		24,227
179	0101328F	ICBM REENTRY VEHICLES	112,753		112,753
181	0102110F	UH-1H REPLACEMENT PROGRAM	44,464		44,464
182	0102326F	REGION/SECTOR OPERATION CONTROL CENTER MODERNIZATION PROGRAM	5,929		5,929
183	0102412F	NORTH WARNING SYSTEM (NWS)	100		100
184	0205219F	MQ-9 UAV	162,080		162,080
186	0207131F	A-10 SQUADRONS	24,535		24,535
187	0207133F	F-16 SQUADRONS	223,437		223,437
188	0207134F	F-15E SQUADRONS	298,908		298,908
189	0207136F	MANNED DESTRUCTIVE SUPPRESSION	14,960		14,960
190	0207138F	F-22A SQUADRONS	665,038	-16,100	648,938

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191	0207142F	Software delays		[-16,100]	
		F-35 SQUADRONS	132,229	-2,600	129,629
		Unjustified USAF ALIS unique funding		[-2,600]	
192	0207146F	F-15EX	159,761		159,761
193	0207161F	TACTICAL AIM MISSILES	19,417		19,417
194	0207163F	ADVANCED MEDIUM RANGE AIR-TO-AIR MISSILE (AMRAAM)	51,799		51,799
195	0207227F	COMBAT RESCUE—PARARESCUE	669		669
196	0207247F	AF TENCAP	21,644		21,644
197	0207249F	PRECISION ATTACK SYSTEMS PROCUREMENT	9,261		9,261
198	0207253F	COMPASS CALL	15,854		15,854
199	0207268F	AIRCRAFT ENGINE COMPONENT IMPROVEMENT PROGRAM	95,896		95,896
200	0207325F	JOINT AIR-TO-SURFACE STANDOFF MISSILE (JASSM)	70,792		70,792
201	0207410F	AIR & SPACE OPERATIONS CENTER (AOC)	51,187		51,187
202	0207412F	CONTROL AND REPORTING CENTER (CRC)	16,041		16,041
203	0207417F	AIRBORNE WARNING AND CONTROL SYSTEM (AWACS)	138,303		138,303
204	0207418F	AFSPECWAR—TACP	4,223		4,223
206	0207431F	COMBAT AIR INTELLIGENCE SYSTEM ACTIVITIES	16,564		16,564
207	0207438F	THEATER BATTLE MANAGEMENT (TBM) C4I	7,858		7,858
208	0207444F	TACTICAL AIR CONTROL PARTY-MOD	12,906		12,906
210	0207452F	DCAPES	14,816		14,816
211	0207521F	AIR FORCE CALIBRATION PROGRAMS	1,970		1,970
212	0207573F	NATIONAL TECHNICAL NUCLEAR FORENSICS	396		396
213	0207590F	SEEK EAGLE	29,680		29,680
214	0207601F	USAF MODELING AND SIMULATION	17,666		17,666
215	0207605F	WARGAMING AND SIMULATION CENTERS	6,353		6,353
216	0207610F	BATTLEFIELD ABN COMM NODE (BACN)	6,827		6,827
217	0207697F	DISTRIBUTED TRAINING AND EXERCISES	3,390		3,390

218	0208006F	MISSION PLANNING SYSTEMS	91,768		91,768
219	0208007F	TACTICAL DECEPTION	2,370		2,370
220	0208064F	OPERATIONAL HQ—CYBER	5,527		5,527
221	0208087F	DISTRIBUTED CYBER WARFARE OPERATIONS	68,279		68,279
222	0208088F	AF DEFENSIVE CYBERSPACE OPERATIONS	15,165		15,165
223	0208097F	JOINT CYBER COMMAND AND CONTROL (JCC2)	38,480		38,480
224	0208099F	UNIFIED PLATFORM (UP)	84,645		84,645
230	0301025F	GEObASE	2,767		2,767
231	0301112F	NUCLEAR PLANNING AND EXECUTION SYSTEM (NPES)	32,759		32,759
238	0301401F	AIR FORCE SPACE AND CYBER NON-TRADITIONAL ISR FOR BATTLESPACE AWARENESS	2,904		2,904
239	0302015F	E-4B NATIONAL AIRBORNE OPERATIONS CENTER (NAOC)	3,468		3,468
240	0303131F	MINIMUM ESSENTIAL EMERGENCY COMMUNICATIONS NETWORK (MEECN)	61,887		61,887
242	0303140F	INFORMATION SYSTEMS SECURITY PROGRAM	10,351		10,351
243	0303142F	GLOBAL FORCE MANAGEMENT—DATA INITIATIVE	1,346		1,346
246	0304260F	AIRBORNE SIGINT ENTERPRISE	128,110	-8,000	120,110
		Program decrease		[-8,000]	
247	0304310F	COMMERCIAL ECONOMIC ANALYSIS	4,042		4,042
251	0305020F	CCMD INTELLIGENCE INFORMATION TECHNOLOGY	1,649		1,649
252	0305022F	ISR MODERNIZATION & AUTOMATION DVMIT (IMAD)	19,265		19,265
253	0305099F	GLOBAL AIR TRAFFIC MANAGEMENT (GATM)	4,645		4,645
254	0305103F	CYBER SECURITY INITIATIVE	384		384
255	0305111F	WEATHER SERVICE	23,640	7,000	30,640
		Commercial weather pilot		[7,000]	
256	0305114F	AIR TRAFFIC CONTROL, APPROACH, AND LANDING SYSTEM (ATCAL)	6,553		6,553
257	0305116F	AERIAL TARGETS	449		449
260	0305128F	SECURITY AND INVESTIGATIVE ACTIVITIES	432		432
262	0305146F	DEFENSE JOINT COUNTERINTELLIGENCE ACTIVITIES	4,890		4,890
264	0305179F	INTEGRATED BROADCAST SERVICE (IBS)	8,864		8,864
265	0305202F	DRAGON U-2	18,660		18,660
267	0305206F	AIRBORNE RECONNAISSANCE SYSTEMS	121,512	18,000	139,512
		Gorgon Stare Wide Area Motion Imagery program increase		[18,000]	
		Sensor Open Systems Architecture		[18,000]	

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268	0305207F	MANNED RECONNAISSANCE SYSTEMS	14,711		14,711
269	0305208F	DISTRIBUTED COMMON GROUND/SURFACE SYSTEMS	14,152		14,152
270	0305220F	RQ-4 UAV	134,589		134,589
271	0305221F	NETWORK-CENTRIC COLLABORATIVE TARGETING	15,049		15,049
272	0305238F	NATO AGS	36,731		36,731
273	0305240F	SUPPORT TO DCGS ENTERPRISE	33,547		33,547
274	0305600F	INTERNATIONAL INTELLIGENCE TECHNOLOGY AND ARCHITECTURES	13,635		13,635
275	0305881F	RAPID CYBER ACQUISITION	4,262		4,262
276	0305884F	PERSONNEL RECOVERY COMMAND & CTRL (PRC2)	2,207		2,207
277	0307577F	INTELLIGENCE MISSION DATA (IMD)	6,277		6,277
278	0401115F	C-130 AIRLIFT SQUADRON	41,973		41,973
279	0401119F	C-5 AIRLIFT SQUADRONS (F)	32,560		32,560
280	0401130F	C-17 AIRCRAFT (IF)	9,991		9,991
281	0401132F	C-130J PROGRAM	10,674		10,674
282	0401134F	LARGE AIRCRAFT IR COUNTERMEASURES (LAIRCIM)	5,507		5,507
283	0401218F	KC-135S	4,591		4,591
286	0401318F	CV-22	18,419		18,419
288	0408011F	SPECIAL TACTICS / COMBAT CONTROL	7,673		7,673
290	0708055F	MAINTENANCE, REPAIR & OVERHAUL SYSTEM	24,513		24,513
291	0708610F	LOGISTICS INFORMATION TECHNOLOGY (LOGIT)	35,225		35,225
292	0708611F	SUPPORT SYSTEMS DEVELOPMENT	11,838		11,838
293	0804743F	OTHER FLIGHT TRAINING	1,332		1,332
295	0901202F	JOINT PERSONNEL RECOVERY AGENCY	2,092		2,092
296	0901218F	CIVILIAN COMPENSATION PROGRAM	3,869		3,869
297	0901220F	PERSONNEL ADMINISTRATION	1,584		1,584
298	0901226F	AIR FORCE STUDIES AND ANALYSIS AGENCY	1,197		1,197
299	0901538F	FINANCIAL MANAGEMENT INFORMATION SYSTEMS DEVELOPMENT	7,006		7,006

300	0901554F	DEFENSE ENTERPRISE ACNING AND MGT SYS (DEAMS)	45,638	45,638
301	1201017F	GLOBAL SENSOR INTEGRATED ON NETWORK (GSIN)	1,889	-1,889
		Transfer to Space Force		[-1,889]
302	1201921F	SERVICE SUPPORT TO STRATCOM—SPACE ACTIVITIES	993	993
303	1202140F	SERVICE SUPPORT TO SPACECOM ACTIVITIES	8,999	8,999
314	1203400F	SPACE SUPERIORITY INTELLIGENCE	16,810	16,810
316	1203620F	NATIONAL SPACE DEFENSE CENTER	2,687	2,687
318	1203906F	NCMC—TW/AA SYSTEM	6,990	6,990
322A	9999999999	CLASSIFIED PROGRAMS	15,777,856	15,777,856
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	21,466,680	-263,589
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, AF	37,391,826	-344,489
		RESEARCH, DEVELOPMENT, TEST & EVAL, SPACE FORCE		
		APPLIED RESEARCH		
001	1206601SF	SPACE TECHNOLOGY	130,874	34,000
		Ground based optical GEO surveillance		[5,000]
		Rapid development of low-cost, small satellite technology		[20,000]
		Small satellite mission operations center		[9,000]
		SUBTOTAL APPLIED RESEARCH	130,874	34,000
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES		
002	1203164SF	NAVSTAR GLOBAL POSITIONING SYSTEM (USER EQUIPMENT) (SPACE)	390,704	390,704
003	1203710SF	EO/IR WEATHER SYSTEMS	131,000	106,000
		Program reduction for phase 2 risk reduction Spec 012		[-25,000]
004	1206422SF	WEATHER SYSTEM FOLLOW-ON	83,384	83,384
005	1206425SF	SPACE SITUATION AWARENESS SYSTEMS	33,359	33,359
006	1206427SF	SPACE SYSTEMS PROTOTYPE TRANSITIONS (SSPT)	142,808	142,808
007	1206438SF	SPACE CONTROL TECHNOLOGY	35,575	35,575
008	1206760SF	PROTECTED TACTICAL ENTERPRISE SERVICE (PTES)	114,390	109,390
		Unjustified growth		-5,000
009	1206761SF	PROTECTED TACTICAL SERVICE (PTS)	205,178	200,178
				[-5,000]

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010	1206855SF	Unjustified growth		[-5,000]	71,395
		EVOLVED STRATEGIC SATCOM (ESS)	71,395		71,395
011	1206857SF	SPACE RAPID CAPABILITIES OFFICE	103,518		103,518
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	1,311,311	-35,000	1,276,311
		SYSTEM DEVELOPMENT & DEMONSTRATION			
012	1203269SF	GPS III FOLLOW-ON (GPS IIF)	263,496	-10,000	253,496
		Execution lagging		[-10,000]	
013	1203940SF	SPACE SITUATION AWARENESS OPERATIONS	41,897		41,897
014	1206421SF	COUNTERSPACE SYSTEMS	54,689		54,689
015	1206422SF	WEATHER SYSTEM FOLLOW-ON	2,526		2,526
016	1206425SF	SPACE SITUATION AWARENESS SYSTEMS	173,074		173,074
017	1206431SF	ADVANCED EHF MILSATCOM (SPACE)	138,257		138,257
018	1206432SF	POLAR MILSATCOM (SPACE)	190,235		190,235
019	1206442SF	NEXT GENERATION OPIR	2,318,864	-49,000	2,269,864
		Block 0 GEO unjustified cost growth		[-20,000]	
		Program decrease		[-29,000]	
020	1206853SF	NATIONAL SECURITY SPACE LAUNCH PROGRAM (SPACE)—EMD	560,978	150,000	710,978
		Program increase		[150,000]	
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	3,744,016	91,000	3,835,016
		MANAGEMENT SUPPORT			
021	1206116SF	SPACE TEST AND TRAINING RANGE DEVELOPMENT	20,281		20,281
022	1206392SF	ACQ WORKFORCE—SPACE & MISSILE SYSTEMS	183,930		183,930
023	1206398SF	SPACE & MISSILE SYSTEMS CENTER—MHA	9,765		9,765
024	1206860SF	ROCKET SYSTEMS LAUNCH PROGRAM (SPACE)	17,993	10,000	27,993
		Tactically Responsive Launch Operations		[10,000]	

025	1206864SF	SPACE TEST PROGRAM (STP)	26,541		26,541
		SUBTOTAL MANAGEMENT SUPPORT	268,510	10,000	268,510
OPERATIONAL SYSTEM DEVELOPMENT					
026	1201017SF	GLOBAL SENSOR INTEGRATED ON NETWORK (GSIN)	3,708	1,889	5,597
		Transfer from Air Force		[1,889]	
027	1203001SF	FAMILY OF ADVANCED BLOS TERMINALS (FAB-T)	247,229	-10,000	237,229
		Program decrease		[-10,000]	
028	1203110SF	SATELLITE CONTROL NETWORK (SPACE)	75,480	-15,000	60,480
		Program decrease		[-15,000]	
029	1203165SF	NAVSTAR GLOBAL POSITIONING SYSTEM (SPACE AND CONTROL SEGMENTS)	1,984		1,984
030	1203173SF	SPACE AND MISSILE TEST AND EVALUATION CENTER	4,397		4,397
031	1203174SF	SPACE INNOVATION, INTEGRATION AND RAPID TECHNOLOGY DEVELOPMENT	44,746	-5,000	39,746
		Underexecution		[-5,000]	
032	1203182SF	SPACELIFT RANGE SYSTEM (SPACE)	11,020	5,000	16,020
		Space launch range services and capabilities		[5,000]	
033	1203265SF	GPS III SPACE SEGMENT	10,777		10,777
034	1203873SF	BALLISTIC MISSILE DEFENSE RADARS	28,179		28,179
035	1203913SF	NUDET DETECTION SYSTEM (SPACE)	29,157		29,157
036	1203940SF	SPACE SITUATION AWARENESS OPERATIONS	44,809	-5,000	39,809
		Underexecution		[-5,000]	
037	1206423SF	GLOBAL POSITIONING SYSTEM III—OPERATIONAL CONTROL SEGMENT	481,999	-10,000	471,999
		Program decrease		[-10,000]	
		Unjustified growth		[-5,000]	
041	1206770SF	ENTERPRISE GROUND SERVICES	116,791		116,791
041A	9999999999	CLASSIFIED PROGRAMS	3,632,866		3,632,866
		SUBTOTAL OPERATIONAL SYSTEM DEVELOPMENT	4,733,142	-38,111	4,695,031
SOFTWARE & DIGITAL TECHNOLOGY PILOT PROGRAMS					
042	1203614SF	JSPOC MISSION SYSTEM	149,742	-20,000	129,742
		Unjustified increase; transfer to commercial Space Domain Awareness Services and Data		[-20,000]	
42A	9999999999	COMMERCIAL SATCOM		45,000	45,000

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		Commercial polar space-based proliferated LEO broadband services and demonstrations		[25,000]	
		Increase for commercial space domain awareness services and data		[20,000]	
		SUBTOTAL SOFTWARE & DIGITAL TECHNOLOGY PILOT PROGRAMS	149,742	25,000	174,742
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, SPACE FORCE	10,327,595	86,889	10,414,484
		RESEARCH, DEVELOPMENT, TEST & EVAL, DW			
		BASIC RESEARCH			
001	0601000BR	DTRA BASIC RESEARCH	14,617		14,617
002	0601101E	DEFENSE RESEARCH SCIENCES	479,958		479,958
003	0601110D8Z	BASIC RESEARCH INITIATIVES	35,565	22,000	57,565
		Restore Minerva research initiative		[17,000]	
		START research consortium of excellence for irregular warfare and advanced analytics		[5,000]	
004	0601117E	BASIC OPERATIONAL MEDICAL RESEARCH SCIENCE	53,730		53,730
005	0601120D8Z	NATIONAL DEFENSE EDUCATION PROGRAM	100,241	5,000	105,241
		Civics education pilot		[5,000]	
006	0601228D8Z	HISTORICALLY BLACK COLLEGES AND UNIVERSITIES/MINORITY INSTITUTIONS	30,975	20,000	50,975
		PIPELINE program		[3,000]	
		Program increase		[17,000]	
007	0601384BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM	45,300		45,300
		SUBTOTAL BASIC RESEARCH	760,386	47,000	807,386
		APPLIED RESEARCH			
008	0602000D8Z	JOINT MUNITIONS TECHNOLOGY	19,409	5,000	24,409
		New energetic materials design		[5,000]	
009	0602115E	BIOMEDICAL TECHNOLOGY	107,568		107,568
011	0602230D8Z	DEFENSE TECHNOLOGY INNOVATION	35,000		35,000

012	060234D8Z	LINCOLN LABORATORY RESEARCH PROGRAM	41,080	41,080	
013	0602251D8Z	APPLIED RESEARCH FOR THE ADVANCEMENT OF S&T PRIORITIES	60,722	60,722	
014	0602303E	INFORMATION & COMMUNICATIONS TECHNOLOGY	435,920	403,920	-32,000
		Program decrease			[-32,000]
015	0602383E	BIOLOGICAL WARFARE DEFENSE	26,950	26,950	
016	0602384BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM	201,807	206,807	5,000
		Treatment testing technology for nuclear, chemical, and biological exposure			[5,000]
017	0602668D8Z	CYBER SECURITY RESEARCH	15,255	15,255	
018	0602702E	TACTICAL TECHNOLOGY	233,271	233,271	
019	0602715E	MATERIALS AND BIOLOGICAL TECHNOLOGY	250,107	250,107	
020	0602716E	ELECTRONICS TECHNOLOGY	322,693	322,693	
021	0602718BR	COUNTER WEAPONS OF MASS DESTRUCTION APPLIED RESEARCH	174,571	174,571	
022	0602751D8Z	SOFTWARE ENGINEERING INSTITUTE (SEI) APPLIED RESEARCH	9,573	9,573	
023	1160401BB	SOF TECHNOLOGY DEVELOPMENT	42,464	47,464	5,000
		Sustained Human Performance and Resilience			[5,000]
		SUBTOTAL APPLIED RESEARCH	1,976,390	1,959,390	-17,000
ADVANCED TECHNOLOGY DEVELOPMENT					
024	0603000D8Z	JOINT MUNITIONS ADVANCED TECHNOLOGY	22,920	22,920	
025	0603121D8Z	SO/LIC ADVANCED DEVELOPMENT	4,914	4,914	
026	0603122D8Z	COMBATING TERRORISM TECHNOLOGY SUPPORT	51,089	51,089	
027	0603133D8Z	FOREIGN COMPARATIVE TESTING	25,183	25,183	
029	0603160BR	COUNTER WEAPONS OF MASS DESTRUCTION ADVANCED TECHNOLOGY DEVELOPMENT	366,659	366,659	
030	0603176C	ADVANCED CONCEPTS AND PERFORMANCE ASSESSMENT	14,910	64,910	50,000
		Restore low power laser demonstrator			[50,000]
032	0603180C	ADVANCED RESEARCH	18,687	28,687	10,000
		Program increase			[10,000]
033	0603225D8Z	JOINT DOD-DOE MUNITIONS TECHNOLOGY DEVELOPMENT	18,873	18,873	
034	0603286E	ADVANCED AEROSPACE SYSTEMS	230,978	230,978	
035	0603287E	SPACE PROGRAMS AND TECHNOLOGY	158,439	158,439	
036	0603288D8Z	ANALYTIC ASSESSMENTS	23,775	23,775	
037	0603289D8Z	ADVANCED INNOVATIVE ANALYSIS AND CONCEPTS	36,524	36,524	

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038	0603291D8Z	ADVANCED INNOVATIVE ANALYSIS AND CONCEPTS—MHA	14,703		14,703
039	0603294C	COMMON KILL VEHICLE TECHNOLOGY	11,058		11,058
040	0603338D8Z	DEFENSE MODERNIZATION AND PROTOTYPING	133,375		133,375
042	0603342D8Z	DEFENSE INNOVATION UNIT (DIU)	26,141		26,141
043	0603375D8Z	TECHNOLOGY INNOVATION	27,709		27,709
044	0603384BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM—ADVANCED DEVELOPMENT	188,001		188,001
045	0603527D8Z	RETRACT LARCH	130,283		130,283
046	0603618D8Z	JOINT ELECTRONIC ADVANCED TECHNOLOGY	15,164		15,164
047	0603648D8Z	JOINT CAPABILITY TECHNOLOGY DEMONSTRATIONS	85,452		85,452
048	0603662D8Z	NETWORKED COMMUNICATIONS CAPABILITIES	5,882		5,882
049	0603680D8Z	DEFENSE-WIDE MANUFACTURING SCIENCE AND TECHNOLOGY PROGRAM	93,817	50,000	143,817
		Accelerating rapid prototyping by integrating high performance computing and advanced manu- facturing.		[5,000]	
		Additive manufacturing training		[5,000]	
		Advanced structural manufacturing technologies		[30,000]	
		Flexible hybrid electronics		[5,000]	
		Hypersonic thermal management research		[5,000]	
050	0603680S	MANUFACTURING TECHNOLOGY PROGRAM	40,025		40,025
052	0603712S	GENERIC LOGISTICS R&D TECHNOLOGY DEMONSTRATIONS	10,235		10,235
053	0603716D8Z	STRATEGIC ENVIRONMENTAL RESEARCH PROGRAM	53,862	105,000	158,862
		AFF replacement		[50,000]	
		PFAS Innovation Award Fund		[5,000]	
		PFAS remediation and disposal technology		[50,000]	
054	0603720S	MICROELECTRONICS TECHNOLOGY DEVELOPMENT AND SUPPORT	124,049		124,049
055	0603727D8Z	JOINT WARFIGHTING PROGRAM	3,871		3,871
056	0603739E	ADVANCED ELECTRONICS TECHNOLOGIES	95,864		95,864
057	0603760E	COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS	221,724		221,724

058	0603766E	NETWORK-CENTRIC WARFARE TECHNOLOGY	661,158		661,158
059	0603767E	SENSOR TECHNOLOGY	200,220		200,220
060	0603769D8Z	DISTRIBUTED LEARNING ADVANCED TECHNOLOGY DEVELOPMENT	6,765		6,765
061	0603781D8Z	SOFTWARE ENGINEERING INSTITUTE	12,598		12,598
064	0603924D8Z	HIGH ENERGY LASER ADVANCED TECHNOLOGY PROGRAM	105,410		105,410
065	0603941D8Z	TEST & EVALUATION SCIENCE & TECHNOLOGY	187,065		187,065
		Directed energy test workloads			
066	0603950D8Z	NATIONAL SECURITY INNOVATION NETWORK	40,000	40,000	40,000
		Restore program	[40,000]	[40,000]	[40,000]
067	0604055D8Z	OPERATIONAL ENERGY CAPABILITY IMPROVEMENT	65,000	65,000	65,000
		Program increase	[65,000]	[65,000]	[65,000]
070	1160402BB	SOF ADVANCED TECHNOLOGY DEVELOPMENT	89,072	89,072	89,072
		SOF 3-D printing technologies	[5,000]	[5,000]	[5,000]
071	1206310SDA	SPACE SCIENCE AND TECHNOLOGY RESEARCH AND DEVELOPMENT	72,422	72,422	72,422
		SUBTOTAL ADVANCED TECHNOLOGY DEVELOPMENT	3,913,876	3,913,876	3,913,876
ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES					
072	0603161D8Z	NUCLEAR AND CONVENTIONAL PHYSICAL SECURITY EQUIPMENT ROT&E ADC&P	32,636	32,636	32,636
073	0603600D8Z	WALKOFF	106,529	106,529	106,529
075	0603851D8Z	ENVIRONMENTAL SECURITY TECHNICAL CERTIFICATION PROGRAM	61,345	61,345	61,345
		PFAS remediation and disposal technology	52,000	52,000	52,000
		Program increase	[2,000]	[2,000]	[2,000]
076	0603881C	BALLISTIC MISSILE DEFENSE TERMINAL DEFENSE SEGMENT	412,627	412,627	412,627
		Insufficient justification—homeland defense underlay	[−100,000]	[−100,000]	[−100,000]
077	0603882C	BALLISTIC MISSILE DEFENSE MIDCOURSE DEFENSE SEGMENT	1,004,305	1,004,305	1,004,305
		Unjustified growth—RKV cancellation	[−85,000]	[−85,000]	[−85,000]
078	0603884BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM—DEM/VAL	76,167	76,167	76,167
		Decontamination technologies for civilian pandemic preparedness	5,000	5,000	5,000
			[5,000]	[5,000]	[5,000]
079	0603884C	BALLISTIC MISSILE DEFENSE SENSORS	281,957	281,957	281,957
080	0603890C	BMD ENABLING PROGRAMS	599,380	599,380	599,380
081	0603891C	SPECIAL PROGRAMS—MDA	420,216	420,216	420,216
082	0603892C	AEGIS BMD	814,936	814,936	814,936
			−10,000	−10,000	−10,000

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083	0603896C	Program decrease		[-10,000]	
084	0603898C	BALLISTIC MISSILE DEFENSE COMMAND AND CONTROL, BATTLE MANAGEMENT AND COMMUNICATI	593,353		593,353
085	0603904C	BALLISTIC MISSILE DEFENSE JOINT WARRIOR SUPPORT	49,560		49,560
086	0603906C	MISSILE DEFENSE INTEGRATION & OPERATIONS CENTER (MDIOC)	55,356		55,356
087	0603907C	REGARDING TRENCH	11,863		11,863
088	0603913C	SEA BASED X-BAND RADAR (SBX)	118,318		118,318
089	0603914C	ISRAELI COOPERATIVE PROGRAMS	300,000		300,000
090	0603915C	BALLISTIC MISSILE DEFENSE TEST	378,302		378,302
092	0603923D8Z	BALLISTIC MISSILE DEFENSE TARGETS	536,133		536,133
093	0604011D8Z	COALITION WARFARE	10,129		10,129
		NEXT GENERATION INFORMATION COMMUNICATIONS TECHNOLOGY (5G)	449,000	-49,000	400,000
		Program decrease for Restoring S&T		[-49,000]	
094	0604016D8Z	DEPARTMENT OF DEFENSE CORROSION PROGRAM	3,325		3,325
095	0604115C	TECHNOLOGY MATURATION INITIATIVES	67,389		67,389
098	0604181C	HYPERSONIC DEFENSE	206,832		206,832
099	0604250D8Z	ADVANCED INNOVATIVE TECHNOLOGIES	730,508		729,508
		Micro nuclear reactors		-1,000	
		Program decrease for Restoring S&T		[50,000]	
		Program decrease for Restoring S&T		[-51,000]	
100	0604294D8Z	TRUSTED & ASSURED MICROELECTRONICS	489,076		489,076
101	0604331D8Z	RAPID PROTOTYPING PROGRAM	102,023		82,023
		Program decrease for Restoring S&T		-20,000	
102	0604341D8Z	DEFENSE INNOVATION UNIT (DIU) PROTOTYPING	13,255		16,255
		Talent optimization pilot program		3,000	
		Program decrease for Restoring S&T		[3,000]	
103	0604400D8Z	DEPARTMENT OF DEFENSE (DOD) UNMANNED SYSTEM COMMON DEVELOPMENT	2,787		2,787
105	0604672C	HOMELAND DEFENSE RADAR—HAWAII (HDR-H)		130,000	130,000
		Continue radar development and siting efforts		[130,000]	
107	0604682D8Z	WARGAMING AND SUPPORT FOR STRATEGIC ANALYSIS (SSA)	3,469		3,469

109	0604826J	JOINT C5 CAPABILITY DEVELOPMENT, INTEGRATION AND INTEROPERABILITY ASSESSMENTS	19,190	19,190	
110	0604873C	LONG RANGE DISCRIMINATION RADAR (LRDR)	137,256	137,256	
111	0604874C	IMPROVED HOMEMLAND DEFENSE INTERCEPTORS	664,138	664,138	
		Delayed NGI contract award		-250,000	
112	0604876C	BALLISTIC MISSILE DEFENSE TERMINAL DEFENSE SEGMENT TEST	7,768	7,768	
113	0604878C	AEGIS BMD TEST	170,880	170,880	
		Unjustified cost growth		-75,000	
114	0604879C	BALLISTIC MISSILE DEFENSE SENSOR TEST	76,456	76,456	
115	0604880C	LAND-BASED SM-3 (LBSM3)	56,628	56,628	
116	0604887C	BALLISTIC MISSILE DEFENSE MIDCOURSE SEGMENT TEST	67,071	67,071	
118	0300206R	ENTERPRISE INFORMATION TECHNOLOGY SYSTEMS	2,198	2,198	
119	0303191D8Z	JOINT ELECTROMAGNETIC TECHNOLOGY (JET) PROGRAM	997	997	
120	0305103C	CYBER SECURITY INITIATIVE	1,148	1,148	
121	1206410SDA	SPACE TECHNOLOGY DEVELOPMENT AND PROTOTYPING	215,994	215,994	
		HBTSS—transfer to 1206895C		-60,000	
		Unjustified growth		[-20,000]	
122	1206893C	SPACE TRACKING & SURVEILLANCE SYSTEM	34,144	34,144	
123	1206895C	BALLISTIC MISSILE DEFENSE SYSTEM SPACE PROGRAMS	32,068	32,068	
		HBTSS—transfer from 1206410SDA		120,000	
		HBTSS sensor payload development		[20,000]	
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	9,416,712	-340,000	9,076,712
SYSTEM DEVELOPMENT & DEMONSTRATION					
124	0604161D8Z	NUCLEAR AND CONVENTIONAL PHYSICAL SECURITY EQUIPMENT ROT&E SDD	7,173	7,173	
126	0604384BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM—EMD	319,976	319,976	
127	0604771D8Z	JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM (JTIDS)	54,985	54,985	
128	0605000BR	COUNTER WEAPONS OF MASS DESTRUCTION SYSTEMS DEVELOPMENT	15,650	15,650	
129	0605013BL	INFORMATION TECHNOLOGY DEVELOPMENT	1,441	1,441	
130	0605021SE	HOMEMLAND PERSONNEL SECURITY INITIATIVE	7,287	7,287	
131	0605022D8Z	DEFENSE EXPORTABILITY PROGRAM	12,928	12,928	
132	0605027D8Z	OUSDI(C) IT DEVELOPMENT INITIATIVES	10,259	10,259	
133	0605070S	DOD ENTERPRISE SYSTEMS DEVELOPMENT AND DEMONSTRATION	1,377	1,377	

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134	0605075D8Z	OMO POLICY AND INTEGRATION	1,648		1,648
135	0605080S	DEFENSE AGENCY INITIATIVES (DAI)—FINANCIAL SYSTEM	20,537		20,537
136	0605090S	DEFENSE RETIRED AND ANNUITANT PAY SYSTEM (DRAS)	1,638		1,638
137	0605141BR	MISSION ASSURANCE RISK MANAGEMENT SYSTEM (MARMS)	5,500		5,500
138	0605210D8Z	DEFENSE-WIDE ELECTRONIC PROCUREMENT CAPABILITIES	8,279		8,279
139	0605294D8Z	TRUSTED & ASSURED MICROELECTRONICS	107,585		107,585
140	0605772D8Z	NUCLEAR COMMAND, CONTROL, & COMMUNICATIONS	3,685		3,685
143	0305304D8Z	DOD ENTERPRISE ENERGY INFORMATION MANAGEMENT (EEM)	3,275		3,275
144	0305310D8Z	CWMD SYSTEMS: SYSTEM DEVELOPMENT AND DEMONSTRATION	20,585		20,585
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	603,808		603,808
		MANAGEMENT SUPPORT			
145	0603829J	JOINT CAPABILITY EXPERIMENTATION	11,239		11,239
146	0604774D8Z	DEFENSE READINESS REPORTING SYSTEM (DRRS)	9,793		9,793
147	0604875D8Z	JOINT SYSTEMS ARCHITECTURE DEVELOPMENT	8,497		8,497
148	0604940D8Z	CENTRAL TEST AND EVALUATION INVESTMENT DEVELOPMENT (CTEIP)	422,451	13,000	435,451
		Gulf Test range and training enhancements		[13,000]	
149	0604942D8Z	ASSESSMENTS AND EVALUATIONS	18,379		18,379
150	0605001E	MISSION SUPPORT	74,334		74,334
151	0605100D8Z	JOINT MISSION ENVIRONMENT TEST CAPABILITY (JMETC)	79,046		79,046
153	0605126J	JOINT INTEGRATED AIR AND MISSILE DEFENSE ORGANIZATION (JIAMDO)	50,255		50,255
155	0605142D8Z	SYSTEMS ENGINEERING	49,376		49,376
156	0605151D8Z	STUDIES AND ANALYSIS SUPPORT—OSD	5,777		5,777
157	0605161D8Z	NUCLEAR MATTERS-PHYSICAL SECURITY	16,552		16,552
158	0605170D8Z	SUPPORT TO NETWORKS AND INFORMATION INTEGRATION	9,582		9,582
159	0605200D8Z	GENERAL SUPPORT TO USD (INTELLIGENCE)	1,940		1,940
160	0605384BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM	122,951		122,951

167	0605790D8Z	SMALL BUSINESS INNOVATION RESEARCH (SBR)/ SMALL BUSINESS TECHNOLOGY TRANSFER	3,582	3,582
168	0605797D8Z	MAINTAINING TECHNOLOGY ADVANTAGE	29,566	29,566
169	0605798D8Z	DEFENSE TECHNOLOGY ANALYSIS	29,059	29,059
170	0605801KA	DEFENSE TECHNICAL INFORMATION CENTER (DTIC)	59,369	16,069
		Program decrease		-43,300
				[-43,300]
171	0605803SE	R&D IN SUPPORT OF DOD ENLISTMENT, TESTING AND EVALUATION	29,420	29,420
172	0605804D8Z	DEVELOPMENT TEST AND EVALUATION	27,198	27,198
173	0605898E	MANAGEMENT HQ—R&D	13,434	13,434
174	0605998KA	MANAGEMENT HQ—DEFENSE TECHNICAL INFORMATION CENTER (DTIC)	2,837	2,837
175	0606100D8Z	BUDGET AND PROGRAM ASSESSMENTS	13,173	13,173
176	0606225D8Z	ODNA TECHNOLOGY AND RESOURCE ANALYSIS	3,200	3,200
177	0606589D8W	DEFENSE DIGITAL SERVICE (DDS) DEVELOPMENT SUPPORT	999	999
180	0203345D8Z	DEFENSE OPERATIONS SECURITY INITIATIVE (DOSI)	3,099	3,099
181	0204571J	DEFENSE OPERATIONS SECURITY INITIATIVE (DOSI)	3,058	3,058
182	0208045K	JOINT STAFF ANALYTICAL SUPPORT	59,813	59,813
185	0303140SE	JOINT STAFF ANALYTICAL SUPPORT	1,112	1,112
186	0303166J	C4I INTEROPERABILITY	545	545
187	0303260D8Z	INFORMATION SYSTEMS SECURITY PROGRAM	1,036	1,036
188	0305172K	SUPPORT TO INFORMATION OPERATIONS (IO) CAPABILITIES	30,824	30,824
190	0305208K	DEFENSE MILITARY DECEPTION PROGRAM OFFICE (DMDPO)	3,048	3,048
194	0804768J	COMBINED ADVANCED APPLICATIONS	31,125	31,125
195	0808709SE	DISTRIBUTED COMMON GROUND/SURFACE SYSTEMS	100	100
196	0901598C	COCOM EXERCISE ENGAGEMENT AND TRAINING TRANSFORMATION (GE2T2)—NON-MHA	26,902	26,902
197	0903235K	DEFENSE EQUAL OPPORTUNITY MANAGEMENT INSTITUTE (DEOMI)	3,138	3,138
198A	9999999999	MANAGEMENT HQ—MDA	41,583	41,583
		JOINT SERVICE PROVIDER (JSP)		
		CLASSIFIED PROGRAMS		
		SUBTOTAL MANAGEMENT SUPPORT	1,297,392	-30,300
				1,267,092
199	0604130V	OPERATIONAL SYSTEMS DEVELOPMENT	14,378	14,378
200	0604532K	ENTERPRISE SECURITY SYSTEM (ESS)	132,058	132,058
201	0605127T	JOINT ARTIFICIAL INTELLIGENCE	1,986	1,986
202	0605147T	REGIONAL INTERNATIONAL OUTREACH (RIO) AND PARTNERSHIP FOR PEACE INFORMATION MANA	316	316
		OVERSEAS HUMANITARIAN ASSISTANCE SHARED INFORMATION SYSTEM (OHASIS)		

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203	0607210D8Z	INDUSTRIAL BASE ANALYSIS AND SUSTAINMENT SUPPORT	9,151	70,000	79,151
		Autotune filter manufacturing scale-up for advanced offboard electronic warfare		[10,000]	
		Domestic organic light emitting diode microdisplay manufacturing		[5,000]	
		Domestic rare earth magnet capability		[5,000]	
		Domestic tungsten		[5,000]	
		Program increase		[15,000]	
		Radar supplier resiliency plan		[5,000]	
		Submarine workforce development and training		[20,000]	
		Ultra-hard armor		[5,000]	
204	0607310D8Z	CWMD SYSTEMS: OPERATIONAL SYSTEMS DEVELOPMENT	19,082		19,082
205	0607327T	GLOBAL THEATER SECURITY COOPERATION MANAGEMENT INFORMATION SYSTEMS (G-TSCMIS)	3,992		3,992
206	0607384BP	CHEMICAL AND BIOLOGICAL DEFENSE (OPERATIONAL SYSTEMS DEVELOPMENT)	39,530		39,530
207	0208043J	PLANNING AND DECISION AID SYSTEM (PDAS)	3,039		3,039
212	0302019K	DEFENSE INFO INFRASTRUCTURE ENGINEERING AND INTEGRATION	16,324		16,324
213	0303126K	LONG-HAUL COMMUNICATIONS—DCS	11,884		11,884
214	0303131K	MINIMUM ESSENTIAL EMERGENCY COMMUNICATIONS NETWORK (MEECN)	5,560		5,560
215	0303136G	KEY MANAGEMENT INFRASTRUCTURE (KMI)	73,356		73,356
216	0303140D8Z	INFORMATION SYSTEMS SECURITY PROGRAM	46,577		46,577
217	0303140G	INFORMATION SYSTEMS SECURITY PROGRAM	356,713	-20,000	336,713
		GenCyber		[20,000]	
		Program decrease		[-40,000]	
218	0303140K	INFORMATION SYSTEMS SECURITY PROGRAM	8,922		8,922
219	0303150K	GLOBAL COMMAND AND CONTROL SYSTEM	3,695		3,695
220	0303153K	DEFENSE SPECTRUM ORGANIZATION	20,113		20,113
223	0303228K	JOINT REGIONAL SECURITY STACKS (JRSS)	9,728	-9,728	
		Program decrease		[-9,728]	
231	0305128V	SECURITY AND INVESTIGATIVE ACTIVITIES	5,700		5,700

235	0305186D8Z	POLICY R&D PROGRAMS	7,144	7,144	
236	0305199D8Z	NET CENTRICITY	21,793	21,793	
238	0305208BB	DISTRIBUTED COMMON GROUND/SURFACE SYSTEMS	6,066	6,066	
245	0305387D8Z	HOMELAND DEFENSE TECHNOLOGY TRANSFER PROGRAM	2,190	2,190	
252	0708012K	LOGISTICS SUPPORT ACTIVITIES	1,654	1,654	
253	0708012S	PACIFIC DISASTER CENTERS	1,785	1,785	
254	0708047S	DEFENSE PROPERTY ACCOUNTABILITY SYSTEM	7,301	7,301	
256	1105219BB	MQ-9 UAV	21,265	21,265	
258	1160403BB	AVIATION SYSTEMS	230,812	230,812	
259	1160405BB	INTELLIGENCE SYSTEMS DEVELOPMENT	19,558	19,558	
260	1160408BB	OPERATIONAL ENHANCEMENTS	136,041	151,041	15,000
		Machine learning and AI technologies to enable operational maneuver			[10,000]
		Modular expeditionary compact high-energy lasers			[5,000]
261	1160431BB	WARRIOR SYSTEMS	59,511	94,511	35,000
		Increased research for cUAS in austere locations abroad			[35,000]
262	1160432BB	SPECIAL PROGRAMS	10,500	10,500	
263	1160434BB	UNMANNED ISR	19,154	19,154	
264	1160480BB	SOF TACTICAL VEHICLES	9,263	9,263	
265	1160483BB	MARITIME SYSTEMS	59,882	59,882	
266	1160489BB	GLOBAL VIDEO SURVEILLANCE ACTIVITIES	4,606	4,606	
267	1160490BB	OPERATIONAL ENHANCEMENTS INTELLIGENCE	11,612	11,612	
268	1203610K	TELEPORT PROGRAM	3,239	3,239	
268A	9999999999	CLASSIFIED PROGRAMS	4,746,466	4,746,466	
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	6,161,946	90,272	6,252,218
SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS					
269	0608197V	NATIONAL BACKGROUND INVESTIGATION SERVICES—SOFTWARE PILOT PROGRAM	121,676	121,676	
270	0608648D8Z	ACQUISITION VISIBILITY—SOFTWARE PILOT PROGRAM	16,848	16,848	
271	0303150K	GLOBAL COMMAND AND CONTROL SYSTEM	86,750	76,750	-10,000
		Program decrease			[10,000]
272	0308588D8Z	ALGORITHMIC WARFARE CROSS FUNCTIONAL TEAMS—SOFTWARE PILOT PROGRAM	250,107	200,107	-50,000
		Program decrease			[50,000]

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		SUBTOTAL SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS	475,381	-60,000	415,381
		UNDISTRIBUTED			
273A	9999999999	PANDEMIC PREPAREDNESS AND RESILIENCE NATIONAL SECURITY FUND Program increase		1,000,000 [1,000,000]	1,000,000
		SUBTOTAL UNDISTRIBUTED		1,000,000	1,000,000
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, DW	24,280,891	1,014,972	25,295,863
		OPERATIONAL TEST & EVAL, DEFENSE			
		MANAGEMENT SUPPORT			
001	06051180TE	OPERATIONAL TEST AND EVALUATION	100,021		100,021
002	06051310TE	LIVE FIRE TEST AND EVALUATION	70,933		70,933
003	06058140TE	OPERATIONAL TEST ACTIVITIES AND ANALYSES	39,136		39,136
		SUBTOTAL MANAGEMENT SUPPORT	210,090		210,090
		TOTAL OPERATIONAL TEST & EVAL, DEFENSE	210,090		210,090
		TOTAL RDT&E	106,224,793	264,835	106,489,628