TITLE II—RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

Subtitle A—Authorization of Appropriations

Authorization of appropriations (sec. 201)

The committee recommends a provision that would authorize the appropriations for research, development, test, and evaluation activities at the levels identified in section 4201 of division D of this Act.

Subtitle B—Program Requirements, Restrictions, and Limitations

Designation and activities of senior officials for critical technology areas supportive of the National Defense Strategy (sec. 211)

The committee recommends a provision that would require the Under Secretary of Defense for Research and Engineering (USD(R&E)) to designate a group of senior Department of Defense officials who would be responsible for coordinating research and engineering in technology areas deemed critical to the National Defense Strategy (NDS). Each of the designated senior officials would be responsible for a particular technology area and would continuously and iteratively build the pathways necessary to develop new technologies vital to the modernization priorities of the NDS. The officials' responsibilities would encompass technical, logistical, and financial dimensions and would include coordination with international, interagency, and private sector organizations. The provision would also require the designated senior officials to coordinate with the appropriate intelligence agencies to develop direct comparisons between the capabilities of the United States and the adversaries of the United States.

The provision would also require that the USD(R&E) provide an annual report to the congressional defense committees regarding successful advances in research and engineering and technology transition and adoption following the implementation of the provision.

The committee notes the USD(R&E) has currently assigned a group of senior officials that serve as Assistant Directors (ADs) or Technical Directors (TDs) for the NDS modernization priorities. The committee believes that these ADs and TDs play a valuable role in building roadmaps to develop critical technologies while simultaneously coordinating efforts across the military services and the Department of Defense. The committee further notes that the recruitment of ADs and TDs with deep knowledge of and expertise in their designated technology areas is key to ensuring the effective

development and coordination of these technologies' development across the Department of Defense. The committee is encouraged by the impressive backgrounds of the current ADs and TDs and believes that these positions should be further formalized to institutionalize their roles and responsibilities. The committee believes that all DOD S&T organizations should coordinate appropriate S&T activities with these senior officials.

The committee directs the Under Secretary of Defense for Research and Engineering to provide each fiscal year, not later than 30 days after the date on which the budget justification materials are submitted to Congress in support of the Department of Defense budget, until December 1, 2025, to the congressional defense committees a briefing on the technology roadmaps and the findings of the most recent review conducted of the relevant research and engineering budgets, including a list of projects and activities with unwarranted or inefficient duplication.

Governance of fifth-generation wireless networking in the Department of Defense (sec. 212)

The committee recommends a provision that would establish a cross-functional team (CFT) for fifth-generation wireless networking and designate the Chief Information Officer (CIO) of the Department of Defense, in carrying out the responsibilities established in section 142 of title 10, United States Code, to lead the CFT and serve as the senior designated official for fifth-generation wireless networking policy, oversight, guidance, and coordination in the Department.

The committee commends the Department of Defense, in particular the Under Secretary of Defense for Research and Engineering (USD(R&E)), for its efforts over the last 2 years to develop a plan to determine how fifth-generation (5G) wireless networking can be used in military applications, how to gain network superiority, and how to protect 5G networks from adversaries seeking to compromise it. The committee is pleased with the USD(R&E)'s and the broader Department's rapid action in developing an experimentation plan to accelerate development of fundamental 5G dual-use technologies. The committee is also pleased with the Department's robust engagement with industry, through the National Spectrum Consortium, for these testing and experimentation projects.

While the committee is impressed with the progress USD(R&E) has made regarding 5G experimentation and believes that USD(R&E) needs to continue to play a key role in 5G research and development, the committee realizes that a broader enterprise-wide approach is needed for the Department to fully leverage and operationalize the technology effectively across the Department. As the Department continues to execute this experimentation plan, the committee believes that a broader, lasting governance structure is required to advance the development and adoption of next generation wireless communication policies, technologies, capabilities, and applications in a coordinated manner across the entire Department. The committee also believes that the adoption of these next generation wireless capabilities will be transformational for the Department.

The committee encourages the Secretary of Defense to identify and allocate the appropriate personnel necessary to support the 5G CFT and the additional responsibilities of the CIO for 5G policy, oversight, guidance, and coordination within the Department to ensure that this critical emerging technology becomes a competitive advantage to the warfighter. The committee is aware of the CFT model that the Department has employed to govern its cyber programs and policy—the establishment of a permanent team in the office of the Principal Cyber Advisor to support the rotating cyber CFT—and encourages the Secretary of Defense to use a similar construct in resourcing this implementation. The committee also expects that, as the leader of the CFT, the CIO will regularly report to and receive direction from the Secretary of Defense and Deputy Secretary of Defense.

Application of artificial intelligence to the defense reform pillar of the National Defense Strategy (sec. 213)

The committee recommends a provision that would require the Secretary of Defense to establish a set of no fewer than five use cases of artificial intelligence capabilities that support reform efforts consistent with the National Defense Strategy. The provision would also require the Under Secretary of Defense for Research and Engineering to pilot a technology development and prototyping activity that leverages commercially available artificial intelligence technologies and systems in the context of these use cases.

The committee notes that the pilot technology development and prototyping activity should inform, and be broadly applicable to, an artificial intelligence (AI) engineering approach that enables the Department to share data, algorithms, and models to accelerate AI adoption. The committee also notes that these efforts should be undertaken in coordination with other appropriate stakeholders, including the Joint Artificial Intelligence Center, elements of the Office of the Secretary of Defense, and the military departments, to ensure that infrastructure, acquisition, and other enabling activities are in place, that high priority activities are selected for execution, and that effective capabilities are transitioned into operational use.

The committee notes the compelling business case for near-term application of AI at scale within the Department of Defense (DOD) to enhance the effectiveness and efficiency of DOD "back office" business processes and business systems. Already in wide and effective use in the commercial sector, as well as in some DOD business functions, such applications can have fewer technological hurdles for their transition into use and provide significant opportunity to drive reforms and savings by optimizing the business functions of the DOD. The committee also believes that a comprehensive DOD AI engineering approach would advance the analysis and use of data across the Department in other application areas.

The committee notes that relatively simple applications of existing AI systems would greatly improve the way in which the Department analyzes and uses data to support management of enterprise acquisition, personnel, audit, and financial management functions.

Extension of authorities to enhance innovation at Department of Defense laboratories (sec. 214)

The committee recommends a provision that would extend a pilot program for the enhancement of the research, development, test and evaluation centers of the Department of Defense, established under section 233 of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114–9 328; 10 U.S.C. 2358 note), through September 30, 2025. The provision would also extend a pilot program to improve incentives for technology transfer from Department of Defense laboratories, established under section 233 of the National Defense Authorization Act for Fiscal Year 2018 (Public Law 115–91; 10 U.S.C. 2514 note), through September 30, 2025.

The committee commends the military services that have been able to implement these pilot programs and encourages all the military services to look for opportunities to fully use these authorities. The committee notes that the Navy has indicated that it has aggressively implemented 18 management initiatives at technical warfare centers and labs under section 233 of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114–328) that have achieved greater efficiencies and effectiveness by decreasing processing days for administrative procedures by nearly 500,000 days over 18 months.

Updates to Defense Quantum Information Science and Technology Research and Development program (sec. 215)

The committee recommends a provision that would amend the Defense Quantum Information Science and Technology Research and Development Program, established in section 234 of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Public Law 115–232), by directing each of the Secretaries of the military departments to develop more robust programs for quantum computing capabilities.

The provision would require the Secretaries to develop and annually update a list of problems for which quantum computers are uniquely suited or could better resolve technical and research challenges. The provision would also support efforts by private sector, government, industry, and academic researchers by connecting small and medium-sized businesses with existing quantum computing capabilities with researchers who can make use of existing commercial quantum computers.

The committee notes the importance of harnessing quantum computing technologies to effectively compete in the rapidly-changing global security climate outlined in the National Defense Strategy.

Program of part-time and term employment at Department of Defense science and technology reinvention laboratories of faculty and students from institutions of higher education (sec. 216)

The committee recommends a provision that would implement a recommendation of the National Security Commission on Artificial Intelligence (AI) and authorize a pilot program to permit university students and faculty to take on part-time and term employment at

Department of Defense (DOD) laboratories to work on critical technologies and research activities.

The Commission noted that, when private sector companies hire university faculty as summer or part-time researchers, they "benefit from access to a diverse group of experts that understands and often creates the world's most cutting-edge AI. In turn the companies provide resources, exposure to new techniques, and financial compensation to the professors, sometimes including funding for their university-based lab. When the professors return to teaching, they also expose promising students to the companies' work, creating student awareness and excitement about the available opportunities, a positive perception of the companies, and relationships that encourage student employment upon graduation." The Commission recommended that DOD replicate this proven technique and hire university faculty with relevant science, technology, engineering, and mathematics expertise to serve as part-time researchers in laboratories. The Commission also noted that faculty members could work during sabbaticals, summer breaks, or limited hours throughout the year.

Improvements to Technology and National Security Fellowship of Department of Defense (sec. 217)

The committee recommends a provision that would amend section 235 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92) to increase the pay range for participants in the Department of Defense Technology and National Security Fellowship, executed by the Under Secretary of Defense for Research and Engineering. The committee notes that this fellowship is intended to bring more technology expertise to the Department of Defense and the Congress, with a focus on the intersection between technology and national security policy challenges. The provision would also add new background check requirements for fellows as a prerequisite for participation in the program.

Department of Defense research, development, and deployment of technology to support water sustainment (sec. 218)

The committee recommends a provision that would require the Secretary of Defense to research, develop, and deploy advanced technologies that support water sustainment with technologies that capture ambient humidity and harvest, recycle, and reuse water.

Development and testing of hypersonic capabilities (sec. 219)

The committee recommends a provision that would encourage the development of hypersonics capabilities as a key element of the National Defense Strategy. These weapons represent an area of intense technological competition between the United States, People's Republic of China, and Russian Federation. The committee is concerned that there is a lack of focus on air-launched and air-breathing hypersonic capability inside the Department of Defense and remains concerned that more attention needs to be focused on the expeditious development and maturation of key hypersonic flight technologies. In addition to the need to improve ground-based test

facilities such as wind tunnels, the Department of Defense (DOD) also needs to increase its flight test rate to expedite the maturation and fielding of hypersonic technologies. The combination of ground-based testing and flight testing is critical to fully maturing the fundamental technologies needed to field a hypersonic flight system. High-rate hypersonic flight test programs would help mature six critical technology areas: (1) Thermal protection systems and high temperature flight structures; (2) Seekers and sensors for hypersonic vehicles; (3) Advanced navigation, guidance, and control; (4) Communications and data links; (5) High speed aerodynamic characterization; and (6) Advanced avionics and vehicle communication systems for hypersonic vehicles.

Therefore, the provision would require the Under Secretary of Defense for Research and Engineering, in consultation with the Chief of Staff of the Air Force, to provide an executable strategy and report to the congressional defense committees, no later than December 30, 2020, on the plan to field air-launched and air-breathing hypersonic weapon capabilities within 3 years. The strategy would include required investment in testing and infrastructure to address the need for both flight and ground testing.

Disclosure requirements for recipients of Department of Defense research and development grants (sec. 220)

The committee recommends a provision that would amend chapter 139 of title 10, United States Code, by adding a new section on disclosure requirements for recipients of Department of Defense research and development grants with an effective date of October 1, 2021.

Subtitle C—Plans, Reports, and Other Matters

Assessment on United States national security emerging biotechnology efforts and capabilities and comparison with adversaries (sec. 231)

The committee recommends a provision that would require the Secretary of Defense, through the Under Secretary of Defense for Research and Engineering and the Under Secretary of Defense for Intelligence and Security, to conduct an assessment of U.S. efforts to develop biotechnologies and biotechnology capabilities as compared to our adversaries' efforts and capabilities. The provision would also require the Secretary of Defense, through the Under Secretary of Defense for Intelligence and Security, to assess the ability of the intelligence community to meet the intelligence analysis needs of the Department of Defense with respect to emerging biotechnologies. The Secretary of Defense would be required to submit to the congressional defense committees a report on the assessments not later than February 1, 2021.

The committee notes the importance of biotechnology to the evolving global security landscape as outlined in the National Defense Strategy. Therefore, the committee expects an assessment of the efforts to develop emerging biotechnology capabilities for the national security purposes of the Department, other federal government agencies, academia, and industry. Additionally, the assessment should include an evaluation of resourcing efforts, to include

items such as funding, workforce capabilities and recruitment capabilities, facilities, test infrastructure, and the ability of the industrial base to support and operationalize successful research efforts. The assessment should also include a description of timelines for operational deployment of emerging biotechnologies for national security purposes.

The assessments should also analyze the overall progress made in the field of biotechnology by the United States and our adversaries, including the viability, deployment, and timelines for operational deployment of new technologies and broader efforts to ensure our competitive capabilities in the global arena. As a nascent and dynamic emerging field of global competition, the committee is concerned about the ability of the intelligence community to provide in-depth and adequate analysis to support U.S. research and development activities in the emerging biotechnology area beyond traditional biological weapons. As such, the assessment should include an analysis of the adequacy of current defense academic and industrial intelligence and security apparatus (including the Defense Counterintelligence and Security Agency and service counterintelligence centers) to support Department of Defense investments in biotechnology. The assessment should also include review of the necessary supporting functions required for optimal intelligence community assessment of biotechnologies, including technology forecasting, bioinformatics tools, and technical solutions. Recommendations for improvement should include needed upgrades to intelligence analysis and workforce, a suggested optimal organizational construct for the intelligence community to support the Department's biotechnology enterprise, and potential organizational schemes for a more effective whole-of-community approach.

Independent comparative analysis of efforts by China and the United States to recruit and retain researchers in national security-related fields (sec. 232)

The committee recommends a provision that would require the National Academies of Science, Engineering, and Medicine to conduct a study comparing methods for recruiting and retaining technology researchers, including financial incentives and academic opportunities, currently used by the U.S. and Chinese governments. The study would focus on incentives employed by China to bring researchers in American academic and government laboratories into Chinese talent programs and how these incentives diverge from those offered by the United States.

The committee notes that China maintains programs such as China's Thousand Talents, initially formed to attract Chinese expatriates and other researchers to China and recently renamed the National High-end Foreign Experts Recruitment Plan, to provide funding to researchers in the United States, including tenured American professors and researchers at federally-funded laboratories. Through these talent programs, American researchers are encouraged to set up labs in China and conduct research in Chinese laboratories, granting China access to sensitive technologies developed in the United States.

The committee notes China's efforts to close technology gaps through intellectual property theft and the relevance of these ef-

forts to challenges outlined in the National Defense Strategy (NDS). The committee also notes both the importance of robust basic research in science and technology to NDS implementation as well as the prevalence of foreign students in science, technology, engineering, and mathematics education in the United States.

Department of Defense demonstration of virtualized radio access network and massive multiple input multiple output radio arrays for fifth generation wireless networking (sec. 233)

The committee recommends a provision that would require the Department of Defense (DOD) to demonstrate virtualized radio access network (RAN) and network core technologies and massive multiple input multiple output (MIMO) radio array technology for commercial use that is globally competitive in terms of cost and performance. The provision would require that this technology demonstration be conducted at one or more of the sites where the DOD is deploying fifth generation (5G) network instances.

The committee notes that leading global providers of 5G wireless networking RAN equipment and RAN radio arrays are foreign companies in Europe, South Korea, and China. These providers offer vertically integrated, specialized, and proprietary products that are highly coupled, which make it difficult for customers to mix components from multiple companies and results in high costs. The committee is aware that, as in many other information technology sectors, wireless networking technologies are being developed that replace dedicated hardware through software virtualization on commodity computing systems. In addition, there is an emerging set of open standards for the interfaces among wireless networking components and functions that complements this virtualization technology.

The committee believes that these developments will offer opportunities for new entrants, including existing and new U.S. companies, to enter the wireless networking industry and compete effectively on cost and performance in the global 5G competition with China. The committee believes that it is important for the Department of Defense to demonstrate the maturity, cost, and performance of virtualized RAN technology, in coordination with the U.S. telecommunications industry, to ensure that this technology is a viable contender for commercial 5G network deployments.

The committee notes that MIMO radio arrays, currently based on specialized Gallium Nitride radio-frequency electronics, will also be critical in developing a competitive wireless networking solution, particularly in terms of cost, weight, power, and performance. The committee believes that competing effectively in 5G wireless networking technology will require U.S. companies to bring forth significant innovation in massive MIMO radio array technology.

Independent technical review of Federal Communications Commission Order 20–48 (sec. 234)

The committee recommends a provision that would require the Secretary of Defense to enter into an agreement with the National Academies of Science, Engineering, and Medicine to conduct an independent technical review of the Order and Authorization

adopted by the Federal Communications Commission (FCC) on April 19, 2020 (FCC 20–48). The independent technical review would include a comparison of the two different approaches used for evaluation of potential harmful interference. The provision also would require the National Academies of Science, Engineering, and Medicine to submit a report on the independent technical review.

The committee is aware that extensive testing performed by 9 federal agencies concluded that the Ligado proposal will cause interference for both civilian and military Global Positioning System (GPS) users. The committee notes that the Department of Defense, Department of Justice, National Aeronautics and Space Administration, Department of Transportation, Department of Commerce, Department of Homeland Security, Department of Energy, and Federal Aviation Administration all strongly oppose this proposal. The committee is also concerned that the mitigation conditions imposed on Ligado in the FCC Order are not practical and do not adequately protect GPS.

The committee is aware that one of the main justifications in the FCC Order for approving Ligado's proposal involves the methods used for determining harmful interference. The committee believes that further technical evaluation of the methods is warranted and therefore recommends this independent study to review the two approaches (the Ligado-proposed and FCC-approved criteria of harmful interference to determine how select receivers are impacted versus the Department of Transportation study method of determining an allowable level of noise adjacent to the relevant spectrum) to determine which one most effectively mitigates risk and to recommend a way forward, including the possibility of incorporating additional testing.

Report on and limitation on expenditure of funds for micro nuclear reactor programs (sec. 235)

The committee recommends a provision that would require the Secretary of Defense to submit to the appropriate congressional committees a report on the Department's micro nuclear reactor programs. The report would be required to cover operational, safety, programmatic, diplomatic, regulatory, and legal issues, in coordination with officials within the Department of Defense, Department of Energy, Department of State, and Nuclear Regulatory Commission. The provision would prohibit obligation or expenditure of funds beyond 20 percent of those authorized to be appropriated for such programs in fiscal year 2021 by this Act until submission of the report.

The committee supports the Department's efforts to explore alternative operational energy sources and also supports innovation in reactor technology but does not believe that the Department has considered the unique complexities associated with nuclear energy in designing these programs. The committee is also concerned about implications for policy and programs outside the Department of Defense, including availability of unobligated enriched uranium.

Modification to Test Resource Management Center strategic plan reporting cycle and contents (sec. 236)

The committee recommends a provision that would modify the Test Resource Management Center strategic plan reporting cycle and period to be covered. It is currently a 30-year strategic plan, re-baselined every 2 years. This provision would make the strategic plan cover a 15-year period, to be re-baselined at least every 4 fiscal years, with an annual update as needed. The new strategic plan would be due not later than 1 year after the release of the Secretary of Defense's National Defense Strategy (NDS).

The committee notes that the current strategic plan required by section 196 of title 10, United States Code, is not as useful to the Congress or the Department of Defense as it could be, due to the nature and frequency of the updates. The committee believes that a more helpful strategic plan would be on a 4-year cycle, with yearly updates to relay any changes, analysis, or high visibility items determined worthy of reporting by the Director of the Test Resource Management Center.

Limitation on contract awards for certain unmanned vessels (sec. 237)

The committee recommends a provision that would require the submission of a certification by the Under Secretary of Defense for Research and Engineering to the congressional defense committees prior to the Department of Defense's contracting for certain vessels.

The committee is concerned that an excessive number of unmanned surface and undersea vessels (USVs and UUVs) are being acquired prematurely using Research, Development, Test, and Evaluation funds and that these vessels may include subsystems that lack sufficient technical reliability and technological maturity to allow the vessels to meet threshold requirements.

The committee seeks to avoid contracting for USVs and UUVs when the technical reliability and technological maturity of subsystems critical to propulsion and electrical distribution or the military purposes of the vessels are either unknown or known to be insufficient. For example, the committee notes the Navy requirement for Medium and Large USVs (MUSV and LUSV) to operate continuously at sea for at least 30 days without preventative maintenance, corrective maintenance, or emergent repairs. The committee is unaware of any unmanned vessel of the size or complexity envisioned for MUSV or LUSV that has demonstrated at least 30 days of such operation.

The committee understands that the Strategic Capabilities Office (SCO) prototype vessels intended to provide risk reduction for the Navy's LUSV program have demonstrated a maximum of 2 to 3 days of continuous operation. The committee also understands that the SCO vessels are approximately 25 percent the size by tonnage of a Navy LUSV. As a result, the committee is concerned that the applicability of lessons learned and risk reduction from the SCO vessels to the Navy MUSV and LUSV programs will be limited.

The committee views prior and successful land-based prototyping of individual critical subsystems as essential to providing a solid technical foundation for USV and UUV programs. Rather than delaying these programs, the committee believes that a deliberate en-

gineering-based subsystem prototyping approach will enable the delivery of capable, reliable, and sustainable USVs and UUVs that meet the needs of fleet commanders faster than the plan contained in the budget request, which assumes that several unproven or non-existent subsystems will rapidly materialize to meet the Navy's requirements for these vessels.

Documentation relating to Advanced Battle Management System (sec. 238)

The committee recommends a provision that would require the Secretary of the Air Force to submit specific documentation germane to the Advanced Battle Management System immediately upon enactment of this Act.

Armed Services Vocational Aptitude Battery Test special purpose adjunct to address computational thinking (sec. 239)

The committee recommends a provision that would require the Secretary of Defense, within 1 year of enactment of this Act, to establish a special purpose test adjunct to the Armed Services Vocational Aptitude Battery test to address computational thinking skills relevant to military applications.

Budget Items

Army

Artificial Intelligence Human Performance Optimization

The budget request included 303.3 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 61102A for Defense Research Sciences.

The committee notes the importance of improving special operations forces' individual performance optimization, resilience, and readiness, including recent emphasis on natural movement, full-range body motion, and gravity-aided non-traditional suspension training exercises. The committee is also aware that an opportunity may exist to fuse these new health and human performance approaches with advancements in artificial intelligence. The committee therefore encourages development of the Human Development Ecosystem to improve the health and well-being of individual military operators. The committee understands that this effort will further investigate application of AI to the physiological, cognitive, and emotional needs of the warfighter.

Therefore, the committee recommends an increase of $2.0 million, in RDT&E, Army, for PE 61102A for AI Human Performance Optimization.

Increase in basic research, Army

The budget request included $303.3 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 61102A Defense Research Sciences.

The committee recognizes the increasingly complex security environment detailed in the National Defense Strategy and born from rapid technological change, challenges from adversaries in every

operating domain, and decreased readiness derivative of the longest continuous stretch of armed conflict in U.S. history. Accordingly, it is crucial to adequately fund, resource, and structure the Department of Defense to conduct RDT&E activities for critical emerging technologies to stay ahead of our adversaries, most notably Russia and China. Resources must be devoted and responsibly spent toward research and development of artificial intelligence, quantum computing, hypersonics, directed energy, biotechnology, autonomy, cyber, space, 5G, microelectronics, and fully networked command, control, and communications technologies. As such, the committee encourages rapid development, prototyping, testing, and acquisition of these emerging technologies in order to remain ahead of our adversaries.

Therefore, the committee recommends an increase of $10.0 million in RDT&E, Army, for PE 61102A Defense Research Sciences to support additional basic research.

Pandemic Vaccine Response

The budget request included $11.8 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62115A Biomedical Technology.

Given the recent COVID–19 global pandemic, the committee notes the importance of protecting warfighter populations in the event of a global pandemic and supports expanding rapid response vaccine capabilities and capacity to preserve force readiness during an outbreak. The committee commends the Department of Defense for its prior efforts to pursue novel rapid production capabilities and encourages the Department to pursue late-stage multi-modal platform technologies capable of responding to pandemics such as influenza and COVID–19.

Therefore, the committee recommends an increase of $4.0 million, in RDT&E, Army, for PE 62115A for pandemic vaccine response research.

Hybrid additive manufacturing

The budget request included $42.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62141A Lethality Technology.

The committee notes that additive manufacturing can enable rapid prototyping and manufacturing of missile and smart bomb electronics, energetics, structural components, and warheads. The committee supports the development of the next generation of integrated hybrid additive manufacturing processes and equipment necessary to prototype missile, rocket, and munition materials, electronics, subsystems, and fully integrated components to demonstrate advanced designs and capabilities. These processes could enable the capability to combine materials on demand and at faster production rates and has the advantage of delivering a range of products without the need to retool manufacturing equipment.

Therefore, the committee recommends an increase of $3.0 million in RDT&E, Army, for PE 62141A for hybrid additive manufacturing.

Pathfinder Air Assault

The budget request included $30.8 million for Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62142A Army Applied Research.

The committee notes the importance of coupling soldier insights with basic research initiatives to expedite the delivery of new technologies to the field. The committee further notes that Army Futures Command (AFC) is leading the Army Modernization Program and that the AFC University Technology Development Directorate (UTDD) has improved the delivery of university-based applied research outcomes to the force through the incorporation of soldier insights. The committee encourages the expansion of these efforts to improve air assault operations and precision fires and the continued co-designing of technology solutions with soldiers, ensuring outcomes that will fulfill their needs.

Therefore, the committee recommends an increase of $3.0 million, in RDT&E, Army, for PE 62142A for Pathfinder Air Assault.

Harnessing Emerging Research Opportunities to Empower Soldiers Program

The budget request included $125.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62143A Soldier Lethality Technology.

The committee is aware of the work being done by the Combat Capabilities Development Command's Soldier Center in improving the protection, survivability, mobility, and combat effectiveness of soldiers. Among these efforts is continued research in areas of advanced ballistic polymers for body armor, fibers to make uniforms more fire-resistant, lightweight structures for advanced shelters—all examples of tangible benefits to the soldier.

The committee recommends an increase of $2.5 million in RDT&E, Army, for PE 62143A for the Harnessing Emerging Research Opportunities to Empower Soldiers program.

Metal-based display technologies

The budget request included $125.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62143A Soldier Lethality Technology.

The committee notes the value of high efficiency and ruggedized computer display technology, which reduces the weight burden of extra batteries and displays and improves the warfighter's mobility and soldier lethality.

Therefore, the committee recommends an increase of $3.0 million in RDT&E, Army, for PE 62143A for lightweight, metal-based display technologies.

Pathfinder Airborne

The budget request included $125.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62143A Soldier Lethality Technology.

The committee notes the importance of enhancing Airborne Joint Forcible Entry operations in contested areas and fostering innovation to enable improved airborne responses to crisis contingencies around the world. The Pathfinder Airborne program pursues ap-

plied research projects to enable critical Army-specific airborne missions in technologies that include: advanced materials for soldier protection, communication, and sensing; next-generation additive manufacturing methods and materials; secure communications, smart wireless systems, and 5G wireless networks; visualization, simulation, and analytics for enhanced decision-making; quantum computing, sensing, and communications; and enhanced soldier performance.

Therefore, the committee recommends an increase of $5.0 million, in RDT&E, Army, for PE 62143A for the Pathfinder Airborne program.

Ground technology advanced manufacturing, materials, and process technologies

The budget request included $28.0 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62144A Ground Technology.

The committee notes that the Advanced Manufacturing, Materials, and Processes (AMMP) program located within the Center for Agile Materials Manufacturing Science at the Army Research Laboratory provides important tools and materials and process technologies to the rest of the Army and accelerates the ability of the Army to enhance its industrial base capabilities to meet the Army's six modernization priorities. The committee further notes that these innovations can reduce lifecycle costs and enhance capabilities for the warfighter.

Therefore, the committee recommends an increase of $2.0 million, in RDT&E, Army, for PE 62144A for ground technology advanced manufacturing, materials, and process initiatives.

Ground Combat Vehicle Platform Electrification

The budget request included $217.6 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62145A Next Generation Combat Vehicle (NGCV) Technology.

The committee recognizes that improving vehicle electrification technologies is essential for overmatch on the future battlefield and supports the Army Futures Command, specifically the NGCV Cross-Functional Team, as it executes experiments and builds prototypes.

Therefore, the committee recommends an increase of $2.0 million in RDT&E, Army, for PE 62145A for ground combat vehicle platform electrification.

Immersive virtual modeling and simulation techniques

The budget request included $217.6 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62145A Next Generation Combat Vehicle Technology.

The committee recognizes the importance of immersive and virtual simulation modeling and simulation enterprise support for the development of autonomous vehicle technologies.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Army, for PE 62145A for immersive virtual modeling and simulation techniques.

Next Generation Combat Vehicle modeling and simulation

The budget request included $219.6 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62145A Next Generation Combat Vehicle Technology.

The committee notes that the Next Generation Combat Vehicle (NGCV) cross-functional team places a high emphasis on modeling and simulation for analyzing and evaluating vehicle platforms and technologies. The committees notes that there is a need to quickly perform complex trade studies on requirements, sub-system optimizations, and portfolio investments to provide program options in a timely fashion to decision-makers, including through the use of advanced software, modeling, and software-in-the-loop techniques.

The committee recommends an additional $3.0 million in RDT&E, Army, for PE 62145A for NGCV modeling and simulation activities.

Backpackable communications intelligence system

The budget request included $114.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62146A Network C3I Technology.

The committee notes the importance of conducting missions against non-state actors and near-peer competitors in highly contested domains. The National Defense Strategy highlights the need for maintaining capability to address non-state threats, along with increased resources for a potential high-end conflict against near-peer state actors. These state actors employ high frequency communications as either backup or primary modes for command and control. The committee notes that backpackable communications intelligence systems are small, covertly operable systems capable of countering some threat communications capabilities in highly contest environments, including locating sources of adversary wireless communications signals.

The committee recommends an increase of $5.0 million, in RDT&E, Army, for PE 62146A for backpackable communications intelligence systems.

Defense resiliency platform against extreme cold weather

The budget request included $114.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62146A Network C3I Technology.

The committee notes the impact of extreme cold weather on military infrastructure and the challenges that it poses for U.S. military operations. The committee notes the value of research in developing advanced capabilities for extreme cold regions in increasing the Army's ability to map remote extreme cold regions, ensuring the superiority of the U.S. Army in extreme cold regions, and reducing the deterioration of infrastructure due to freeze-thaw cycles. The committee further notes that research in developing capabilities for extreme cold regions should incorporate risk assessment, ground-based measurements, bio-inspired innovative sensors, geospatial mapping, and intelligent prediction capabilities.

Therefore, the committee recommends an increase of $3.0 million, in RDT&E, Army, for PE 62146A for a defense resiliency platform against extreme cold weather.

Multi-drone multi-sensor intelligence, surveillance, and reconnaissance capability

The budget request included $114.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62146A Network C3I Technology.

The committee recommends an increase of $2.0 million in RDT&E, Army, for PE 62146A for multi-drone/multi-sensor intelligence, surveillance, and reconnaissance capabilities.

Quantum computing based materials optimization

The budget request included $114.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62146A Network C3I Technology.

The committee notes the importance of the construction and demonstration of quantum computing technologies for the design and development of novel advanced materials. The committee further notes that quantum computing-based approaches for the rapid design of next generation materials may result in long-term accelerated development of military systems and may improve the rate of production of key defense technologies.

Therefore, the committee recommends an increase of $2.0 million, in RDT&E, Army, for PE 62146A for quantum computing-based materials optimization.

Composite artillery tube and propulsion prototyping

The budget request included $60.6 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62147A Long Range Precision Fires Technology.

The committee recognizes the need for extended range, greater mobility, and improved maneuverability for conventional tube artillery. Composite tube technology will allow the use of powerful propellants that will achieve the desired Extended Range Cannon Artillery ranges while reducing weight and length of tube, enabling greater combat maneuverability. The committee notes that this will increase effectiveness and survivability on the multi-domain battlefield. The committee believes that research into this technology could enable shorter, lighter tubes that can use stronger propulsion to achieve required range, allow greater mobility, which could enable circumvention of enemy counter fire, and increase weapon system lethality.

Therefore, the committee recommends an increase of $7.0 million in RDT&E, Army, for PE 62147A for research and development of composite tubes and propulsion prototyping.

Counter Unmanned Aerial System threat research and development

The budget request included $56.3 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62150A Air and Missile Defense Technology.

The committee supports the Army's investment in advanced technologies to mitigate threats from Unmanned Aircraft Systems (UAS), especially as these threats emerge and mature rapidly. The committee believes that it is important to leverage existing and proven counter-UAS technologies and to investigate ways to ex-

pand these technologies with automation and machine learning algorithms to discretely identify, detect, and classify emerging threat UAS systems. The committee notes that these technologies will enable soldiers to rapidly compress kill chain decision-making processes while increasing force protection for ground and airborne autonomous vehicles, which will expand soldiers' situational awareness within the battle space. The committee believes that it is important for the Army Research Lab to collaborate with academia and private industry to develop commercially available counter-UAS technology for force protection and other needs. The committee also encourages the Army Research Lab to help inform Army requirements and advise on technologies to fulfill Army Futures Command objectives.

Therefore, the committee recommends an increase of $5.0 million in PE 62150A Air and Missile Defense Technology for counter-UAS threat research.

Counter unmanned aircraft systems research

The budget request included $56.3 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62150A Air and Missile Defense Technology.

The committee recognizes that the threat of unmanned aerial systems (UASs) to U.S. forces, activities, and infrastructure reflects a variety of UAS sizes and sophistications and is rapidly evolving and proliferating. Developing ever-evolving counter-UAS solutions requires nimble, collaborative research.

Accordingly, the committee recommends an increase of $5.0 million in RDT&E, Army, for PE 62150A for a counter-UAS research activity.

Coronavirus nanovaccine research

The budget request included $95.5 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 62787A Medical Technology.

The committee notes that the United States Army Medical Research and Development Command is a key part of the whole-of-government response to COVID–19. The National Institute of Allergies and Infectious Diseases has identified nanovaccine research as potentially preventing pandemic diseases with vaccines that are more effective, are more durable, and can be produced more quickly.

Therefore, the committee recommends an increase of $2.0 million in RDT&E, Army, for PE 62787A to continue Department of Defense efforts in developing nanovaccine capabilities for COVID–19 and directs the Army to integrate the nanovaccine research with other coronavirus research efforts to the maximum extent practicable.

3D Advanced Manufacturing

The budget request included $109.6 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63118A for Soldier Lethality Advanced Technology.

The committee recommends an increase of $2.0 million in RDT&E, Army, for PE 63118A for 3D Advanced Manufacturing.

Cybersecurity for industrial control systems and building automation

The budget request included $14.8 million for Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63119A Ground Advanced Technology.

The committee understands the importance of creating research programs that would enhance partnerships in developing cybersecurity capabilities and strategic technical workforce development efforts in fields critical to national security. The committee believes that it is important to create opportunities to study the cybersecurity vulnerabilities of industrial and facility-related control systems, such as those used on military installations, and to expand the scope and cooperation of academia's current efforts with leading Federal laboratories in cybersecurity training and assessment and advanced control system technology implementation. The committee encourages the Army to leverage ongoing collaboration with Army research organizations to accomplish these efforts.

Therefore, the committee recommends an increase of $3.0 million, in RDT&E, Army, for PE 63119A for cybersecurity for industrial control systems and building automation.

Graphene applications for military engineering

The budget request included $14.8 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63119A Ground Advanced Technology.

The committee recognizes the importance of graphene and its use in many applications. These include materials that provide lighter logistics and stronger facilities protection, augment concealment and cover through multispectral augmentation, improve sensor and detection capabilities, and allow for better ground and air mobility. These types of materials applications align well with Army Futures Command's six modernization priorities.

Therefore, the committee recommends an increase of $3.0 million in RDT&E, Army, for PE 63119A for graphene applications for military engineering.

High performance computing modernization

The budget request included $188.0 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63461A Army High Performance Computing Modernization Program (HPMCP).

The committee notes that the HPMCP supports the advanced computing needs of Department of Defense acquisition, engineering, testing, and research organizations. The committee notes that the President's budget request routinely underfunds investment in this capability, such that annual Congressional increases are necessary for the HPMCP to continue normal operations. The committee also commends the HPMCP community for providing technical assistance to the scientific community during the COVID–19 crisis and supporting a variety of research activities, from modeling the movement of droplets travelling through an aircraft to conducting virtual screenings of vaccine alternatives.

Therefore, the committee recommends an increase of $5.0 million, in RDT&E, Army, for PE 63461A for high performance computing modernization.

Carbon fiber and graphitic composites for Next Generation Combat Vehicle program

The budget request included $199.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63462A Next Generation Combat Vehicle Advanced Technology.

The committee recognizes the versatility and broad application that carbon fiber technology provides for weight reduction and improving the survivability of the next generation of combat vehicles.

Therefore, the committee recommends an increase of $10.0 million in RDT&E, Army, for PE 63462A for test and development of carbon fiber and graphitic foam applications in the Next Generation Combat Vehicle program.

Cyber and connected vehicle innovation research

The budget request included $199.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63462A Next Generation Combat Vehicle Advanced Technology.

The committee recognizes the importance of identifying vehicle cyber vulnerabilities and adaptively securing manned and unmanned military vehicles. The committee further notes that, by leveraging partnerships in the commercial automotive, trucking, and defense industrial bases, the Army can bring together traditional and non-traditional suppliers to provide cost-effective cybersecurity solutions at manufacturing scale.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Army, for PE 63462A for cyber and connected vehicle research.

Small unit ground robotic capabilities

The budget request included $27.7 million for Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63462A Next Generation Combat Vehicle Advanced Technology.

The committee notes that the Army's current dismounted infantry platoons have effective parity with those of potential adversaries. The committee is aware that our adversaries are increasingly sophisticated in the robotic arena, which in turn demands correspondingly capable responses to emerging threats. The committee also notes that there is no current organization or location that integrates dismounted infantry platoon-level robotic capabilities. These capabilities include: the Small Multipurpose Equipment Transport system and smaller unmanned ground vehicles; small unmanned aircraft systems; robotic air and small ground modular mission payloads; and technologies in autonomy, artificial intelligence, and communications. The committee believes that it is important that the Army extend air and ground robotic capabilities to smaller and lighter maneuver units, focusing initially on dismounted infantry platoons in order to provide them with substantial advantages over comparable potential adversary units.

Therefore, the committee recommends an increase of $7.5 million, in RDT&E, Army, for PE 63462A for small unit ground robotic capabilities.

Virtual Experimentations Enhancement

The budget request included $199.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63462A Next Generation Combat Vehicle Advanced Technology.

The committee recognizes the importance of automated virtual and physical prototyping to reduce the risk and cost of developing new technologies to support crew optimization, autonomy, and operations in degraded visual environments.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Army, for PE 63462A for Virtual Experimentations Enhancement.

Hyper velocity projectile extended range technologies

The budget request included $121.1 million in Research, Development, Test, and Engineering (RDT&E), Army, for PE 63464A Long Range Precision Fires Advanced Technology.

The committee notes the importance of the development and testing of advanced guidance technology for the Hypervelocity Projectile—Extended Range (HVP–ER). The committee also notes that the HVP–ER requires a terminal sensor capability to meet Army's requirements to locate targets in Global Positioning System-degraded and -denied environments and that successful implementation of a terminal sensor in the HVP–ER would provide a necessary capability to achieve objective requirements for both the Extended Range Cannon Artillery Howitzer and the Cannon-Delivered Area Effects Munition programs.

Therefore, the committee recommends an increase of $3.0 million, in RDT&E, Army, for PE 63464A for extended range hyper velocity projectile technologies.

Electromagnetic effects research to support long range precision fires and air and missile defense cross functional teams

The budget request included $58.1 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63466A Air and Missile Defense Advanced Technology.

The committee notes the importance of: reducing the time required for development and testing associated with the Long Range Precision Fires (LRPF) and Air and Missile Defense (AMD) cross-functional teams, the ability to assess specific electromagnetic effects associated with radar and other electronic warfare programs, and expedited RDT&E activities in support of the LRPF and AMD cross-functional teams.

Accordingly, the committee recommends an increase of $5.0 million in RDT&E, Army, for PE 63466A to establish electromagnetic effects research capabilities to directly support the LRPF and AMD cross-functional teams.

Development and fielding of high energy laser capabilities—Army

The budget request included $58.1 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63466A Air and Missile Defense Advanced Technology.

The committee recommends an increase of $10.5 million in RDT&E, Army, for PE 63466A for support for the high energy laser system characterization lab for the development and fielding of high energy laser capabilities.

Hypersonic hot air tunnel test environment

The budget request included $11.1 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63305A Army Missile Defense Systems Integration.

The committee notes the importance of support facilities and propulsion methods that will demonstrate and test high speed and hypersonic technologies. The committee also notes that the Director of the Test Resource Management Center identified a need for increased capacity for and capability in ground testing of thermal protection systems to support hypersonic programs. The committee notes that a test environment that delivers high temperature testing available over a full hypersonic mission profile would support the aggressive set of hypersonics programs, prototypes, and deployment schedules envisioned in the National Defense Strategy and associated implementation plans.

Therefore, the committee recommends an increase of $3.0 million in RDT&E, Army, for PE 63305A for hypersonic hot air tunnel test environment development.

Future Long Range Assault Aircraft (FLRAA)

The budget request included $327.7 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 63801A Aviation—Advance Development.

The committee supports the development and procurement of the Future Long Range Assault Aircraft (FLRAA), which is a critical Army modernization priority. The committee understands that additional funding could enable the integration of key technologies onto the platform in order to mitigate program risk.

Accordingly, the committee recommends an increase of $5.0 million in RDT&E, Army, for PE 63801A to support integration activities for the Future Long Range Assault Aircraft program.

Operational Fires program reduction, Army

The budget request included $156.8 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 64115A Technology Maturation Initiatives.

The committee recognizes the importance of coordinating various service and agency hypersonics activities and is concerned with the lack of a transition pathway for the Defense Advanced Research Projects Agency's Operational Fires effort into a funded Army acquisition or development activity.

Therefore, the committee recommends a decrease of $10.0 million in RDT&E, Army, for PE 64115A for an Operational Fires program reduction.

Hypersonic program reduction, Army

The budget request included $801.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 64182A Hypersonics.

The committee recognizes the importance of hypersonic research and development, especially in light of the National Defense Strategy and the advancing threats that it describes. However, the committee is concerned that there has been a lack of adequate coordination on hypersonic prototyping efforts among the various stakeholders and service components.

Therefore, the committee recommends a decrease of $5.0 million in RDT&E, Army, for PE 64182A.

Joint Counter Small Unmanned Aircraft Systems Office

The budget request included $18.7 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 64741A Project FG5 Counter Unmanned Aerial Systems.

The committee is encouraged by the Department of Defense designation of the Army as Executive Agent for Counter small Unmanned Aircraft Systems (C–sUAS) in 2019, the rapid standup of the Joint C–sUAS Office in 2020, and the recommendation to downselect and prioritize resources toward the most promising systems. The Chief of Staff of the Army identified in his unfunded priorities list a requirement of $17.5 million to: address gaps in currently fielded C–sUAS systems, increase capability against Group 3 unmanned aircraft systems threats, and expand interoperability.

Accordingly, the committee recommends an increase of $17.5 million in RDT&E, Army, for PE 64741A Project FG5 for Counter Unmanned Aerial Systems.

Counter Unmanned Aerial Systems for Special Operations Forces

The budget request included $18.7 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 64741A Project FG5 Counter Unmanned Aerial Systems.

The committee notes that deployed military personnel, especially special operations forces (SOF) deployed to austere locations, face an increasing threat from weaponized unmanned aerial systems (UASs). The committee believes that counter-UAS systems utilizing artificial intelligence, open-architecture systems, and the ability to integrate multiple sensors to detect, engage, and defeat threats could decrease the workload associated with existing counter-UAS solutions and more effectively protect small SOF teams and fixed locations. The committee understands that U.S. Special Operations Command (SOCOM), in partnership with the Defense Innovation Unit and the Defense Threat Reduction Agency, successfully demonstrated such capabilities in both a test environment and during an overseas operational assessment. The committee is encouraged by SOCOM's plans to conduct additional overseas operational assessments in fiscal year 2020 and notes that, elsewhere in this Act, the committee authorizes additional funds through the Joint Counter-Small UAS Office and for SOCOM to support continued advancement of these technologies.

Therefore, the committee recommends an increase of $7.5 million in RDT&E, Army, for PE 64741A for counter-unmanned aircraft systems.

Counter small unmanned aircraft systems operational demonstrations

The budget request included $18.7 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 64741A Project FG5 Counter Unmanned Aerial Systems.

The committee is encouraged by the Department of Defense's designation of the Army as Executive Agent for Counter small Unmanned Aircraft Systems (C–sUAS) in 2019, the rapid standup of the Joint C–sUAS Office in 2020, and the recommendation to downselect and prioritize resources toward the most promising systems. The committee expects the JCO to work closely with the United States Special Operations Command (SOCOM) on its developmental efforts to support expeditionary, mounted, and dismounted C–sUAS capabilities for deployed special operations forces. The committee understands that SOCOM is conducting operational demonstrations of C–sUAS capabilities in the United States and overseas and believes that these efforts are important for developing and acquiring capabilities to address emerging unmanned aircraft system threats and filling critical capability gaps identified by combatant commanders.

Accordingly, the committee recommends an increase of $15.0 million in RDT&E, Army, for PE 64741A Project FG5 Counter Unmanned Aerial Systems.

Next Generation Squad Weapon

The budget request included $265.8 million in RDT&E, Army, for PE 64802A for Weapons and Munitions Engineering Development, of which $30.6 million was for Small Caliber Ammo for Next Gen Squad Weapons.

The committee understands that the Next Generation Squad Weapon (NGSW) is a top Army modernization priority urgently needed to increase the lethality of soldiers, marines, and special operators in close-combat formations. The NGSW program includes the NGSW rifle, the NGSW automatic rifle, the NGSW fire control optic, and a common 6.8 millimeter ammunition cartridge designed to address emerging threat capabilities and provide overmatch against threats at ranges beyond the current weapon systems.

Therefore, the committee recommends an increase of $0.8 million, for a total of $265.6 million, for PE 64802A for Weapons and Munitions in order to increase funding for NGSW small caliber ammunition to incorporate more soldiers, marines, and special operators in providing user assessment of the NGSW system.

The committee urges the Army to keep the committee fully apprised of progress relating to the fielding of the NGSW and how the Army will utilize user feedback and acceptance in determining key acquisition decisions in the program.

Bradley and Stryker Active Protection Systems

The budget request included no funding in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 64852A Project XU9 for the suite of Survivability Enhancements Systems.

The committee understands that additional funds would enable completion of Urgent Materiel Release (UMR) testing for the Bradley Iron Fist Light De-coupled (IFLD) and limited characterization

activities in support of Stryker and other ground combat platform active protection systems.

Accordingly, the committee recommends an increase of $47.0 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 64852A in order to complete both the follow-on limited characterization effort ($14.0 million) and the IFLD UMR Phase II testing ($33.0 million).

Integrated Data Software Pilot Program

The budget request included $142.7 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 65013A Information Technology Development.

The committee notes that new commercial software solutions can be used to improve the military services' supply, logistics, and spare parts management, increasing their combat readiness while reducing costs. The committee is aware of the challenges that the Army has faced in synchronizing information management and data to maintain a digital connection between the product data and parts information. The committee recommends that the Army make efforts to prioritize this integration and analysis activity and encourages its adoption throughout the Army's logistics enterprise to increase readiness and reduce costs.

Accordingly, the committee recommends an increase of $5.0 million in RDT&E, Army, for PE 65013A for an integrated data software pilot program.

Army cyber situational understanding capability

The budget request included $28.5 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 65041A Defensive Cyber Tool Development.

The committee understands that the Army intends for the Cyber Situational Understanding tool to provide tactical commanders with a better understanding of their and adversary forces' activity, maneuver, and exposure in the cyber, electromagnetic, and broader information domains. The Defense Advanced Research Projects Agency's PlanX capability, now transitioned to the Strategic Capabilities Office's Project IKE program and to United States Cyber Command, was initially developed to provide such a capability for tactical commanders. While PlanX has been adapted through further development to meet the specific needs of Cyber Command's planning and operational elements and is being used today by Army cyber protection teams, at least portions of the codebase remain well-suited for providing the tactical-level situational awareness that the Army seeks for its brigade- and division-level commanders. In fact, the committee understands that the PlanX capability is being used in such tactical applications outside of the cyber domain today. The PlanX codebase is also owned entirely by the government and would provide interoperability between the Cyber Mission Forces and Army maneuver units, making it an attractive baseline for further development projects. This line of reasoning is also applicable to similar Navy and Air Force initiatives to provide cyber situational awareness to tactical commanders.

The committee therefore directs the Secretary of the Army to assess: (1) The PlanX/Project IKE capability's ability to meet, with

further development, the Cyber Situational Understanding tool requirements; (2) The cost-efficiency of using the PlanX/Project IKE capability as the baseline for the Cyber Situational Awareness tool; (3) The training and interoperability benefits that result from acquisition and employment of situational understanding tools with a common baseline across the Cyber Mission Forces and tactical cyber units; and (4) Whether or not the Cyber Situational Understanding program should be reoriented to utilize and build off of the PlanX/Project IKE capability. The Secretary of the Army shall deliver a briefing to the Committees on Armed Services of the Senate and House of Representatives, detailing the findings of the assessment and a proposed path forward, no later than January 30, 2021.

Therefore, the committee recommends a decrease of $12.0 million for PE 65041A for the Cyber Situational Understanding program to avoid duplication. The committee directs that the remaining funds for this initiative be used for tailoring the Joint Cyber Command and Control (JCC2) baseline to the Army's specific brigade combat team application. The committee urges the Departments of the Navy and Air Force to undertake similar efforts to adapt the JCC2 solution to tactical-level echelons.

Indirect Fire Protection Capability Increment 2

The budget request included $235.8 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 65052A Indirect Fire Protection Capability Increment 2 (IFPC Inc 2).

The committee understands that a lower level of funding would be sufficient to execute all planned fiscal year 2021 activities for this program.

Accordingly, the committee recommends a decrease of $47.8 million in RDT&E, Army, for PE 65052A for IFPC Inc 2.

Optionally Manned Fighting Vehicle

The budget request included $327.7 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 65625A Optionally Manned Fighting Vehicle (OMFV).

The committee supports the Army's efforts to replace the Bradley Fighting Vehicle, which has been in service for over 30 years, but notes the OMFV program reset that occurred in January 2020. The committee understands that the Army terminated physical prototyping by multiple vendors planned and budgeted for fiscal years 2020 and 2021 in favor of digital prototyping prior to proceeding to physical prototypes.

Accordingly, the committee recommends a decrease of $80.0 million in RDT&E, Army, for PE 65625A.

Directed energy test and evaluation capabilities

The budget request included $350.4 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 65601A Test Ranges and Facilities.

The committee notes that directed energy systems are a priority within the modernization efforts to support the National Defense Strategy. The committee further notes that the "FY 2018–FY 2028 Strategic Plan for DOD T&E Resources'" report indicated that the

demand for directed energy test capabilities will soon expand from "demand for testing to address specific objectives of laboratory demonstrations" to "demand for testing to address requirements for validating a weapon system for operational use."

Accordingly, the committee recommends an increase of $15.0 million in RDT&E, Army, for PE 65601A Test Ranges and Facilities to fund directed energy test capabilities.

Precision Strike Missile

The budget request included $122.7 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 67134A Long Range Precision Fires.

The committee is supportive of the Precision Strike Missile (PrSM) program, including efforts to significantly increase range and versatility of the missile, but notes that the program is proceeding with a single vendor instead of two as originally planned and programmed.

Accordingly, the committee recommends a decrease of $7.5 million in RDT&E, Army, for PE 67134A for PrSM.

Guided Multiple-Launch Rocket System

The budget request included no funds in Research, Development, Test, and Evaluation (RDT&E), Army, to qualify a second source for solid rocket motors (SRMs) for the Guided Multiple-Launch Rocket System, Extended Range (GMRLRS–ER).

The committee is concerned that, as the Army transitions to the GMLRS–ER, a sole supplier of SRMs may not have the capacity to meet future production needs or provide a surge capacity, thus exposing the Army to the risk of disruption via a single point of failure.

Accordingly, the committee recommends an increase of $17.5 million in RDT&E, Army, for PE 25778A to qualify a second source of solid rocket motors for GMLRS–ER.

Advanced manufacturing technologies

The budget request included $61.0 million in Research, Development, Test, and Evaluation (RDT&E), Army, for PE 78045A End Item Industrial Preparedness Activities under the Manufacturing Technology Program.

The committee notes that the 2019 Army Modernization Strategy states that the Army is attempting to " fundamentally change the way [it] develop[s] materiel capability. Advanced manufacturing methods and materials will be incorporated into system design, development, production, and sustainment."

Therefore, the committee recommends the following increases in RDT&E, Army, for PE 78045A to support the advanced manufacturing of weapons and systems consistent with Army modernization priorities: $7.5 million for functional fabrics manufacturing; $5.0 million for tungsten manufacturing for armaments; and $5.0 million for nanoscale materials manufacturing.

Navy

Defense University Research and Instrumentation Program

The budget request included $116.8 million for Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 61103N University Research Initiatives.

The committee notes the importance of the competitive grant process managed by the Office of Naval Research (ONR), through which the Defense University Research Instrumentation Program (DURIP) funds the academic institutions' purchase and development of the research equipment and infrastructure necessary for high-quality Navy-relevant science. This instrumentation plays a vital role in allowing Department of Defense-critical research projects to acquire technical resources specifically engineered to meet their requirements and is critical in accelerating the development of operational capabilities for the warfighter. The technologies developed and acquired through the DURIP process ensure that the next generation of scientists and engineers are trained with and have access to cutting-edge equipment and infrastructure, including in the execution of research aboard Navy-supported academic research vessels.

Therefore, the committee recommends an increase of $2.0 million, in RDT&E, Navy, for PE 61103N for the Defense University Research and Instrumentation Program.

Increase in basic research, Navy

The budget request included $467.2 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 61153N Defense Research Sciences.

The committee recognizes the "increasingly complex security environment" detailed in the National Defense Strategy and born from rapid technological change, challenges from adversaries in every operating domain, and decreased readiness derivative of the longest continuous stretch of armed conflict in U.S. history. Accordingly, it is crucial to adequately fund, resource, and structure the Department of Defense to conduct RDT&E activities for critical emerging technologies to stay ahead of our adversaries, most notably Russia and China. Resources must be devoted and responsibly spent toward research and development of artificial intelligence, quantum computing, hypersonics, directed energy, biotechnology, autonomy, cyber, space, 5G, microelectronics, and fully networked command, control, and communications technologies. As such, the committee encourages rapid development, prototyping, testing, and acquisition of these emerging technologies in order to remain ahead of our adversaries.

Therefore, the committee recommends an increase of $10.0 million in RDT&E, Navy, for PE 61153N Defense Research Sciences to support additional basic research.

Predictive modeling for undersea vehicles

The budget request included $467.2 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 61153N Defense Research Sciences.

The committee notes that the designs of Naval undersea systems are increasing in complexity, scope, and sophistication. This, along with complex operating environments, makes advanced predictive modeling and computational tools for such systems difficult to develop. Without validated modeling tools, underwater vehicle and platform development relies heavily on experimentation, which can significantly lengthen the design phase, result in costly system-level rework, and restrict innovation.

The committee recommends an increase of $3.0 million in RDT&E, Navy, for PE 61153N for predictive modeling for undersea vehicles.

Direct air capture and blue carbon removal technology program

The budget request included $21.4 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $122.2 million was for PE 62123N Force Protection Applied Research.

The committee notes that the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92) required the Secretary of Defense, in coordination with the Secretary of Homeland Security, the Secretary of Energy, and the heads of such other Federal agencies as the Secretary of Defense considers appropriate, to carry out a program on research, development, testing, evaluation, study, and demonstration of technologies related to blue carbon capture and direct air capture.

Accordingly, the committee recommends an increase of $8.0 million in RDT&E, Navy, for PE 62123N for electric propulsion research for carbon capture.

Electric propulsion for military craft and advanced planning hulls

The budget request included $122.3 million for Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 62123N Force Protection Applied Research.

The committee notes the ongoing, yet increasing, operational tempo of naval special warfare maritime units such as the Special Warfare Combatant Craft and Coastal Riverine Force squadrons. The committee is aware that U.S. Special Operations Command has identified mission critical capability objectives for hybrid propulsion technologies and low signature management that, in the face of increasingly technologically advanced adversaries, are of substantial importance and should be supported.

Therefore, the committee recommends an increase of $2.0 million, in RDT&E, Navy, for PE 62123N for electric propulsion for military craft and advanced planning hulls.

Expeditionary unmanned systems launch and recovery

The budget request included $122.3 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 62123N Force Protection Applied Research.

The committee supports the Navy's investment in advanced fixed wing unmanned aerial vehicles and notes that, in order to support persistent operations in austere environments, additional investment in expeditionary launch and recovery capabilities is war-

ranted. The committee believes that it is important to conduct research and development related to the launch and recovery of expeditionary unmanned systems that enable high-efficiency, high-payload drones to take off and land on land and at-sea.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Navy, for PE 62123N to support expeditionary unmanned systems launch and recovery.

Testbed for autonomous ship systems

The budget request included $122.3 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 62123N Force Protection Applied Research.

The committee notes that a key technology gap for long-duration autonomous ship operation lies in the robustness and resiliency of the hull and machinery plant. The committee also notes that autonomous ships will be expected to operate for months between human-assisted maintenance and that autonomous machinery must be robust and resilient in order to avoid failure, repair damage, or redirect platforms as needed. The committee notes the development of digital-twin technologies that allow for predictive or automated maintenance and improved operations and logistics and help fill a critical gap that has been identified in autonomous systems.

Therefore, the committee recommends an increase of $3.0 million, in RDT&E, Navy, for PE 62123N for the development of a testbed for autonomous ship systems.

Interdisciplinary Cybersecurity Research

The budget request included $50.6 million for Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 62131M Marine Corps Landing Force Technology.

The committee notes the current research efforts to understand expeditionary cyber challenges and commends the interdisciplinary approach to developing solutions for cyber systems and considering the role of human behavior in the tactical cyber environment. The committee supports continued multidisciplinary research in the areas of dynamic cyber defense, tactical cyberspace operations and signals intelligence, sensing, computation, and mobile communications.

Therefore, the committee recommends an increase of $3.0 million, in RDT&E, Navy, for PE 62131M for interdisciplinary cybersecurity research.

Humanoid robotics research

The budget request included $67.8 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 62236N Warfighter Sustainment Applied Research.

The committee recognizes the promise of autonomous humanoid robotics for dangerous and repetitive jobs on ships designed primarily for use by human sailors. In particular, the Navy has identified shipboard firefighting and a number of shipboard maintenance tasks as ideal candidates for integrating the use of humanoid robots.

Therefore, the committee recommends an increase of $4.0 million in RDT&E, Navy, for PE 62236N for humanoid robotics research.

Social networks and computational social science

The budget request included $67.8 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 62236N Warfighter Sustainment Applied Research.

The committee supports the Navy's research efforts to: develop algorithms, methods, and tools for analysis of social hysteria propagation and group polarization; improve methods of information environment assessment and strategic communication; and refine detection of adversarial information maneuvers across social media platforms.

The committee recommends an additional $3.0 million in RDT&E, Navy, for PE 62236N for social networks and computational social science research.

Naval academic undersea vehicle research partnerships

The budget request included $56.4 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 62747N Undersea Warfare Applied Research.

The committee notes that partnerships among academia, government, and industry are instrumental in translating technological advances to emerging Navy undersea vehicles and systems in cost-effective ways, training a highly skilled workforce, and supporting increased and sustained submarine production capacity. Undersea dominance is an enduring capability that is a key foundation of our national defense and a core element of strategic overmatch in an era of great power competition.

Therefore, the committee recommends an increase of $7.5 million, in RDT&E, Navy, for PE 62747N for Navy and academia submarine partnerships.

Thermoplastic materials

The budget request included $160.5 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 62792N for Innovative Naval Prototypes Applied Research.

The committee recommends an increase of $7.3 million in RDT&E, Navy, for PE 62792N for continued development of technology to fabricate composite aircraft and ship parts from highly formable thermoplastic materials.

Mission planning advanced technology demonstration

The budget request included $219.0 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 63640M United States Marine Corps Advanced Technology Demonstration.

The committee supports the Department of Defense Unmanned Systems Integrated Roadmap and notes the importance of a robust intelligence, surveillance, and reconnaissance (ISR) platform for forward deployed operations in contested environments. The committee encourages the development of a Mission Support Station that allows mission plans to be created and then dynamically updated based on available data from numerous sources, including

weather, satellite imagery, sensor feeds, and other ISR from unmanned systems.

Therefore, the committee recommends an increase of $3.0 million in RDT&E, Navy, for PE 63640M for the mission planning advanced technology demonstration.

Unmanned surface vessel development

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $464.0 million was for PE 63178N Medium and Large Unmanned Surface Vehicles and $38.4 million was for PE 63573N Advanced Surface Machinery Systems.

The committee notes that the budget request provides for the prototyping and testing of Medium and Large Unmanned Surface Vessels (MUSVs and LUSVs), including procurement of up to two additional LUSVs in conjunction with a Strategic Capabilities Office (SCO) initiative. The committee understands that the 4 LUSVs procured by the SCO beginning in fiscal year 2018, at a cost of more than $510 million, are sufficient to achieve the objectives of the SCO initiative, which is scheduled to be completed in the fourth quarter of fiscal year 2021.

The committee believes that further procurement of MUSVs and LUSVs should occur only after the lessons learned from the current SCO initiative have been incorporated into the system specification and additional risk reduction actions are taken.

A specific area of technical concern for the committee is the Navy requirement for MUSVs and LUSVs to operate continuously at sea for at least 30 days without preventative maintenance, corrective maintenance, or emergent repairs. The committee is unaware of any unmanned vessel of the size or complexity envisioned for MUSV or LUSV that has demonstrated at least 30 days of such operation.

The committee understands that the SCO prototype vessels that are intended to provide risk reduction for these programs have demonstrated between 2 to 3 days of continuous operation. The committee also understands that the SCO vessels are approximately 25 percent the size by tonnage of a LUSV, which may limit the applicability of lessons learned and risk reduction from the SCO vessels to the MUSV and LUSV programs. Among other critical subsystems, the committee views the main engines and electrical generators in particular as key USV mechanical and electrical subsystems whose reliability is critical to ensuring successful operations at sea for at least 30 continuous days.

The committee also notes that additional funding is necessary to accelerate completion of the Integrated Power and Energy Systems test facility (ITF) to achieve full test capability in fiscal year 2023, consistent with section 131 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92), as well as the qualification of silicon carbide power modules.

Accordingly, the committee recommends a decrease of $464.0 million, for a total of $0, in RDT&E, Navy, for PE 63178N, and an increase of $200.0 million, for a total of $238.4 million in RDT&E, Navy, for PE 63573N.

The committee's intent is that the increased funding in PE 63178N be used for: the USV main engine and electrical generator qualification testing directed elsewhere in this Act ($70.0 million); USV autonomy development, which may include conversion of existing vessels ($45.0 million); accelerating ITF testing ($75.0 million); and accelerating the qualification of silicon carbide power modules ($10.0 million).

Advanced combat systems technology

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $70.2 million was for PE 63382N advanced combat systems technology.

The committee notes that project 3416 (HIJENKS) had insufficient schedule justification ($7.0 million) and project 3422 (SHARC) would procure excess platforms ahead of satisfactory testing ($7.1 million).

Accordingly, the committee recommends a decrease of $14.1 million, for a total of $56.1 million, in RDT&E, Navy, for PE 63382N.

Surface and shallow water mine countermeasures

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $52.4 million was for PE 63502N surface and shallow water mine countermeasures.

The committee notes Barracuda (project 2989) schedule delays, including a 2-year delay in the critical design review and developmental testing to fiscal years 2022 and 2024 respectively. The committee is also concerned that operational testing was removed from the program schedule and directs the Secretary of the Navy to restore such testing.

Accordingly, the committee recommends a decrease of $28.2 million, for a total of $24.2 million, in RDT&E, Navy, for PE 63502N.

Advanced submarine system development

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $185.4 million was for PE 63561N advanced submarine system development.

The committee notes that engineering development models are early to need in project 9710.

The committee also notes that additional funding ($20.0 million) could be used to complete procurement qualification of out-of-autoclave bow dome technology and demonstrate other components that utilize this technology for future use on Virginia-class and other classes of submarines.

Accordingly, the committee recommends a net increase of $10.0 million, for a total of $195.4 million, in RDT&E, Navy, for PE 63561N.

Ship concept advanced design

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $126.4 million was for PE 63563N ship concept advanced design.

The committee lacks sufficient clarity on the capability requirements to support the following ship design efforts: Future Surface

Combatant (project 2196, $19.1 million), next generation medium amphibious ship (project 4044, $30.0 million), and next generation medium logistics ship (project 4045, $30.0 million).

The committee supports the Conditions Based Maintenance + (CBM+) initiative, which improves the cost, schedule, and performance outcomes in ship maintenance availabilities using analytic tools. The committee understands that additional funds ($16.0 million) could accelerate the implementation of the CBM+ initiative.

Accordingly, the committee recommends a decrease of $63.1 million, for a total of $63.3 million, in RDT&E, Navy, for PE 63563N.

Large Surface Combatant preliminary design

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $70.2 million was for PE 63564N ship preliminary design and feasibility studies.

The committee lacks sufficient clarity on the Large Surface Combatant (LSC) capability requirements and the program's compliance with section 131 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92) to support the start of preliminary design for the LSC program or completion of the Capabilities Development Document (project 0411).

Accordingly, the committee recommends a decrease of $41.3 million, for a total of $29.0 million, in RDT&E, Navy, for PE 63564N.

Additionally, the committee directs the Secretary of the Navy to submit a report with Navy's fiscal year 2022 budget request that details the plan to comply with the requirements of section 131 of the National Defense Authorization Act for Fiscal Year 2020.

Littoral Combat Ship

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $32.2 million was for PE 63581N Littoral Combat Ship.

The committee notes available prior year funds in project 3096.

Accordingly, the committee recommends a decrease of $5.0 million, for a total of $27.2 million, in RDT&E, Navy, for PE 63581N.

LCS mission modules

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $67.9 million was for PE 63596N LCS mission modules.

The committee notes that the Littoral Combat Ship mine countermeasures mission package has an outdated integrated master schedule and test and evaluation master plan (project 2550). The committee also notes available prior year funds due to testing delays (project 2551).

Accordingly, the committee recommends a decrease of $35.0 million, for a total of $32.9 million, in RDT&E, Navy, for PE 63596N.

Conventional munitions

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $9.9 million was for PE 63609N conventional munitions.

The committee notes insufficient justification to support insensitive weapons development (project 0363).

Accordingly, the committee recommends a decrease of $7.8 million, for a total of $2.1 million, in RDT&E, Navy, for PE 63609N.

Surface Navy Laser Weapon System

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $128.8 million was for PE 63925N directed energy and electric weapon systems.

The committee notes excess engineering and sustainment support costs for the Surface Navy Laser Weapon System (project 3402).

Accordingly, the committee recommends a decrease of $15.0 million, for a total of $113.8 million, in RDT&E, Navy, for PE 63925N.

Large unmanned undersea vehicles

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $78.1 million was for PE 64031N large unmanned undersea vehicles.

The committee notes excess procurement ahead of Snakehead phase 1 testing, which is scheduled for fiscal year 2022. The committee seeks to avoid excess procurement of these systems in advance of satisfactory testing.

Accordingly, the committee recommends a decrease of $36.0 million, for a total of $42.1 million, in RDT&E, Navy, for PE 64031N.

Advanced undersea prototyping

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $115.9 million was for PE 64536N advanced undersea prototyping.

The committee notes that the Snakehead and Orca test strategies require updates to enable certification by the Director of Operational Test and Evaluation in accordance with the Senate report accompanying the Department of Defense Appropriations Bill, 2020, incorporated into the Consolidated Appropriations Act, 2020 (S. Rept. 116–103). Additionally, the committee is aware of Orca testing delays.

Accordingly, the committee recommends a decrease of $20.0 million, for a total of $95.9 million, in RDT&E, Navy, for PE 64536N.

Hypersonic program reduction, Navy

The budget request included $1.1 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 64659N Precision Strike Weapons Development Program.

The committee recognizes the importance of hypersonics research and development, especially in light of the National Defense Strategy and the advancing threats posed by adversaries. However, the committee is concerned that there has been a lack of adequate coordination on hypersonics prototyping efforts among the various stakeholders and service components.

Therefore, the committee recommends a decrease of $5.0 million in RDT&E, Navy, for PE 64659N Precision Strike Weapons Development Program.

Conventional prompt strike

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $1.1 billion was for PE 64659N precision strike weapons development program.

The committee notes that the budget request included modification and installation costs for conventional prompt strike weapons integration on two *Virginia*-class submarines but included funds for the procurement of only one *Virginia*-class submarine. Therefore, modification and installation costs are early to need for one *Virginia*-class submarine.

Accordingly, the committee recommends a decrease of $52.0 million, for a total of $1.1 billion, in RDT&E, Navy, for PE 64659N.

The committee supports conventional prompt strike weapons development and the associated submarine integration. However, the committee lacks clarity on the requirement, including the inventory objective, for submarines capable of employing these weapons and notes that projected funding through fiscal year 2025 will total more than $900.0 million for submarine design, modification, and installation costs for such weapons.

Therefore, the committee directs the Chief of Naval Operations to submit to the congressional defense committees not later than March 30, 2021, approved requirements, including the inventory objective by ship class, for submarines capable of employing conventional prompt strike weapons. The Chief of Naval Operations shall coordinate this response with a related report from the Chairman of the Joint Chiefs of Staff on mission planning and force structure for hypersonic weapon systems, which is required elsewhere in this Report and due on the same date.

Additionally, the committee directs the Secretary of Navy to request funding required for new construction submarine modification and installation costs associated with conventional prompt strike weapons as part of the end cost of each such submarine in the Shipbuilding and Conversion, Navy account in future budget submissions.

Submarine tactical warfare systems

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $63.9 million was for PE 64562N submarine tactical warfare systems.

The committee notes AN/BYG–1 APB17 and APB19 testing delays.

Accordingly, the committee recommends a decrease of $5.0 million, for a total of $58.9 million, in RDT&E, Navy, for PE 64562N.

Advanced degaussing

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $51.9 million was for PE 64567N ship contract design.

The committee understands that, since legacy degaussing systems for surface combatants were developed, alternative methods for performing this function have proven to be more capable and cost-effective.

The committee believes that conducting an installation and demonstration of advanced degaussing capability on an existing *Arleigh*

Burke-class destroyer is warranted to evaluate the utility of such a capability for further forward-fit and back-fit on naval vessels.

Accordingly, the committee recommends an increase of $14.9 million, for a total of $66.8 million, in RDT&E, Navy, for PE 64567N.

Lightweight torpedo development

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $146.0 million was for PE 64610N lightweight torpedo development.

The committee notes High Altitude Anti-Submarine Warfare Weapon operational testing delays (project 1412) and Mk 54 Mod 2 torpedo contract delays (project 3418).

Accordingly, the committee recommends a decrease of $30.0 million, for a total of $116.0 million, in RDT&E, Navy, for PE 64610N.

Submarine acoustic warfare development

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $69.2 million was for PE 11226N submarine acoustic warfare development.

The committee notes that the Compact Rapid Attack Weapon engineering design model (TI–2) is early to need.

Accordingly, the committee recommends a decrease of $8.0 million, for a total of $61.2 million, in RDT&E, Navy, for PE 11226N.

Integrated surveillance system

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $103.0 million was for PE 24311N integrated surveillance system.

The committee notes that, since fiscal year 2015, the Navy has utilized Transformational Reliable Acoustic Path Systems (TRAPS) in anti-submarine warfare missions. The committee understands that these deployable systems have performed satisfactorily and comprise a critical element of the Navy's overall integrated undersea surveillance system. The committee is concerned that capability or capacity gaps may result if additional spiral 1 TRAPS units are not procured in fiscal year 2021.

In addition, the committee understands that additional funding in project 0766 could accelerate the development, configuration, and integration of advanced sensors and associated signal processing into representative system sensor packages for developmental and operational testing.

Accordingly, the committee recommends an increase of $50.0 million, for a total of $153.0 million, in RDT&E, Navy, for PE 24311N.

LCAC composite component development

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $1.7 million was for PE 24413N amphibious tactical support units.

The committee understands that additional investment in advanced composites manufacturing for air cushion vehicle components, including propeller blades and composite deck house modules, could reduce the overall acquisition and life cycle costs of the Navy's air cushioned landing crafts.

Accordingly, the committee recommends an increase of $5.0 million, for a total of $6.7 million, in RDT&E, Navy, for PE 24413N.

G/ATOR demonstration

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $22.2 million was for PE 24460M Ground/Air Task Oriented Radar.

The committee believes that the Joint Force, particularly the Marine Corps, could derive significant warfighting benefits in the integrated air and missile defense mission area from integrating the AN/TPS–80 Ground/Air Task-Oriented Radar (G/ATOR) with Standard Missile–6 (SM–6) and the Cooperative Engagement Capability (CEC) network.

The committee understands that a proof-of-concept demonstration using a G/ATOR to conduct an SM–6 engagement would require $73.6 million, which includes the procurement of a G/ATOR that would remain a dedicated test asset.

The committee further understands that the G/ATOR is capable of providing tracks, via the USMC Composite Tracking Network (CTN), to the CEC network. However, changes to the CTN are required to enable completion of an Engage On Remote capability between Navy surface combatants and a G/ATOR.

The committee further understands it would cost approximately $10.0 million to analyze the feasibility of a stand-alone G/ATOR and SM–6 engagement.

The committee notes that the Marine Corps is supportive of conducting such a demonstration and analysis, which would consist of two tracking events and a live fire shoot, coordinated with the Navy, in fiscal year 2022.

Accordingly, the committee recommends an increase of $83.6 million, for a total of $105.8 million, in RDT&E, Navy, for PE 24460M.

Attack and utility replacement aircraft vehicle

The budget request included $21.5 billion in Research, Development, Test, and Evaluation (RDT&E), Navy, of which $18.1 million was for PE 64212N, Other Helo Development, including $11.3 million for development of an attack and utility replacement aircraft (AURA) vehicle.

The Navy AURA program has been has been following the Army's development of the Future Long Range Assault Aircraft (FLRAA), applying lessons learned from the Army program, and assessing subsystem commonality with the Army development efforts.

The committee supports such cooperation, urges the Navy and Army to expand these efforts, and recommends an increase of $5.0 million in PE 64212N for that purpose.

Cyber tool development

The budget request included $35.0 million in Research, Development, Test, and Evaluation (RDT&E), Navy, for PE 35251N Cyber Space Operations Forces and Force Support.

The committee recognizes the importance of the Navy Cyber Warfare Development Group (NCWDG), which benefits enormously from its unique intelligence, prototyping, and acquisition authori-

ties and nesting within U.S. Fleet Cyber Command. The committee encourages the Army and Air Force to evaluate the authorities available to and organizational alignment of the NCWDG and the feasibility of modeling their tool development organizations and activities after the NCWDG. The committee also understands that the funding for development and acquisition of operational tools across the Navy and Army is insufficient for the development and acquisition of foundational tool suits, a critical component of the Joint Cyber Warfighting Architecture.

Therefore, the committee recommends an increase of $10.0 million in RDT&E, Navy, for PE 35251N Cyber Space Operations Forces and Force Support for cyber tool development.

Air Force

Increase in basic research, Air Force

The budget request included $315.3 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 61102F Defense Research Sciences.

The committee recognizes the "increasingly complex security environment" detailed in the National Defense Strategy and born from rapid technological change, challenges from adversaries in every operating domain, and decreased readiness derivative of the longest continuous stretch of armed conflict in U.S. history. Accordingly, it is crucial to adequately fund, resource, and structure the Department of Defense to conduct RDT&E activities for critical emerging technologies to stay ahead of our adversaries, most notably Russia and China. Resources must be devoted and responsibly spent toward research and development of artificial intelligence, quantum computing, hypersonics, directed energy, biotechnology, autonomy, cyber, space, 5G, microelectronics, and fully networked command, control, and communications technologies. As such, the committee encourages rapid development, prototyping, testing, and acquisition of these emerging technologies in order to remain ahead of our adversaries.

Therefore, the committee recommends an increase of $10.0 million in RDT&E, Air Force, for PE 61102F Defense Research Sciences to support additional basic research.

High Energy Synchrotron X-Ray program

The budget request included $140.8 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 62102F Materials.

The committee notes the value of continued funding for high-energy X-ray beamlines optimized for Air Force research needs. This research capability enables Air Force Research Laboratory researchers, collaborators, and original equipment manufacturers to employ real-time, three-dimensional x-ray characterization methods to test a broad range of mission-critical structural and functional materials. The committee notes the value of this research to high performance materials for tactical aircraft, the understanding of metal fatigue, processes for additive manufacturing technologies, and scientific workforce development.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Air Force, for PE 62102F for the High Energy Synchrotron X-Ray research program.

Materials maturation for high mach systems

The budget request included $140.8 million for Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 62102F Materials.

The committee notes the importance of advanced thermal protection systems (TPSs) research to enable efficient operation of high-speed vehicles for military and commercial aerospace needs. The committee further notes that much scientific and technical work remains in the exploration of the capabilities of the high temperature materials and associated coatings, identification of non-destructive inspection techniques, study of initiation and progression of material damage in severe flight environments, and transition of the technology into advanced load-bearing TPSs.

Therefore, the committee recommends an increase of $5.0 million, in RDT&E, Air Force, for PE 62102F for materials maturation for high mach systems.

Metals Affordability Initiative

The budget request included $140.8 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 62102F Materials.

The committee recognizes the importance of the Metals Affordability Initiative as an innovative public-private partnership that makes metals for warfighter needs lighter, stronger, and more affordable. Since the program's inception in 1999, the MAI has saved taxpayers over $2 billion, and has a 10:1 return on taxpayer investment, by increasing yields, decreasing maintenance costs, and minimizing time and expense for metals manufacturing for Air Force needs.

Therefore, the committee recommends an increase of $5.0 million in PE 62102F Materials to support the Metals Affordability Initiative.

Qualification of additive manufacturing processes

The budget request included $140.8 million for Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 62102F Materials.

The committee notes that Executive Order 13806, "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resilience of the United States," points to "gaps in the national-security-related domestic manufacturing capabilities, including non-existent, extinct, threatened and single-point-of-failure capabilities." The committee also notes that a great deal of additive manufacturing research and development is conducted openly on commercially available systems, allowing adversaries access to substantial innovation. The committee supports further development of additive manufacturing processes that leverage unclassified innovations for sensitive and classified weapon systems.

Therefore, the committee recommends an increase of $2.0 million, in RDT&E, Air Force, for PE 62102F for qualification of additive manufacturing processes.

Technologies to repair fasteners

The budget request included $103.3 million for Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 63030F Air Force Foundational Development/Demos.

The committee notes that the galvanic corrosion of fastener holes in carbon-composite and aluminum alloy airframes is a significant maintenance burden and a source of aircraft downtime. The committee believes that the development of inexpensive and reliable technologies that can repair fastener holes could reduce maintenance costs and extend the useful lifetime of the F–22 and F–35.

Therefore, the committee recommends an increase of $2.5 million, in RDT&E, Air Force, for PE 63030F for technologies to repair fasteners.

Hypersonic materials

The budget request included $349.2 million in Research, Development, Test, and Evaluation, Air Force (RDAF), for PE 62201F Aerospace Vehicle Technologies.

The committee supports the Air Force's efforts to design and test materials capable of withstanding the hypersonic environment.

Accordingly, the committee recommends an increase of $10.0 million in RDAF for PE 62201F.

Golden Horde Vanguard program reductions

The budget request included $157.6 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 63032F Future AF Integrated Technology Demos.

The committee recognizes the importance of programs that support the transition of promising innovative science and technology programs into formal acquisition or operational use. The committee notes that these efforts are more appropriately funded outside of the limited funding available for science and technology efforts themselves.

Therefore, the committee recommends a decrease of $50.0 million in RDT&E, Air Force, for PE 63032F Future AF Integrated Technology Demos for Golden Horde Vanguard program reductions. The committee report reallocates this funding to high priority science and technology activities in support of the National Defense Strategy.

Fixed-wing improvements

The budget request included $199.6 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 63033F Next Gen Platform Dev/Demo.

The committee notes that Air Force efforts to improve B–52 flight operations resulted in a 6.6 percent performance gain, saving 4.2 million gallons of fuel per year, and a positive return on investment in less than 1 year. Flight data analysis also showed that not pursuing efficiencies resulted in increased fuel burn and costs, 350 additional maintenance hours per year, and 41 days of non-mission

capable status for landing gear maintenance. Analysis for KC–135 aft body drag reduction devices show savings of $7.5 million per year.

Accordingly, the committee recommends the following increases: $3.0 million for B–52 pylon fairings, $3.0 million for C–130 finlets, and $3.0 million for KC–135 aft body drag, in RDT&E, Air Force, for PE 63033F Next Gen Platform Dev/Demo.

AETP/NGAP

The budget request included $636.5 million in Research, Development, Test, and Evaluation, Air Force (RDAF), for PE 64004F Advanced Engine Development.

The committee supports the Air Force's efforts to develop state of the art engine technology that has the potential to provide expanded flight envelopes with increases in thermal and power production at the same time. The committee encourages the Air Force to accelerate this revolutionary technology to achieve the increase in combat capability.

Accordingly, the committee recommends an increase of $50.0 million in RDAF for PE 64004F.

Directed energy counter-Unmanned Aerial Systems (CUAS)

The budget request included $21.0 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 64032F Directed Energy Prototyping.

Unmanned aerial systems (UASs) pose a growing threat to U.S. forces. The development of directed energy capabilities to counter UASs and cruise missiles is critical, as employment of such defensive capabilities would impose substantial costs on adversaries.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Air Force, for PE 64032F.

Advanced Hypersonic Air-breathing Weapon

The budget request included $381.9 million in Research, Development, Test, and Evaluation, Air Force (RDAF), for PE 64033F Hypersonic Prototyping.

The committee supports the Air Force's efforts in developing air-breathing hypersonic missiles but is concerned that the Air Force has not provided sufficient resources to successfully transition the Hypersonic Air Breathing Weapon being developed by the Defense Advanced Research Projects Agency (DARPA), in partnership with the Air Force, based on the recent successes and acceleration of the DARPA program.

Accordingly, the committee recommends an increase of $65.0 million in RDAF for PE 64033F.

KC–135 operational energy increases

The budget request included $219.3 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 64858F Tech Transition Program.

The committee notes that roughly 60 percent of operational energy use occurs in the Air Force at a cost of over $5.4 billion per year. One of the greatest consumers of fuel in the Air Force is the KC–135. Just switching from horizontal to vertical wiper blades

with a $2 million investment can save almost $10 million each year. Using low-cost flight planning software instead of traditional practices can decrease the workload for flight planners by roughly 300 hours per month. In the air, the same planning software has been shown to improve flight efficiency by at least 10 percent, which saves $75.0 million per year.

Accordingly, the committee recommends the following increases: $4.5 million for agile software development and operations, $10.0 million for KC–135 winglets, and $2.0 million for KC–135 vertical wipers in RDT&E, Air Force, for PE 64855F Tech Transition Program.

Polar communications

The budget request included $219.0 million in Research, Development, Test, and Evaluation (RDT&E), Space Force, for PE 64858F Tech Transition.

The committee understands that strategic satellite communication is vital to national security and that there exists a potential 7-year gap in resilient capability coverage. Additionally, the Commander, U.S. Northern Command, has warned about a lack of basic and reliable communications in the northern most latitudes, communications that the Department of Defense will need to help respond to great power competition. The committee is aware of recent developments in low- and medium-earth orbit communications that could support additional satellite capability to begin to establish more robust communications at these northern latitudes.

Therefore, the committee recommends and increase of $46.0 million in RDT&E, Space Force, for PE 64858F for strategic satellite communications capability.

Low-Cost Attritable Aircraft Technology

The budget request included $219.3 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 64858F Tech Transition Program.

The committee supports the Assistant Secretary of the Air Force for Acquisition, Technology, and Logistics' intent to accelerate the Air Force Research Laboratory's Low-Cost Attributable Aircraft Technology XQ–58 program for collaborative pairing with manned platforms, potentially including the F–35. The committee views the combined application of commercial technology, autonomy, and artificial intelligence as an innovative solution to meeting the demands of the National Defense Strategy.

Accordingly, the committee recommends an increase of $128.0 million, in RDT&E, Air Force, for PE 0604858F for the purchase of additional XQ–58 aircraft and operationally relevant testing.

Long Endurance UAS

The budget request included $219.3 million in Research, Development, Test, and Evaluation, Air Force (RDAF), for PE 64858F Tech Transition Program.

The committee supports the Air Force's effort to provide an alternative to traditional space assets by using unmanned vehicles to provide persistent over the horizon surveillance, targeting, and tactical communications capability.

Accordingly, the committee recommends an increase of $33.5 million in RDAF for PE 64858F for long endurance unmanned aircraft systems.

Rapid repair of high performance materials

The budget request included $219.3 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 64858F Tech Transition Program.

The committee recognizes the importance of further advancement of systems that can be used to repair high performance materials for the Department of Defense. The committee highly encourages further integration of portable deployable systems.

Accordingly, the committee recommends an increase of $6.0 million, in RDT&E, Air Force, for PE 64858F for development of technologies to enable the rapid repair of high performance materials.

Small satellites

The budget request included $219.3 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 64858F Technology Transition Program.

The committee is encouraged by the Department of Defense's focus on small satellite capabilities and supports the growth and expansion of the space industry capabilities in this critical technology area.

Therefore, the committee recommends an increase of $6.0 million in RDT&E, Air Force, for PE 64858F for small satellites.

Air Force Open Systems Integration

The budget request included no funding in Research, Development, Test, and Evaluation, Air Force (RDAF), for PE 0604429F Airborne Electronic Attack.

The committee supports the Air Force's initiative to transition the Systems of Systems Technology Integration Tool Chain for Heterogeneous Electronic Systems (STITCHES) capability to the 850th Electronic Warfare Group. This open systems integration solution provides critical capability across the Department of Defense. The committee was disappointed to learn that the transition was authorized but failed to capture the required funding.

Accordingly, the committee recommends an increase of $30.0 million in RDAF for PE 0604429F for STITCHES transition activities.

SLATE/VR Training

The budget request included $248.7 million in Research, Development, Test, and Evaluation, Air Force (RDAF), for PE 0605223F Advanced Pilot Training.

The committee supports the effort to accelerate the fielding of commercially developed airborne augmented reality for: (1) Inflight learning; (2) Operational training; (3) Advancing learning and performance assessment science and practice by integrating and testing advanced airborne augmented reality prototypes in Air Force training aircraft; and (4) Active Air Force fighters through initial integration activities for the F–16.

Accordingly, the committee recommends an increase of $6.0 million in RDAF for PE 0605223F.

Gulf Test Range modernization

The budget request included $208.7 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 64759F Major T&E Investment.

The committee notes its support for the next phase in the Gulf Test Range telemetric modernization process.

Therefore, the committee recommends an increase of $15.0 million in RDT&E, Air Force, for PE 64759F for Gulf Test Range modernization.

Enterprise Resource Planning Common Services

The budget request included $9.9 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 38602F Enterprise Information Services.

The committee remains concerned about the Air Force's development of Enterprise Resource Planning Common Services with respect to implementing best practices for the frequency of capability delivery to end users and notes that the acquisition strategy for this program is inconsistent with the Air Force's digital modernization strategy.

The committee recommends a reduction of $7.5 million in RDT&E, Air Force, for PE 38602F.

Advanced Air to Air capability

The budget request included $15.8 billion in Research, Development, Test, and Evaluation, Air Force (RDAF), for PE 9999999 Classified Programs.

The committee supports the Air Force's efforts in developing advanced air-to-air weapons to enable air superiority, which is fundamental to achieving victory in any conflict.

Accordingly, the committee recommends an increase of $62.0 million in RDAF for PE 999999.

Air Force Integrated Personnel and Pay System

The budget request included $27.0 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 65018F Air Force Integrated Personnel and Pay System (AF–IPPS).

The committee notes its continuing concern with AF–IPPS implementation of best practices for frequency of capability delivery to end users and that the acquisition strategy for this program is inconsistent with the Air Force's digital modernization strategy.

Therefore, the committee recommends a decrease of $20.0 million in RDT&E, Air Force, for PE 65018F.

B–1B Squadrons

The budget request included $15.8 million in Research, Development, Test, and Evaluation, Air Force (RDAF), for PE 11126F B–1B Squadrons.

The committee supports the Air Force's request to realign funds to support certain B–1 radio cryptographic modernization requirements within this account.

Accordingly, the committee recommends an increase of $10.8 million in RDAF for PE 11126F for cryptographic modernization activities.

PDI: Mission Partner Environment (MPE) local upgrades, U.S. Indo-Pacific Command

The budget request included $13.6 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 35600F International Intelligence Technology and Architectures.

The unfunded priorities list submitted by the Commander, U.S. Indo-Pacific Command (INDOPACOM), included additional funding for Mission Partner Environment (MPE) local upgrades to modernize the command, control, communications, and computers architecture in the INDOPACOM area of responsibility and provide local systems to support and enhance operations with allies and partners.

Therefore, the committee recommends an increase of $3.7 million in RDT&E, Air Force, for PE 35600F, specifically for the BICES–X program.

C–17 microvanes

The budget request included $9.9 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 41130F C–17 Aircraft (IF).

The committee supports efforts to increase efficiency and to reduce costs associated with fuel burn. The committee notes that the Air Force estimates savings of approximately $10.0 million per year, with less than a 4-month positive return on investment, through the use of C–17 microvanes, which have been shown to streamline airflow and reduce drag.

Accordingly, the committee recommends an increase of $3.0 million in RDT&E, Air Force, for PE 41130F for the fielding of C–17 microvanes.

Logistics Information Technology

The budget request included $35.2 million in Research, Development, Test, and Evaluation (RDT&E), Air Force, for PE 78610F Logistics Information Technology (LOGIT).

The committee notes its concern with the progress of the Item Master effort with respect to implementation of best practices for frequency of capability delivery to end users and that the acquisition strategy for this program is inconsistent with the Air Force's digital modernization strategy.

Therefore, the committee recommends a decrease of $20.0 million in RDT&E, Air Force, for PE 78610F.

Small satellite mission operations center

The budget request included $139.9 million in Research, Development, Test, and Evaluation (RDT&E), Space Force, for PE 1206601SF Space Technology Applied Research.

The committee believes that there is significant potential in small satellite missions and that a central operations center would provide synergy to the ongoing Department of Defense efforts.

Therefore, the committee recommends an increase of $3.0 million in RDT&E, Space Force, for PE 1206601SF for a small satellite mission operations center.

GPS User Equipment

The budget request included $390.7 million in Research, Development, Test, and Evaluation (RDT&E), Space Force, for PE 1203164SF NAVSTAR Global Positioning System (User Equipment) (SPACE).

The committee understands that the modernized Global Positioning System user equipment program for the Space Force has slipped by over a year and that more delays are possible.

Therefore, the committee recommends a decrease of $20.0 million in RDT&E, Space Force, for PE 1203164SF.

National Security Space Launch technology development

The budget request included $561.0 million in Research, Development, Test, and Evaluation (RDT&E), Space Force, for PE 1206853SF National Security Space Launch Program (SPACE)—EMD.

Elsewhere in this Act, the committee recommends a provision that would require the Secretary of the Air Force to establish a program to develop technologies and systems to enhance phase three National Security Space Launch requirements and enable further advances in launch capability associated with the insertion of national security payloads into relevant classes of orbits.

Therefore, the committee recommends an increase of $30.0 million in RDT&E, Space Force, for PE 1206853SF. This increase would resource this important program.

Cobra Dane service life extension

The budget request included $28.2 million in Research, Development, Test, and Evaluation, Space Force (RDSF), for PE 1203873SF Ballistic Missile Defense Radars.

The committee notes that, because of projected delays in fielding two homeland defense radars in the Indo-Pacific area of responsibility, Cobra Dane will now be required to exceed its originally planned life expectancy. The committee also notes that this project was included on the unfunded priorities list submitted by the Commander, U.S. Northern Command and North American Aerospace Defense Command.

Accordingly, the committee recommends an increase of $18.5 million in RDSF for PE 120387SF to accelerate the service life extension of the Cobra Dane radar.

Commercial space domain awareness

The budget request included $86.7 million in Research, Development, Test, and Evaluation (RDT&E), Space Force, for PE 1203940SF Space Situation Awareness Operations.

The committee believes that, in an increasingly crowded environment, the space situational awareness (SSA) mission is essential to U.S. Government and commercial space operations. The committee views the use of commercial data for this mission as an important part of an integrated approach to achieving SSA.

Therefore, the committee recommends an increase of $7.0 million in RDT&E, Space Force, for PE 1203940SF for commercial procurement of SSA data.

Global Positioning System III—Operational Control Segment

The budget request included $482.0 million in Research, Development, Test, and Evaluation (RDT&E), Space Force, for PE 1206423SF Global Positioning System III—Operational Control Segment.

The committee believes that Global Positioning System modernization is a critical milestone for achieving the lethal force envisioned in the National Defense Strategy but sees this request as excess to need.

Therefore, the committee recommends a decrease of $65.0 million in RDT&E, Space Force, for PE 1206423SF.

Defense Wide

Defense Established Program to Stimulate Competitive Research

The budget request included $35.6 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 61110D8Z Basic Research Initiatives.

The committee recognizes the importance of the Defense Established Program to Stimulate Competitive Research (DEPSCoR). The program helps increase the number of university researchers and improve the capabilities of institutions of higher education in eligible jurisdictions to perform competitive research relevant to the Department of Defense.

Therefore, the committee recommends an increase of $20.0 million in RDT&E, Defense-wide, for PE 61110D8Z for DEPSCoR.

Minerva Research Initiative

The budget request included $35.6 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 61110D8Z Basic Research Initiatives.

The committee is concerned by the proposed divestment in social science research programs within the Office of the Under Secretary of Defense for Research and Engineering and the Army's withdrawal from Minerva Research Initiative in recent years. At a time when peer and near-peer adversaries are increasingly employing strategies of malign influence and disinformation, maintaining the Nation's technological superiority in the face of these threats requires not only investing in physical sciences but also the integration of cross-disciplinary research that explores the social, cultural, behavioral, political, historical, and religious drivers of today's increasingly complex global security environment.

Therefore, the committee recommends an increase of $17.0 million in RDT&E, Defense-wide, for PE 61110D8Z Basic Research Initiatives for the Minerva research initiative.

The committee further notes that the National Academies of Science, Engineering, and Medicine's 2020 review of Minerva's accomplishments found that, despite facing challenges with establishing a stable, well-functioning organizational structure as well as resource limitations, the program has made important contributions. The study found that the program has had a positive impact on the amount of dialogue between the Department of Defense and

the social science community, the number of social science researchers with an interest in research relevant to national security, and the amount of collaboration among researchers working on topics relevant to national security. The committee directs the Under Secretary of Defense for Research and Engineering to review the findings of this report and brief the congressional defense committees on planned responses to the report's recommendations, no later than March 1, 2021.

Traumatic brain injury medical research

The budget request included $53.7 million for Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 61117E Basic Operational Medical Research Science.

The committee notes the importance of continued medical research conducted by the Army Futures Command and Army Research Laboratory to advance the prevention, detection, and treatment of acute traumatic brain injury (TBI). The committee notes that TBIs are associated with a variety of long-term effects and are prevalent in military and civilian settings. The committee supports this funding increase to help the Army to prevent TBI incidence and ultimately develop prevention, detection, and treatment methodologies that could be used to protect the entire Joint Force as well as civilian populations.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Defense-wide, for PE 61117E for traumatic brain injury medical research.

Aerospace, education, research, and innovation activities

The budget request included $31.0 million for Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 61228D8Z Historically Black Colleges and Universities/Minority Institutions.

The committee notes the importance of fundamental research and the pipeline of highly qualified technical talent in support of long-term national security needs. The committee supports increased funding for aerospace education and research activities at Historically Black Colleges and Universities/Minority Institutions to promote the expansion of the future aerospace technical workforce, especially among U.S. citizens, and to enhance research in areas such as fatigue damage tolerance, experimental aerodynamics, and the performance of materials and components under extreme environmental conditions.

Therefore, the committee recommends an increase of $2.0 million in RDT&E, Defense-wide, for PE 61228D8Z Historically Black Colleges and Universities/Minority Institutions for aerospace education, research, and innovation activities.

Historically Black Colleges and Universities/Minority Institutions

The budget request included $31.0 million for Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 61228D8Z Historically Black Colleges and Universities/Minority Institutions.

The committee notes the importance of increasing the Department of Defense's (DOD) partnerships with Historically Black Colleges and Universities (HBCUs). These HBCU institutions can support the Department of Defense's needs for high quality research as well as serve as a source for United States citizens with science, technology, engineering, and mathematics training who can support national security technology missions.

Therefore, the committee recommends an increase of $5.0 million, in RDT&E, Defense-wide, for PE 61228D8Z.

Emerging biotech research

The budget request included $250.1 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 62715E Materials and Biological Technology.

The committee recognizes the importance of protecting warfighter populations stationed domestically and abroad in the event of a pandemic. The committee supports expanding rapid response vaccine capabilities and capacity that can meet the needs of this population in the event of an outbreak. The committee commends the Department of Defense for its prior efforts, conducted by the Defense Advanced Research Projects Agency, to pursue novel rapid production capabilities and directs the Department to pursue late-stage multi-modal platform technologies capable of responding to pandemics such as influenza, COVID–19, and future infectious diseases.

Therefore, the committee recommends an increase of $40.0 million in RDT&E, Defense-wide, for PE 62715E for an increase in emerging biotechnology research.

Operational Fires program reduction, Defense-wide

The budget request included $231.0 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 63286E Advanced Aerospace Systems.

The committee recognizes the importance of coordinating various service and agency hypersonics activities and is concerned with the lack of a transition pathway for the Defense Advanced Research Projects Agency's Operational Fires effort into a funded Army acquisition or development activity.

Therefore, the committee recommends a decrease of $20.0 million in RDT&E, Defense-wide, for PE 63286E for a reduction in the Operational Fires program.

Hypersonic program reduction

The budget request included $102.0 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 64331D8Z Rapid Prototyping Program.

The committee recognizes the importance of hypersonic research and development, especially in light of the National Defense Strategy and the advancing threats that it describes. However, the committee is concerned that there has been a lack of adequate coordination on hypersonic prototyping efforts among the various stakeholders and service components.

Therefore, the committee recommends a decrease of $20.0 million in RDT&E, Defense-wide, for PE 64331D8Z for hypersonic program reduction.

Stratospheric balloon research

The budget request included $133.4 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 63338D8Z Defense Modernization and Prototyping.

The committee recognizes the increasing importance of stratospheric balloons in command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) and missile defense missions. The committee is concerned that, as projects move from the Office of Secretary of Defense's Missile Defeat Project to elsewhere in the Department, transition of prior research will be insufficient. Specifically, the committee is concerned that the Trippwire high altitude demonstration program, previously funded under the Missile Defeat Project, lacks specific budgetary continuity. The committee understands that the Trippwire technologies still require testing and evaluation activities before they can transition to the military services as a program of record.

Therefore, the committee recommends an increase of $13.0 million in RDT&E, Defense-wide, for PE 63338D8Z for stratospheric balloon research.

Rapid prototyping using digital manufacturing

The budget request included $93.8 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 63680D8Z Manufacturing Technology.

The committee notes that high performance computing, when combined with additive manufacturing, has the potential to significantly support the ability for forward deployed forces and the defense industrial base to make optimal use of the additive manufacturing capabilities. High performance computing assets can be used to optimize design processes, support real time monitoring of manufacturing processes and product quality, and support detailed data analyses of critical parts. The Department of Defense has indicated that the use of high performance computing addresses a critical capability required in implementation of additive manufacturing.

The committee recommends an increase of $5.0 million in RDT&E, Defense-wide, for PE 63680D8Z Manufacturing Technology for rapid prototyping using digital manufacturing.

Defense supply chain technologies

The budget request included $40.0 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 63680S Manufacturing Technology Program.

The committee recognizes the potential of academic partnership programs to increase the adoption of additive manufacturing, automation, and robotics metal-casting technologies among small-to-medium businesses in the defense industrial base.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Defense-wide, for PE 63680S for defense supply chain technologies.

Steel Performance Initiative

The budget request included $40.0 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 63680S Manufacturing Technology Program.

The committee notes that failure to invest in steel technology for advanced weapon systems threatens leadership in commercial steel technology and in defense equipment performance. The committee understands that steel is a critical and enabling material for the performance of defense equipment. Investment is needed in steel alloy development and manufacturing technology to maintain warfighter preparedness and a strong industrial base.

Therefore, the committee recommends an increase of $10.0 million for RDT&E, Defense-wide, for PE 63680S.

Network-Centric Warfare Technology program reduction

The budget request included $661.2 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 63766E Network-Centric Warfare Technology.

The committee is concerned with the coordination of service and Strategic Capabilities Office programs and activities as well as the absence of transition plans for some of the proposed and ongoing research efforts.

Therefore, the committee recommends a decrease of $10.0 million in RDT&E, Defense-wide, for PE 63766E Network-Centric Warfare Technology.

Operational Energy Capability Improvements

The budget request included $0.0 in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 64055D8Z Operational Energy Capability Improvement.

The committee notes that, since its creation in 2012, the Operational Energy Capability Improvement Fund (OECIF) has served as "seed money" to start or consolidate promising innovations and to demonstrate technological feasibility with the goal of transitioning science and technology investments into Department of Defense programs. The committee further notes that OECIF investments are directly focused on the capability needs expressed in the National Defense Strategy and that OECIF's efforts have complemented, not replaced or duplicated, investments made by the military services. The committee is concerned that the budget request did not include funding for the OECIF and notes its support for the program as the Department works to rapidly address new and critical issues arising from emerging threats to our ability to supply the Joint Force.

Accordingly, the committee recommends an increase of $65.0 million in RDT&E, Defense-wide, for PE 64055D8Z Operational Energy Capability Improvement.

Funding for long-duration demonstration initiative and joint program

The budget request included $61.3 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 63851D8Z Environmental Security Technical Certification Program.

The committee recommends an increase of $15.0 million in RDT&E, Defense-wide, for PE 63851D8Z to fund a pilot program on long-duration energy storage established elsewhere in this Act.

Advanced technologies

The budget request included $730.5 million in Research, Development, Test, and Evaluation, Defense-wide (RDDW), for PE 64250D8Z Advanced Innovative Technologies.

The committee is supportive of advanced innovation but is concerned that some of the projects planned to be undertaken in fiscal year 2021 are outside of the charter of the Strategic Capabilities Office—namely, the use of mature technology to produce game-changing capability. The committee is encouraged by the continued work on the hypervelocity gun weapon system (HGWS) and its continued development to provide a low cost integrated air and missile defense interceptor. The committee encourages the continued development of the HGWS program.

Therefore, the committee recommends a decrease of $100.0 million in RDDW for PE 64250D8Z.

Defense Modernization and Prototyping program reduction

The budget request included $133.4 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 64331D8Z Defense Modernization and Prototyping.

The committee recognizes the importance of hypersonic research and development, especially in light of the National Defense Strategy and the advancing threats that it describes. However, the committee is concerned that there has been a lack of adequate coordination on hypersonic prototyping efforts among the various stakeholders and service components.

Therefore, the committee recommends a decrease of $20.0 million in RDT&E, Defense-wide, for PE 64331D8Z.

Homeland Defense Radar-Hawaii

The budget request did not contain funding in Research, Development, Test, and Evaluation, Defense-Wide (RDDW), for PE 64672C Homeland Defense Radar-Hawaii (HDR–H).

The committee is aware of the challenges related to site selection for HDR–H but understands that the Missile Defense Agency has a viable path forward if provided sufficient funding. The committee believes that a persistent sensing capability in this area of responsibility is critical for homeland defense and also notes that this program was included in the unfunded priorities list submitted by the Commander, Indo-Pacific Command.

Accordingly, the committee recommends an increase of $162.0 million in RDDW for PE 64672C.

Next Generation Interceptor

The budget request included $664.1 million in Research, Development, Test, and Evaluation, Defense-wide (RDDW), for PE 64874C Improved Homeland Defense (IHLD) Interceptors.

The committee fully supports the effort to modernize the Ground-Based Interceptor fleet but also notes that delays in releasing the request for proposals for the Next Generation Interceptor (NGI)

have led to a projected contract award date that is almost 1 year later than initially planned for by the Missile Defense Agency (MDA). These delays have also prevented the MDA from obligating or expending the fiscal year 2020 funding that was appropriated for the two initial contract awards.

Accordingly, the committee recommends a decrease of $310.0 million in RDDW for PE 64874C for the NGI program.

PDI: Guam Defense System

The budget request did not include funding in Research, Defense, Test, and Evaluation (RDT&E), Defense-wide, for PE 64880C Land-Based SM–3 for a Guam Defense System (GDS).

The committee notes that this project was included on the unfunded priorities list submitted by the Commander, U.S. Indo-Pacific Command, who stated that Guam is both the western-most territory of the U.S. homeland and a critical location for posture and operations in the Indo-Pacific area of responsibility. The committee agrees with the Commander that protection of U.S. assets and personnel on Guam is critical for effective operations in the region.

Accordingly, the committee recommends an increase of $76.8 million in RDT&E, Defense-wide, for PE 64880C Land-Based SM–3 for GDS.

In addition, the committee expects the Missile Defense Agency (MDA), along with U.S. Strategic Command (STRATCOM) and U.S. Indo-Pacific Command (INDOPACOM), to continue to analyze and refine the plan for a defense architecture against the range of missile threats to Guam while also beginning the work described above.

Accordingly, not later than January 31, 2021, the committee directs the Secretary of Defense, in consultation with the Director of the MDA and the Commanders, STRATCOM and INDOPACOM, to submit to the congressional defense committees an assessment of the architecture required for the defense of Guam from air and missile threats, including ballistic, hypersonic, and cruise missiles. The assessment shall include the following elements:

(1) An analysis of existing and projected air and missile threats to U.S. forces, assets, and infrastructure located on Guam;

(2) An analysis of impacts to the ability of U.S. forces to conduct operations in the INDOPACOM area of operations if systems and assets on Guam are vulnerable to air and missile threats;

(3) An analysis of systems currently available for procurement or deployment that could contribute to the defense of Guam from these threats not later than the end of 2025;

(4) An analysis of new systems currently in development, or modifications to existing systems, that could enhance or substitute for existing options in contributing to this mission;

(5) Estimated cost and schedule for the various options studied; and

(6) Anything else the Secretary deems relevant.

Hypersonic and Ballistic Tracking and Custody Layer

The budget request included $216.0 million in Research, Development, Test, and Evaluation, Defense-wide (RDDW), for PE 1206410SDA Space Technology Development and Prototyping.

The committee understands that the Space Development Agency (SDA) is responsible for the development of the hypersonic and ballistic space-based tracking and custody layer. In addition the committee has been informed that the SDA is transferring funds to have the Missile Defense Agency continue development of the Hypersonic and Ballistic Tracking Space Sensor as a potential sensor for the tracking layer.

Therefore, the committee recommends a decrease of $20.0 million in RDDW for PE 1206410SDA.

Hybrid space

The budget request included $216.0 million in Research, Development, Test, and Evaluation, Defense-wide (RDDW), for PE 1206410SDA Space Technology Development and Prototyping.

The committee understands that the Commander, U.S. Indo-Pacific Command, Commander, U.S. European Command, and other combatant commanders have identified the need for persistent space-based radars in their unfunded priorities lists for fiscal year 2021. A constellation of low earth orbit, space-based radars, with rapid revisit rates and the capability to maintain situational awareness of adversary activities and providing low latency target custody, would meet the requirements of the combatant commanders.

Therefore, the committee recommends an increase of $130.0 million in RDDW for PE 1206410SDA.

Hypersonic and Ballistic Tracking Space Sensor

The budget request did not include funding in Research, Development, Test, and Evaluation, Defense-Wide (RDDW), for PE 1206895C BMDS Space Programs for a Hypersonic and Ballistic Tracking Space Sensor (HBTSS).

The committee is aware that some funding for this capability was included in the budget request for the Space Development Agency (SDA). The committee notes, however, that section 1683 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92) required the Secretary of Defense to assign primary responsibility for the development and deployment of an HBTSS payload to the Missile Defense Agency. Further, the amount of funding contained in the requested SDA budget for this program is far less than what is required to keep the HBTSS program on track, according to fiscal year 2020 budget documentation.

The committee notes that the Commander, U.S. Strategic Command, and Commander, U.S. Northern Command, among other senior military and civilian officials, have stated repeatedly that space-based sensors are the most effective path to improving both homeland and theater missile defenses against a wide range of missile threats. The committee is disappointed that the Department of Defense has once again neglected to request meaningful funding for this program.

Accordingly, the committee recommends an increase of $120.0 million in RDDW in PE 1206895C for HBTSS.

Stryker Nuclear Biological Chemical Reconnaissance Vehicle Sensor Suite Upgrade

The budget request included $320.0 million in Research, Development, Test, and Evaluation, Defense-wide (RDDW), for PE 64384BP Chemical and Biological Defense Program—EMD, of which $128.9 million was for Contamination Avoidance programs, including the Stryker Nuclear Biological Chemical Reconnaissance Vehicle Sensor Suite Upgrade (NBCRV SSU).

The committee understands that platform-mounted reconnaissance of nuclear and radiological hazards is a key capability for ground forces and supports the Department of Defense's efforts to develop stand-off technology that would protect soldiers and equipment from radiation exposure. The committee believes that this capability would be useful on a broader variety of platforms.

Accordingly, the committee recommends an increase of $3.0 million in RDDW for PE 64384BP for Contamination Avoidance programs to accelerate integration activities for the Stryker NBCRV SSU and to investigate platform-agnostic variants of the sensor package.

Infrastructure to assess counter-small UAS commercial solutions

The budget request included $422.5 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 64940D8Z Central Test and Evaluation Investment Program (CTEIP).

The committee notes the expansion of small Unmanned Aircraft System (sUAS) threats as fueled by the proliferation of industry-driven sUAS capabilities highlighted elsewhere in this Act. The committee believes that the scope and complexity of this threat will only increase over the next decade.

Therefore, the committee recommends an increase of $15.0 million in RDT&E, Defense-wide, for PE 64940D8Z to build the necessary test and evaluation infrastructure to assess Counter–sUAS (C–sUAS) capabilities.

To ensure the best use of this additional funding, the committee directs the Under Secretary of Defense for Research and Engineering (USD R&E) to provide a plan for the development of the test and evaluation infrastructure required to appropriately assess C–sUAS solutions so as to systematically address the long-term threat to U.S. troops and critical infrastructure.

The committee expects future funding to be used to build the appropriate test and evaluation infrastructure, but it will be contingent on the efficacy of the briefed plan. The committee recommends that the USD R&E consult with the Department of Justice on its efforts to systematically address C–sUAS threats using a comprehensive test and evaluation plan.

The plan shall be briefed to the congressional defense committees no later than February 1, 2021, and shall address the capability to: (1) Provide full time, space, and position information on low, slow, and small targets that are either under operator control or autono-

mous and that may be executing terrain-following maneuvers; (2) Enable cyber analyses of defeat mechanisms for autonomous and automated systems; (3) Enable end-to-end analysis of the proposed C–sUAS kill chain from sensor to defeat mechanism to impact on UAS functionality; and (4) Such other matters as the USD R&E determines to be appropriate.

Telemetry range extension wave glider relay

The budget request included $422.5 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 64940D8Z Central Test and Evaluation Investment Development.

The committee notes the need for investments in test ranges in support of the capabilities called for in the National Defense Strategy. Range extension enables range safety and Department of Defense over-water test events of long-range hypersonic weapons, aircraft, and sea surface platforms.

Therefore, the committee recommends an increase of $15.0 million in RDT&E, Defense-wide, for PE 64940D8Z.

National Academies study on comparison of talent programs

The budget request included $5.8 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 65151D8Z Studies and Analysis Support—OSD.

The committee recommends a provision elsewhere in this Report to require the National Academies of Science, Engineering, and Medicine to conduct a study comparing methods for recruiting and retaining researchers used by the U.S. and Chinese governments. The committee notes that the People's Republic of China maintains various well-funded talent programs through which American researchers are encouraged to set up labs in China and conduct research in Chinese laboratories, providing the country access to sensitive technologies developed in the United States.

Therefore, the committee recommends an increase of $2.0 million in RDT&E, Defense-wide, for PE 65151D8Z for the National Academies of Science, Engineering, and Medicine study on comparison of talent programs.

Defense Technical Information Center

The budget request included $59.4 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 65801KA Defense Technical Information Center (DTIC).

The committee notes the challenges that the DTIC faces in efficiently and effectively performing its mission to facilitate sharing, maintain open repositories, and develop analytics of data across the research and engineering enterprise. The committee notes that the role of the DTIC needs to be re-examined given the emphasis that the Department of Defense is placing on the use of modern data collection, distribution, and analysis techniques and technologies to support both management and combat missions.

Therefore, the committee recommends a decrease of $50.0 million in RDT&E, Defense-wide, for PE 65801KA.

The committee directs the Under Secretary of Defense for Research and Engineering, in coordination with the Chief Data Officer and other appropriate officials, to brief the congressional de-

fense committees on a plan for the modernization and revitalization of DTIC missions, capabilities, and roles to support the National Defense Strategy no later than December 31, 2021.

Advanced machine tool research

The budget request included $9.2 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 67210D8Z Industrial Base Analysis and Sustainment Support.

The committee notes that Executive Order 13806 (Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States) and the follow-on Department of Defense report both called for strengthening American manufacturing capabilities. The use of non-U.S.-origin machine tools could provide openings for both industrial and national espionage and yield degradation in product quality and functionality. U.S. machine tool makers are largely buying, rather than building, the tools necessary to manufacture cutting edge machine tools.

Therefore, the committee recommends an increase of $20.0 million in RDT&E, Defense-wide, for PE 67210D8Z for research in advanced machine tooling.

Cold spray manufacturing technologies

The budget request included $9.2 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 67210D8Z Industrial Base Analysis and Sustainment Support.

The committee notes that a January 2020 Government Accountability Office report, titled "Military Depots: DOD Can Benefit from Further Sharing of Best Practices and Lessons Learned" (GAO–20–116), cited the potential benefits of the application of cold spray manufacturing technologies in sustainment activities across the Department of Defense.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Defense-wide, for PE 67210D8Z for cold spray manufacturing technologies.

Domestic organic light emitting diode manufacturing

The budget request included $9.2 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 67210D8Z Industrial Base Analysis and Sustainment Support.

The committee recognizes the importance of organic light emitting diode (OLED) microdisplays as critical components in major military aviation and ground combat programs of record. However, the committee is concerned that the domestic OLED manufacturing industrial base is fragile. Spare parts are very limited, often resulting in substantial time and production capacity loss. A single-point-of-failure for any one of these tools can result in a complete production line halt that can span weeks or even months.

Therefore, the committee recommends an increase of $5.0 million in RDT&E, Defense-wide, for PE 67210D8Z for support for domestic OLED manufacturing.

Implementation of radar supplier resiliency plan

The budget request included $9.2 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 67210D8Z Industrial Base Analysis and Sustainment Support.

The committee acknowledges the Department of Defense's preparation of a Radar Supplier Resiliency Plan.

To support implementation of this plan, the committee recommends an increase of $5.0 million in RDT&E, Defense-wide, for PE 67210D8Z. Accordingly, the committee directs the Secretary of Defense to report to the congressional defense committees by April 15, 2021, on the critical deliverables that will have a direct and measurable impact on the radar industrial base during the first year of implementation.

Manufacturing for reuse of NdFeB magnets

The budget request included $9.2 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 67210D8Z Industrial Base Analysis and Sustainment Support.

The committee notes that the Department of Defense depends on high-performance magnets, including rare earth neodymium-iron-boron (NdFeB), for the functioning of sophisticated weapon systems. Section 2533c of title 10, United States Code, requires the Department to stop using magnets from China. The committee is also concerned about the reliability of other sources of these magnets and the global dependence on raw materials supplied by China.

Therefore, the committee recommends an increase of $6.0 million in RDT&E, Defense-wide, for PE 67210D8Z to expand domestic manufacturing capacity for these magnets.

Submarine Construction Workforce Training Pipeline

The budget request included $9.2 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 67210D8Z Industrial Base Analysis and Sustainment Support.

The committee notes that, over the next decade, the submarine shipbuilding industry must hire at least 18,000 new skilled workers to support the production of the *Columbia*-class ballistic missile submarine and the continued construction of the *Virginia*-class submarine. The submarine industry has worked closely with State and local governments, community colleges, high schools, and community-based non-profits for the past several years to establish new training pipelines to support these increased hiring needs. Thus far, such pipeline training programs have placed nearly 2,500 people in submarine industry jobs. The committee notes that additional funding will increase the throughput of these pipelines and expand them into additional States to more adequately respond to the hiring demand.

Therefore, the committee recommends an increase of $20.0 million in RDT&E, Defense-wide, for PE 67210D8Z for increasing the submarine construction workforce training pipeline.

Workforce transformation cyber initiative pilot program

The budget request included $46.5 million for Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 33140D8Z Information Systems Security Program.

The committee supports the National Security Agency (NSA) National Cryptologic School pilot program to enable workforce transformation certificate-based courses on cybersecurity and artificial intelligence that are offered by Center of Academic Excellence (CAE) universities. The committee understand that this pilot program will develop courses and curricula with technology partners and also provide funding for select NSA CAE universities to offer these courses and receive tuition reimbursement for participation in the courses.

Therefore, the committee recommends an increase of $20.0 million, in RDT&E, Defense-wide, for PE 33140D8Z for the workforce transformation cyber initiative pilot program.

Cyber orchestration pilot

The budget request included $8.9 million for Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 33140K Information Systems Security Program.

Elsewhere in this report, the committee directs the Secretary of Defense to sponsor a demonstration of commercial technologies and techniques for enabling interoperability among cybersecurity systems and tools and for machine-to-machine communications and automated workflow orchestration. This demonstration should include comply-to-connect products, the Assured Compliance Assessment Solution, the Automated Continuous Endpoint Monitoring program, the Sharkseer perimeter defense system, and other Department of Defense cybersecurity systems. The committee urges the Secretary to coordinate this demonstration with the speed metrics pilot and the demonstration of the Systems of Systems Technology Integration Tool Chain for Heterogeneous Electronic Systems interoperability technology recommended elsewhere in this report.

Therefore, the committee recommends an increase of $10.0 million, in RDT&E, Defense-wide, for PE 33140K for the cyber orchestration pilot program.

Joint Regional Security Stacks SIPR funding—RDT&E

The budget request included $9.7 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 33228K Joint Regional Security Stacks (JRSS).

The committee is aware of the operational cybersecurity limitations of the JRSS technology as assessed by the Director, Operational Test and Evaluation, the difficulty of training personnel to use the JRSS, and the shortage of feasible tactics, techniques, and procedures to make effective use of the JRSS. The committee believes that the deployment of JRSS on the Secret Internet Protocol Router Network is thus inappropriate, given JRSS' limited cybersecurity capability and the existence of alternative capabilities to execute its network functions.

Therefore, the committee recommends a decrease of $486,000 in RDT&E, Defense-wide, for PE 33228K due to the operational cybersecurity limitations of the JRSS technology.

Multi-Mission Payload

The budget request included $1.2 million in Research, Development, Test, and Evaluation (RDT&E), Special Operations Command, for PE 1160431BB Warrior Systems for Multi Mission Payload (MMP).

The committee notes that United States Special Operations Command (SOCOM) identified executability issues with the MMP–Light program due to appropriations rescissions in fiscal year 2020. As a result, SOCOM requested the transfer of funds from the MMP–Light to the man-pack Capital Equipment Replacement Program for fiscal year 2021.

Therefore, the committee recommends a reduction of $1.2 million in RDT&E, Special Operations Command, for PE 1160431BB. The increase associated with this transfer is reflected elsewhere in this report.

Advanced satellite navigation receiver

The budget request included $39.1 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 65814OTE Operational Test Activities and Analyses.

The committee notes the need for test and evaluation activities for development of countermeasures and counter-countermeasure capabilities. Currently, full characterization of existing threats is limited due to the technical limitations of current flight data systems to support high speed and dynamic flight testing requirements.

Accordingly, the committee recommends an increase of $5.0 million in RDT&E, Defense-wide, for PE 65814OTE to improve threat characterization in high dynamic flight testing.

Joint Test and Evaluation Program

The budget request included $39.1 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 65814OTE Operational Test Activities and Analyses.

The committee notes that the Joint Test and Evaluation program focuses on joint (cross-service and cross-combatant command) warfighter needs and rapid delivery of non-materiel solutions, such as: joint tactics, techniques, and procedures; concepts of operations; improved and new training packages; and new test tools and methodologies. Over the past decade, the program has completed 40 joint tests and 96 quick reaction tests, sponsored primarily by the combatant commands. The committee believes that this important work should continue.

Therefore, the committee recommends an increase of $22.0 million in RDT&E, Defense-wide, for PE 65814OTE to restore the Department's proposed cut to the program under the Defense-Wide Review.

Items of Special Interest

Advanced powertrain demonstrator

The committee supports the efforts of the Army in developing and integrating modern powertrain technology to provide leap-ahead capabilities for ground combat vehicles. The committee notes that the Advanced Powertrain Demonstrator initiative has successfully demonstrated improved power density, which can provide opportunities to add capabilities to existing ground combat vehicles, such as additional crew members or weapons, and has provided a wider array of options for next-generation platforms.

The committee encourages the Army to continue to progress the Advanced Powertrain Demonstrator to higher Technology Readiness Levels and to consider resourcing follow-on efforts, including the Advanced Mobility Experimental Prototype, in collaboration with the Program Executive Office for Ground Combat Systems. In addition, the Army should continue to leverage private sector investment in powertrain technologies to achieve leap-ahead breakthroughs in powertrain efficiency.

Anti-corrosion and nano technologies

The committee remains concerned about the high cost of corrosion within the Department of Defense. The military services, particularly the Navy, face complex threats in the Indo-Pacific region that require our military equipment and infrastructure to be resilient and have maximum operational availability. The committee urges the Office of Naval Research to pursue lightweight, nanotechnology-based capabilities that provide high corrosion resistance and other performance properties to decrease the cost of corrosion and increase the operational availability of military equipment and infrastructure that enhances the ability of the Joint Force, particularly the Navy, to operate in the Indo-Pacific area of responsibility.

Artificial intelligence and machine learning technologies and systems

The committee recognizes that the Department of Defense (DOD) is deploying artificial intelligence (AI) and machine learning (ML) to increase warfighter capability, decrease operational costs, and increase civilian safety. AI/ML can realize these benefits by enabling machines to perform tasks that have traditionally required labor-intensive human intelligence—for example, to analyze data, image, video, and audio files, potentially increasing capabilities to track threats and monitor global developments.

The committee notes that the interim report from the National Security Commission on Artificial Intelligence identifies an outstanding need for distributed and decentralized data processing capabilities, down to the distributed team, squad, and platoon levels, where units often cannot rely on high-bandwidth networks or heavy-duty data processing resources. The committee notes that there may be an opportunity to deploy AI to this distributed tactical edge environment to enhance decision-making and to support activities such as mapping, sensing, and mission planning. The committee encourages the Department to develop, adopt, and de-

ploy such technologies, when appropriate, to gain significant tactical and strategic advantages.

Further, the committee notes the potential use of AI/ML technology to address a broad spectrum of DOD missions. The committee directs the Director of the Joint Artificial Intelligence Center (JAIC) to provide a briefing to the congressional defense committees, no later than March 1, 2021, that identifies military occupational specialties and capabilities across the military services and Defense Agencies and Field Activities that can better leverage AI to maximize effectiveness, mission goals, and cost savings to the Federal Government. The committee directs that this briefing include an identification of business processes and business information technology systems that would directly benefit from the immediate application of commercial AI/ML capabilities to DOD "back office" activities, such as financial management, acquisition, personnel management, and the Department's audit.

The committee also notes the unique cybersecurity vulnerabilities of AI/ML-based systems. The committee notes that the Department's efforts to develop and deploy secure hardware and software do not yet have a clear thrust to mitigate threats that are unique to AI/ML-enabled capabilities. The committee directs the Department to leverage multidisciplinary teams, compromised of U.S. Government, industry, and research university representatives, to urgently develop required capabilities and infrastructure to secure the algorithms, data, and execution of AI/ML-enabled systems. Further, the committee encourages the Department to partner with research universities to develop undergraduate and graduate curricula and research fellowship opportunities focused on threat identification and mitigation for AI/ML-enabled systems.

The committee also encourages the JAIC to work closely with the White House Artificial Intelligence Task Force, as well as the National Institute for Standards and Technology, to develop standards for the use of AI across the U.S. Government and best practices for the Federal Government's engagement of the private sector. The committee also urges the Secretary of Defense to continuously review and refine a detailed code of ethics associated with its use of AI to ensure that any future uses respect civil rights, including privacy, and to ensure that human decision-makers remain central to all operational activities involving AI/ML and AI/ML-enabled capabilities.

Finally, the committee recommends that the Department consider establishing joint U.S.-allied partner ventures, as well as joint DOD ventures with state-level AI-based economic development activities, that address shared needs in AI/ML-enabled capabilities.

Carbon fiber and graphitic foam for Special Operations Forces tactical vehicles

The committee recognizes recent efforts made by United States Special Operations Command (SOCOM) to develop low-cost, wider application carbon fiber and graphitic foam components in support of the Special Operations Forces (SOF) tactical vehicle program. The committee notes that carbon fiber components may reduce vehicle weight, reduce fuel consumption, increase payload capacity,

and could extend service life for SOF tactical vehicles. Additionally, graphitic carbon foam may also reduce vehicle heat signatures and improve heat dissipation from the engine and electronics compartments and could provide protection against blast energy, directed energy weapons, and electromagnetic pulse threats.

The committee notes that the Defense Logistics Agency has designated graphite/carbon fiber as a strategic material. The committee acknowledges that the U.S. Army and SOCOM have identified low cost mesophase pitch as a United States-based source of graphite that can be used to produce carbon fiber, graphitic carbon foam, and battery technologies. The committee recognizes the versatility and broad application that carbon fiber technology may provide for the Armed Forces by reducing the weight of parts as compared to traditional steel components.

Therefore, the committee encourages SOCOM continue its efforts to test, develop, and field low cost carbon fiber and graphitic carbon foam in support of its tactical vehicle program and other programs, as appropriate.

Carbon fiber wheels and graphitic foam for Next Generation Combat Vehicle

The committee commends the U.S. Army Ground Vehicle Systems Center's (GVSC's) decision to transition into lower cost, wider application carbon fiber composite wheels and graphitic carbon foam research in support of the Next Generation Combat Vehicle (NGCV). Carbon fiber wheels may reduce vehicle weight, reduce fuel consumption, increase payload capacity, and extend service life for the NGCV. Graphitic carbon foam may dramatically reduce vehicle heat signatures and improve heat dissipation from engine and electronics compartments while also protecting against blast energy, directed energy weapons, and electromagnetic pulse threats. Finally, these products lend themselves to being produced at remote locations with additive manufacturing processes in support of NGCV operation and maintenance.

The Defense Logistics Agency has designated graphite/carbon fiber as a strategic material. The committee notes favorably that the U.S. Army GVSC has identified low cost mesophase pitch as a United States-based source of graphite that can be used to produce carbon fiber, graphitic carbon foam, and battery technologies for the NGCV. The committee recognizes the versatility and broad application that carbon fiber technology provide for the Armed Forces by reducing the weight of parts by over 50 percent, as compared to traditional steel components, while improving survivability and performance.

The committee encourages the U.S. Army GVSC to continue to test, develop, and field low cost mesophase pitch carbon fiber and graphitic carbon foam components that may reduce vehicle weight, reduce fuel consumption, increase payload capacity, extend service life, reduce vehicle signatures, improve survivability, and utilize additive manufacturing technology to reduce cost and weight in the NGCV program.

Close Combat Lethality Task Force

In March 2018, the Close Combat Lethality Task Force (CCLTF) was established by former Secretary of Defense James Mattis, as a direct report to the Secretary, and chartered with dramatically improving the effectiveness and survivability of close combat formations through a combination of materiel and non-materiel means, including innovations in recruitment, retention, training, concepts of operation, tactics, techniques, and procedures, and equipment. The committee agreed with Secretary Mattis' rationale for creating the CCLTF, specifically that close combat formations should be manned, trained, and equipped as an elite force capable of combat "overmatch," and with its designation as a Cross Functional Team (CFT) under section 911 of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114328), leveraging the critical enabling authorities of that law.

In a memorandum dated March 27, 2020, Secretary of Defense Mark Esper transferred the CCLTF to the Secretary of the Army with a tasking to determine alignment of the CCLTF within the Army hierarchy. This decision effectively ended the CCLTF's designation as a CFT under section 911. As a result, the CCLTF will no longer be accorded the priority of a CFT sponsored by, and reporting directly to, the Secretary of Defense, nor will it exercise the authorities available under section 911 and those assigned by the Secretary of Defense.

The committee is concerned about the potential consequences of these decisions on the close combat mission of the Department of Defense. The Secretary of the Army has been directed to report back to the Secretary of Defense on the authorities, responsibilities, policy, and procedures that the Secretary of the Army will provide for the continued operation of the CCLTF. While the Army's senior leaders have indicated that they remain committed to the vision and success of the CCLTF, it is unclear whether the Army intends to pursue the non-material initiatives that are central to dramatically improving close combat effectiveness and survivability. In addition, the committee notes that the Marine Corps also has considerable equities in the CCLTF, and they are critical to the success of this joint effort.

Therefore, the committee directs the Secretary of the Army to provide a briefing to the SASC, not later than September 30, 2020, on the Army's plan to provide enduring support for the materiel and non-materiel initiatives to improve close combat lethality and survivability. The briefing shall also provide details on the CCLTF's alignment within the Army, how the Army will partner with the Marine Corps and Special Operations Command on the CCLTF's initiatives, and whether the CCLTF will continue to be organized and operated as a cross-functional team reporting directly to a senior leader. Furthermore, the briefing shall address the status of the lines of effort assigned by Secretary Mattis and any changes to recruitment, retention, training, and personnel turnover in close combat units. Finally, the briefing shall also address whether personnel from the Cost Analysis and Program Evaluation office, the Offices of the Under Secretaries of Defense for Research and Engineering, Acquisition and Sustainment, and Personnel and Readiness, the Joint Staff, and U.S. Special Operations

Command will continue to participate in the CCLTF as outside experts.

Collaboration on research to counter foreign malign influence operations

The committee notes that section 228 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92) authorizes the Department of Defense to carry out a research program on foreign malign influence operations as part of the university research program.

The committee believes that countering foreign malign influence should be a priority in the effective implementation of the National Defense Strategy, and the committee urges the Department to utilize this authority to the greatest extent possible and increase its collaboration with academia, nongovernmental organizations, and other relevant entities to maintain an edge in identifying and countering adversarial foreign malign influence.

Therefore, the committee directs the Secretary of Defense to provide a briefing to the the Committees on Armed Services of the Senate and the House of Representatives on how the Department will implement section 228 of the National Defense Authorization Act for Fiscal Year 2020. The briefing shall include, at a minimum: (1) Details on how the program will enhance understanding of foreign malign influence; (2) An identification of organizations that are collaborating on such research as well as a description of steps being taken to ensure appropriate inclusion of the military services' research and cyber centers; and (3) A description of how the program will work with universities, nongovernmental organizations, and other relevant entities to enhance the understanding of and development of appropriate responses to foreign malign influence through collaborative research and the exchange of information.

Comptroller General review of Artificial Intelligence Activities of the Department of Defense

The committee notes that the Department of Defense (DOD) is investing significantly in developing and acquiring artificial intelligence (AI) tools and systems in order to develop and deploy AI-enabled capabilities to support DOD missions. For example, the DOD has established a Joint Artificial Intelligence Center (JAIC) to coordinate Department-wide AI activities, increased science and technology investments in AI, and attempted to employ more AI experts in a variety of roles. The DOD has historically had challenges developing modern capabilities in a timely manner as well as coordinating disparate activities across the Department. Given the growing significance of AI to DOD's acquisition goals, the committee directs the Comptroller General of the United States to continuously monitor and report on: (1) DOD's AI-related efforts, including science and technology, research and development, and formal acquisition programs; (2) The status of these efforts, including types of technologies and technology transition strategies being used; (3) Efforts to build expertise and infrastructure, including accessible data sets and computational capabilities, both within the DOD and across the Federal Government, to support DOD missions. The committee directs the Comptroller General to provide a

briefing on the status of the effort to the committee by September 1, 2020, and provide a report to the committee by February 1, 2021.

Cyber Operations for Base Resilient Architecture

The committee understands that the U.S. is committed to a holistic cyber mission assurance program through investments in defensive cyberspace operations, weapon system cyber resiliency efforts, the Cyber Resiliency Office for Weapon Systems, and Mission Defense Teams.

Therefore, the committee encourages the Secretary of Air Force to continue funding and to expand the Cyber Operations for Base Resilient Architecture pilot program in the U.S. Indo-Pacific Command area of responsibility as part of the overall mission assurance strategy.

Emerging biotechnology for national security

The committee notes the importance that emerging biotechnologies will have in national security missions, including medical response to threats, biological defense, and bio-based manufacturing and computation.

The committee believes that the Department of Defense should consider developing more formal organizations with specific responsibility for maintaining critical technical expertise in these emerging areas and facilitating adoption and availability of these technologies for Department of Defense missions. The committee notes that the optimal construct for such an organization might be a network of linked organizations, or a virtual consortium of independent organizations, to include both public and private sector entities. Activities of such an organization should range from basic research to prototyping of new concepts to support for manufacturing and production to providing technical expertise to the Department as required.

The committee directs the Under Secretary of Defense for Research and Engineering to develop plans for the establishment of and support for potential organizational options to advance emerging biotechnology research, analyses, prototyping, and manufacturing activities for national security missions. The plan developed should address the following issues: development and continuous modernization of fundamental tools and technologies to advance knowledge in engineering biology; options for governance structures, level of investment required, a list of types of participants, intellectual property strategies, and other considerations required to stand up the entity or entities, including required physical and digital infrastructure; and possible metrics to measure progress or success.

The committee directs that the plan include a focus on strengthening the current organization, structure, and funding of emerging biotechnologies research and development across the Department to allow for stronger coordination across the military services and Defense Agencies and Field Activities and to develop, mature, and transition biotechnology activities, including the identification of duties of designated officials and additional authorities required.

The plan should also address coordination with appropriate interagency and international activities.

Not later than March 1, 2021, the Under Secretary of Defense for Research and Engineering shall provide a briefing to the congressional defense committees on the plans, policy recommendations, and implementation plan, strategy, and associated funding requirements.

Ground Vehicle Systems Center modeling and simulation

The U.S. Army Combat Capabilities Development Command (CCDC) Ground Vehicle Systems Center (GVSC) is developing a robust modeling and simulation capability. The committee notes that such a capability could assist the Next Generation Combat Vehicle Cross Functional Team, particularly as the Army focuses on a digital design approach to the Optionally Manned Fighting Vehicle. This approach could leverage modern practices of the commercial automotive industry and foster development of important next generation capabilities. The committee supports modeling and simulation capability development by GVSC and, elsewhere in this report, has authorized funds to support Next Generation Combat Vehicle technologies. The committee directs the Director, Army Combat Capabilities Development Command, to coordinate with the Director, Test Resource Management Center, to ensure that relevant modeling and simulation capabilities are available for wider use across the Department of Defense's test and evaluation enterprise.

High-energy laser weapons systems

The committee recognizes that advancements in stabilized gimbal systems have provided improvements in target detection, identification, and designation on high-energy laser (HEL) weapon systems. The committee notes that these systems can enhance long-range tracking performance, thereby improving success rates and enhancing the safety of servicemembers on the battlefield. Therefore, the committee directs the Secretary of Defense to provide a briefing to the congressional defense committees no later than December 31, 2020, on current actions being taken to improve advanced tracking and targeting capability on HEL weapon systems.

Implement National Academics of Science Army Information Science report recommendations

The committee notes that the 2019 National Academies of Sciences, Engineering, and Medicine Assessment of the Information Sciences Directorate at the Army Research Office found that the Army is producing work of high scientific quality with well qualified program managers and that funded projects are of high caliber and in areas relevant to the Army's science and technology mission with examples of transitions of the research to the Army and to the Department of Defense (DOD) more broadly. The study made a number of recommendations to improve the quality of these programs, related to: program assessment metrics and program management expertise; management of researchers and research portfolios; coordination of activities with other similar DOD and interagency activities; and broadening of the researcher base. The committee also notes that the Department of Defense's Office of Basic

Science issued a 2019 study on "Future Directions at the Intersection of Management Science and Information Science" which highlighted a number of opportunities in these fields where research could be conducted to improve the way that the Army and the Department as a whole could manage business processes within technology development organizations. The committee directs the Secretary of the Army to review these two studies and provide a briefing to the congressional defense committees on how the Army will address the findings and recommendations of these two reports, no later than January 1, 2022. This briefing shall be provided in publicly releasable format, with a classified annex as necessary.

Joint Artificial Intelligence Center reporting structure

The committee is aware of the recommendations made by the National Security Commission on Artificial Intelligence in its March 2020 report and appreciates its efforts to highlight a number of areas where the Department of Defense (DOD) can strengthen its efforts in adopting artificial intelligence (AI). The committee is also aware that, over the past 24 months, the Joint AI Center (JAIC) has grown from a nascent organization into the focal point of the DOD AI Strategy. Many of the JAIC's initial AI capability development efforts have transitioned into operational end use by the military services, combatant commands, and several DOD components. The JAIC is now working with organizations across the DOD to develop dozens of new AI-enabled product lines and share lessons learned that will support independent efforts.

The committee believes that successful AI adoption depends on enabling capabilities across modern digital infrastructure, data management practices, and information technology operations. In recognition of the critical relationship between successful digital transformation and adopting AI, the committee understands that the Department positioned the JAIC within the DOD CIO organization. This structure has enabled the JAIC's success and that of the CIO organization and benefited the DOD enterprise. However, moving forward, the committee also understands that the JAIC's reporting directly to the Secretary of Defense would afford to the JAIC the high visibility that Secretary direct reports enjoy as well as high priority in the budget request process and the ability to grant waivers from any bureaucratic process requirements not grounded in law. The committee encourages the Department to continue to evaluate this balance to ensure that the JAIC appreciates from an appropriate balance of responsibilities, authorities, and oversight. The committee directs the Secretary to brief the congressional defense committees no later than March 31, 2021, on the future plans for the JAIC's alignment and reporting structure.

Nanotechnology research

The committee notes the great advances in nanotechnology made through Department of Defense investments in nanomaterials and electronics in partnership with the National Nanotechnology Initiative. Currently, nanotechnology is fielded in numerous defense systems, including electronics, sensors, medical technologies, coatings, and uniforms. The committee believes that continued investment in this field is important to supporting a variety of modernization ac-

tivities consistent with the National Defense Strategy. Therefore, the committee directs the Under Secretary of Defense for Research and Engineering to provide a briefing, in publicly releasable format, with a classified annex as necessary, on Department activities in the research, development, and use of nanotechnology. The briefing shall describe: applications or proposed applications for nanotechnology in defense systems; specific materials being evaluated; research organizations in the U.S. Government and private sector engaged in such research; identified funding for such activities to date; and a description of the military services' and Defense Advanced Research Projects Agency's assessments on and plans for the use of nanotechnology to support future defense needs and requirements. The committee directs that this briefing be provided to the congressional defense committees no later than December 31, 2021.

National Guard research, development, test and evaluation activities

The committee notes that National Guard and reserve components consist of personnel that have private sector experience that is directly relevant to National Defense Strategy modernization priorities. For example, these personnel may have relevant experience in medical fields, software, robotics, cybersecurity, and other critical technical disciplines. In other cases, National Guard equipment and installations are commonly used in technological development and experimentation activities. For example, the committee is aware that the Army has taken advantage of facilities at Fort Pickett to conduct critical operational testing and experimentation for the Integrated Visual Augmentation System. In order to leverage these capabilities further, the committee directs the Secretary of Defense to review and analyze the benefits and feasibility of authorizing National Guard and Reserve members', equipment's, and facilities' participation on a reimbursable basis in research, development, test and evaluation (RDT&E) projects in which their involvement furthers the work because of a member's or unit's availability, qualifications, experience, education, or facilities and equipment. In this review, the Secretary should consider requesting authority to provide reimbursement for these activities from RDT&E accounts, subject to the availability of appropriations. The committee directs the Secretary to brief the congressional defense committees on a recommendation for this proposed policy action no later than February 1, 2021.

National Security Innovation Network

The committee recognizes that the nature of security threats are changing and notes that innovation and entrepreneurial methodologies can generate new solutions to national security problems. The committee notes that, while certain programs in the Department of Defense have allowed for more rapid acquisition, the challenge of implementing rapid change in the Department persists. The committee further understands that the acquisition of new talent to support the national security workforce will be critical to achieving the aims of the National Defense Strategy and that recruitment from innovative sectors of the economy that have traditionally been

less engaged in the defense enterprise will be critical for continued competitiveness.

The committee highlights the effectiveness of the National Security Innovation Network in building a network of alliances between the defense, academia, and venture communities whose innovation, collaboration, and adaptability can be of crucial service to national security. The committee expresses its support for the program and in particular notes the ongoing expansion of activities at universities through academic accelerator programs and technology and national security fellowships as an example of ways the Department of Defense can provide new pipelines for young talent to consider in support of the Nation's national security.

Open Systems Architecture for the Army's Future Vertical Lift programs

The committee recognizes the benefits of a Modular Open Systems Architecture (MOSA) systems engineering approach, as indicated by subchapter I of title 10, United States Code, which requires its use. The committee therefore appreciates that the Army has used it in the Future Vertical Lift Future Attack Reconnaissance Aircraft and Future Long-Range Assault Aircraft programs and also notes the importance of agile contracting in a time of great power competition.

In order to capture the benefits of a MOSA, the committee directs the Assistant Secretary of the Army for Acquisition, Logistics, and Technology to summarize lessons learned from using MOSA approaches, to include recommendations to update existing Department of Defense policy and guidance on MOSA approaches, no later than December 31, 2021, and to brief the congressional defense committees on this summary and these recommendations. This briefing shall be conducted at the classified level, as required. Should the Assistant Secretary also have views for the Congress to consider regarding updates to subchapter I of title 10, United States Code, the committee directs that the Assistant Secretary provide them.

Optionally Manned Fighting Vehicle requirements and acquisition strategy

The Optionally Manned Fighting Vehicle (OMFV) is a priority Army modernization program critically needed to replace the M2 Bradley fighting vehicle that has been in operational service for more than 30 years. Earlier this year the Army cancelled the initial OMFV solicitation and decided to revise the acquisition strategy. It is the committee's understanding that a reset of the program was necessary in order to establish technologically-achievable and affordable requirements as well as to facilitate competition.

The committee encourages the Army to complete a thorough reevaluation of requirements for the OMFV and to pursue a competitive acquisition approach that will provide best quality and price. Accordingly, the committee directs the Secretary of the Army to provide a classified briefing to the SASC no later than August 1, 2020, on OMFV requirements and the revised acquisition strategy. The briefing shall include the threat-basis and operational ration-

ale for the OMFV requirements and the plan to integrate active protection systems.

Pandemic resilience technologies

COVID–19 has exposed vulnerabilities and challenges for the Navy's operations and logistics and maintenance enterprises. The committee is concerned about the Navy's ability to prepare for and respond to future pandemics. Critical gaps remain in our understanding of how COVID–19 spreads through personnel and platforms in Navy-specific environments and the effectiveness of various disease identification, mitigation, and eradication approaches under consideration.

To ensure warfighter health and ship operational availability into the future, the committee supports a significant applied research and development effort, in partnership with industry and universities, into pandemic resilience technologies and related operational protocols tailored to the unique, contained close-quarters and secure environments on Navy ships and shore facilities.

Accordingly, the committee encourages the Navy to develop and adopt technologies and protocols that have the potential to prevent the spread and mitigate the impact of future pandemics on Navy personnel and operations, including: (1) Artificial intelligence and data-driven infectious disease modeling and interventions; (2) Shipboard airflow management and disinfectant technologies; (3) Personal protective equipment, sensors, and diagnostic systems; and (4) Reduced-manning and unmanned operation, such as resilient unmanned logistics, to reduce human contact.

Predictive maintenance algorithm

The committee recognizes and commends the efforts of the 160th Special Operations Aviation Regiment in becoming one of the Joint Artificial Intelligence Center's (JAIC's) first two National Mission Initiatives through development of an algorithm to conduct predictive maintenance (PMx), rather than forensic or preventative maintenance, on rotary wing aircraft engines.

The committee encourages continued study of this algorithm and its scalability enterprise-wide and continued support of unique partnerships between Department of Defense elements, the JAIC, and outside stakeholders. Not later than November 30, 2020, the Secretary of Defense shall provide a briefing to the Committees on Armed Services of the Senate and the House of Representatives. The briefing shall include details of the following: (1) Positive lessons learned through this partnership and program; (2) Barriers to these partnerships or to scalability, including data availability; and (3) A detailed description of any plans for future adaption of the PMx algorithm for other applications.

Reimbursable work at Army Combat Capabilities Development Command laboratories and engineering centers

The committee notes that the technical workforce and facilities of the Army labs and engineering centers are at the forefront of innovation and prototype development for the Army and a number of other Federal agencies. The committee is aware that recent restrictions on these organizations' ability to perform reimbursable work

have limited the ability for small businesses and other companies to leverage the workforce, equipment, and research infrastructure investments at these labs and centers. These limitations have also limited the ability of the Army's technical organizations to work more closely with leaders in the private sector to adapt new technological capabilities for Army missions.

The committee believes that the capabilities of Department of Defense (DOD) science and technology infrastructure should be available to Federal and industry customers, with those partnerships managed to prioritize defense core activities and missions. Therefore, the committee directs the Secretary of Defense to promulgate policy to fully implement the "manage to budget" flexibilities of subsection (e) of section 2358a of title 10, United States Code, to allow lab and center directors to manage and optimize their reimbursable workloads and customers without regard for funding organization or Tables of Distribution and Allowances limitations. The committee notes that some of the workload can be handled with technically expert term civilian employees, using the authorities established in section 1109 of the National Defense Authorization Act for Fiscal Year 2016 (Public Law 114–92).

Review of barriers to innovation

The committee is aware of the report titled "Barriers to Innovation in Research and Engineering Activities of the Department of Defense," required by section 232 of the National Defense Authorization Act for Fiscal Year 2018 (Public Law 115–91). The committee believes that it is important to address the barriers discussed in the report. The committee encourages the Under Secretary of Defense for Research and Engineering (USD (R&E)) to examine the feasibility of recommendations pertaining to: broadening hiring authorities at Science and Technology Reinvention Laboratories; adjusting reprogramming thresholds to increase the USD (R&E)'s flexibility to shift funds within the science and technology (S&T) budgeting activities; extending the appropriation life of Congressional budget additions; and continued support for authorities that encourage a competitive funding process to help address the challenges of aging infrastructure, that encourage acquisition at the speed of relevance, and that encourage a culture of innovation.

Additionally, the committee directs the USD(R&E), not later than December 31, 2021, to survey laboratories and other S&T organization to identify existing barriers to innovation in the research and engineering enterprise and to brief the congressional defense committees on: (1) Any required updates to the Department of Defense report developed in response to section 232 of the National Defense Authorization Act for Fiscal Year 2018 and proposed recommendations to address relevant findings; (2) Proposed changes in directives, rules, regulations, and other policies that will enhance the ability of the innovation, research, and engineering enterprise of the Department to execute its designated missions, including a description of how proposed changes have been coordinated with the Secretaries of the military departments and the appropriate heads of the Defense Agencies and Field Activities; (3) A schedule, plan, and identification of responsible organizations for addressing barriers identified in the review; and (4) Actions taken

to address specific issues identified in the Department of Defense report developed in response to section 232 of the National Defense Authorization Act for Fiscal Year 2018.

Soldier Enhancement Program

Established by the Congress in 1990, the Soldier Enhancement Program (SEP) allows the Army to quickly provide to soldiers the necessary equipment and clothing for success on the battlefield. It supports accelerated integration and modernization of critical kit, including more lethal weapons, lighter load-bearing equipment, field gear, survivability items, communications equipment, and navigational aids. The committee understands that, during the Army's budget deliberations, senior Army leadership determined that funding for the SEP should be reallocated for higher Army priorities. Furthermore, the committee has been informed that the Army is reviewing how to retain SEP functions with a recommendation pending from Army Futures Command expected later this year. Therefore, the committee directs the Secretary of the Army to provide a briefing to the SASC by September 30, 2020, on the Army's plans to fulfill the critical evaluation and acquisition role performed by the SEP.

Strategic Capabilities Office activities

The committee notes that section 233 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92) mandated that the Strategic Capabilities Office (SCO) report directly to the Deputy Secretary of Defense and established two cross-functional teams to improve the technical quality of SCO prototyping projects and to support the transition of those projects into the military services or Defense Agency and Department of Defense Field Activity acquisition activities or operational use. Consistent with the National Defense Strategy and challenges posed by Russia and China, the committee feels that the SCO should play a key role in responding in a timely fashion to fill the capability gaps and operational needs identified by combatant commands by using proven technology to produce game-changing capabilities with responsive new systems and technologies. The committee directs the Deputy Secretary of Defense to provide a briefing to the congressional defense committees no later than March 1, 2021, on the Strategic Capabilities Office's activities to respond to combatant command identified capability gaps, including an identification of activities to improve the speed at which new capabilities can be delivered and an assessment of the role that military service acquisition activities play in efficiently transitioning appropriate SCO programs into operational capabilities.

Ultra-compact hyperspectral imagery

Technology that can discriminate mobility hazards and targets in the three dimensional battle space may enable soldiers to make quicker decisions to effectively neutralize adversary weapon systems. The committee is aware that Ultra-Compact Hyperspectral Imagery (UCHSI) may provide a compact and affordable real-time imaging sensor that enables the warfighter to detect, identify, track, and prioritize targets of interest. Therefore, the committee

encourages the Army to consider this technology for possible applications that support Army modernization priorities such as the Next Generation Combat Vehicle, Long Range Precision Fires, Soldier Lethality, and Future Vertical Lift.

Unmanned Aerial Systems in Great Power Competition

The committee recognizes the important role that manned and unmanned aerial systems (UASs) serve in great power competition. The committee further appreciates that manned and satellite ISR platforms are costly and limited to episodic coverage and understands that the Department of Defense needs to develop new concepts of operations to effectively employ platforms not inherently designed for operating in contested environments, such as non-stealthy UASs. Therefore, the committee directs the Secretary of the Air Force to submit a report to the Committees on Armed Services of the Senate and the House of Representatives, no later than November 30, 2020, detailing the strengths and vulnerabilities of UASs in a National Defense Strategy-envisioned environment and the tactics, techniques, and procedures that would allow for the survivability of UASs in scenarios pitting the United States against near-peer adversaries.

TITLE XLII—RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

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	Senate Change	Senate Authorized
		RESEARCH, DEVELOPMENT, TEST & EVAL, ARMY			
		BASIC RESEARCH			
2	0601102A	DEFENSE RESEARCH SCIENCES	303,257	12,000	315,257
		AI human performance optimization		[2,000]	
		Increase in basic research		[10,000]	
3	0601103A	UNIVERSITY RESEARCH INITIATIVES	67,148		67,148
4	0601104A	UNIVERSITY AND INDUSTRY RESEARCH CENTERS	87,877		87,877
5	0601121A	CYBER COLLABORATIVE RESEARCH ALLIANCE	5,077		5,077
		SUBTOTAL BASIC RESEARCH	**463,359**	**12,000**	**475,359**
		APPLIED RESEARCH			
7	0602115A	BIOMEDICAL TECHNOLOGY	11,835	4,000	15,835
		Pandemic vaccine response		[4,000]	
11	0602134A	COUNTER IMPROVISED-THREAT ADVANCED STUDIES	2,000		2,000
12	0602141A	LETHALITY TECHNOLOGY	42,425	3,000	45,425
		Hybrid additive manufacturing		[3,000]	
13	0602142A	ARMY APPLIED RESEARCH	30,757	3,000	33,757
		Pathfinder Air Assault		[3,000]	
14	0602143A	SOLDIER LETHALITY TECHNOLOGY	125,435	10,500	135,935

		Harnessing Emerging Research Opportunities to Empower Soldiers Program		[2,500]	
		Metal-based display technologies		[3,000]	
		Pathfinder Airborne		[5,000]	
15	0602144A	GROUND TECHNOLOGY	28,047	2,000	30,047
		Ground technology advanced manufacturing, materials and process initiative		[2,000]	
16	0602145A	NEXT GENERATION COMBAT VEHICLE TECHNOLOGY	217,565	10,000	227,565
		Ground combat vehicle platform electrification		[2,000]	
		Immersive virtual modeling and simulation techniques		[5,000]	
		Next Generation Combat Vehicle modeling and simulation		[3,000]	
17	0602146A	NETWORK C3I TECHNOLOGY	114,404	12,000	126,404
		Backpackable Communications Intelligence System		[5,000]	
		Defense resiliency platform against extreme cold weather		[3,000]	
		Multi-drone multi-sensor ISR capability		[2,000]	
		Quantum computing base materials optimization		[2,000]	
18	0602147A	LONG RANGE PRECISION FIRES TECHNOLOGY	60,553	7,000	67,553
		Composite artillery tube and propulsion prototyping		[7,000]	
19	0602148A	FUTURE VERTICLE LIFT TECHNOLOGY	96,484		96,484
20	0602150A	AIR AND MISSILE DEFENSE TECHNOLOGY	56,298	10,000	66,298
		Counter unmanned aerial systems threat R&D		[5,000]	
		Counter unmanned aircraft systems research		[5,000]	
22	0602213A	C3I APPLIED CYBER	18,816		18,816
40	0602785A	MANPOWER/PERSONNEL/TRAINING TECHNOLOGY	20,766		20,766
42	0602787A	MEDICAL TECHNOLOGY	95,496	2,000	97,496
		Research for coronavirus vaccine		[2,000]	
		SUBTOTAL APPLIED RESEARCH	**920,881**	**63,500**	**984,381**
		ADVANCED TECHNOLOGY DEVELOPMENT			
44	0603002A	MEDICAL ADVANCED TECHNOLOGY	38,896		38,896
49	0603007A	MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY	11,659		11,659
52	0603115A	MEDICAL DEVELOPMENT	27,723		27,723
53	0603117A	ARMY ADVANCED TECHNOLOGY DEVELOPMENT	62,663		62,663
54	0603118A	SOLDIER LETHALITY ADVANCED TECHNOLOGY	109,608	2,000	111,608

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		3D advanced manufacturing		[2,000]	
55	0603119A	GROUND ADVANCED TECHNOLOGY	14,795	6,000	20,795
		Cybersecurity for industrial control systems and building automation		[3,000]	
		Graphene applications for military engineering		[3,000]	
59	0603134A	COUNTER IMPROVISED-THREAT SIMULATION	25,000		25,000
63	0603457A	C3I CYBER ADVANCED DEVELOPMENT	23,357		23,357
64	0603461A	HIGH PERFORMANCE COMPUTING MODERNIZATION PROGRAM	188,024	5,000	193,024
		High performance computing modernization		[5,000]	
65	0603462A	NEXT GENERATION COMBAT VEHICLE ADVANCED TECHNOLOGY	199,358	27,500	226,858
		Carbon fiber and graphitic composites		[10,000]	
		Cyber and connected vehicle innovation research		[5,000]	
		Small unit ground robotic capabilities		[7,500]	
		Virtual experimentations enhancement		[5,000]	
66	0603463A	NETWORK C3I ADVANCED TECHNOLOGY	158,608		158,608
67	0603464A	LONG RANGE PRECISION FIRES ADVANCED TECHNOLOGY	121,060	3,000	124,060
		Hyper velocity projectile—extended range technologies		[3,000]	
68	0603465A	FUTURE VERTICAL LIFT ADVANCED TECHNOLOGY	156,194		156,194
69	0603466A	AIR AND MISSILE DEFENSE ADVANCED TECHNOLOGY	58,130	15,500	73,630
		Electromagnetic effects research to support fires and AMD CFTs		[5,000]	
		High-energy laser system characterization lab		[10,500]	
77	0603920A	HUMANITARIAN DEMINING	8,515		8,515
		SUBTOTAL ADVANCED TECHNOLOGY DEVELOPMENT	**1,203,590**	**59,000**	**1,262,590**
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
78	0603305A	ARMY MISSLE DEFENSE SYSTEMS INTEGRATION	11,062	3,000	14,062
		Hypersonic hot air tunnel test environment		[3,000]	
79	0603308A	ARMY SPACE SYSTEMS INTEGRATION	26,230		26,230

80	0603327A	AIR AND MISSILE DEFENSE SYSTEMS ENGINEERING	26,482		26,482
81	0603619A	LANDMINE WARFARE AND BARRIER—ADV DEV	64,092		64,092
83	0603639A	TANK AND MEDIUM CALIBER AMMUNITION	92,753		92,753
84	0603645A	ARMORED SYSTEM MODERNIZATION—ADV DEV	151,478		151,478
85	0603747A	SOLDIER SUPPORT AND SURVIVABILITY	5,841		5,841
86	0603766A	TACTICAL ELECTRONIC SURVEILLANCE SYSTEM—ADV DEV	194,775		194,775
87	0603774A	NIGHT VISION SYSTEMS ADVANCED DEVELOPMENT	24,316		24,316
88	0603779A	ENVIRONMENTAL QUALITY TECHNOLOGY—DEM/VAL	13,387		13,387
89	0603790A	NATO RESEARCH AND DEVELOPMENT	4,762		4,762
90	0603801A	AVIATION—ADV DEV	647,937	5,000	652,937
		Future Long Range Assault Aircraft (FLRAA)		[5,000]	
91	0603804A	LOGISTICS AND ENGINEER EQUIPMENT—ADV DEV	4,761		4,761
92	0603807A	MEDICAL SYSTEMS—ADV DEV	28,520		28,520
93	0603827A	SOLDIER SYSTEMS—ADVANCED DEVELOPMENT	26,138		26,138
94	0604017A	ROBOTICS DEVELOPMENT	121,207		121,207
96	0604021A	ELECTRONIC WARFARE TECHNOLOGY MATURATION (MIP)	22,840		22,840
97	0604035A	LOW EARTH ORBIT (LEO) SATELLITE CAPABILITY	22,678		22,678
98	0604100A	ANALYSIS OF ALTERNATIVES	10,082		10,082
99	0604101A	SMALL UNMANNED AERIAL VEHICLE (SUAV) (6.4)	1,378		1,378
100	0604113A	FUTURE TACTICAL UNMANNED AIRCRAFT SYSTEM (FTUAS)	40,083		40,083
101	0604114A	LOWER TIER AIR MISSILE DEFENSE (LTAMD) SENSOR	376,373		376,373
102	0604115A	TECHNOLOGY MATURATION INITIATIVES	156,834	–10,000	146,834
		OpFires lack of transition pathway		[–10,000]	
103	0604117A	MANEUVER—SHORT RANGE AIR DEFENSE (M-SHORAD)	4,995		4,995
105	0604119A	ARMY ADVANCED COMPONENT DEVELOPMENT & PROTOTYPING	170,490		170,490
106	0604120A	ASSURED POSITIONING, NAVIGATION AND TIMING (PNT)	128,125		128,125
107	0604121A	SYNTHETIC TRAINING ENVIRONMENT REFINEMENT & PROTOTYPING	129,547		129,547
108	0604134A	COUNTER IMPROVISED-THREAT DEMONSTRATION, PROTOTYPE DEVELOPMENT, AND TESTING	13,831		13,831
109	0604182A	HYPERSONICS	801,417	–5,000	796,417
		Lack of hypersonic prototyping coordination		[–5,000]	
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	Senate Change	Senate Authorized
115	0305251A	CYBERSPACE OPERATIONS FORCES AND FORCE SUPPORT	50,525		50,525
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	**3,421,608**	**–7,000**	**3,414,608**
		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		91,574
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	40,000	83,651
		Joint Counter-UAS Office acceleration		[17,500]	
		Joint Counter-UAS Office SOCOM advanced capabilities		[7,500]	
		Joint Counter-UAS Office SOCOM demonstrations		[15,000]	
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	800	266,611

		Increase NGSW soldier touchpoints		[800]	
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		162,513
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		20,008
147	0604827A	SOLDIER SYSTEMS—WARRIOR DEM/VAL	6,534		6,534
148	0604852A	SUITE OF SURVIVABILITY ENHANCEMENT SYSTEMS—EMD	82,459	47,000	129,459
		Bradley and Stryker APS		[47,000]	
149	0604854A	ARTILLERY SYSTEMS—EMD	11,611		11,611
150	0605013A	INFORMATION TECHNOLOGY DEVELOPMENT	142,678	5,000	147,678
		Integrated data software pilot program		[5,000]	
151	0605018A	INTEGRATED PERSONNEL AND PAY SYSTEM-ARMY (IPPS-A)	115,286		115,286
152	0605028A	ARMORED MULTI-PURPOSE VEHICLE (AMPV)	96,594		96,594
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		23,321
161	0605038A	NUCLEAR BIOLOGICAL CHEMICAL RECONNAISSANCE VEHICLE (NBCRV) SENSOR SUITE	4,846		4,846
162	0605041A	DEFENSIVE CYBER TOOL DEVELOPMENT	28,544	–12,000	16,544
		Army Cyber SU program		[–12,000]	
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	–47,800	187,970
		Army-identified funding early to need		[–47,800]	
168	0605053A	GROUND ROBOTICS	13,710		13,710
169	0605054A	EMERGING TECHNOLOGY INITIATIVES	294,739		294,739
170	0605145A	MEDICAL PRODUCTS AND SUPPORT SYSTEMS DEVELOPMENT	954		954

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
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	–80,000	247,732
		OMFV program reset		[–80,000]	
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		1,467
180	0303032A	TROJAN—RH12	3,451		3,451
183	0304270A	ELECTRONIC WARFARE DEVELOPMENT	55,855		55,855
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	**3,199,798**	**–47,000**	**3,152,798**
		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		106,270
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	15,000	365,359
		Program increase—Army directed energy T&E		[15,000]	
193	0605602A	ARMY TECHNICAL TEST INSTRUMENTATION AND TARGETS	48,475		48,475
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		40,133
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**	**15,000**	**1,348,123**
		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	–7,500	115,233
		Excess funds due to second vendor dropped		[–7,500]	
221	0607136A	BLACKHAWK PRODUCT IMPROVEMENT PROGRAM	11,236		11,236
222	0607137A	CHINOOK PRODUCT IMPROVEMENT PROGRAM	46,091		46,091
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

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
233	0203735A	COMBAT VEHICLE IMPROVEMENT PROGRAMS	268,919		268,919
234	0203743A	155MM SELF-PROPELLED HOWITZER IMPROVEMENTS	427,254		427,254
235	0203744A	AIRCRAFT MODIFICATIONS/PRODUCT IMPROVEMENT PROGRAMS	11,688		11,688
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		79,424
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	17,500	93,075
		Qualification of second SRM source		[17,500]	
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	17,500	78,512
		Functional fabrics manufacturing		[7,500]	
		Nanoscale materials manufacturing		[5,000]	
		Tungsten manufacturing for armanents		[5,000]	
999	9999999999	CLASSIFIED PROGRAMS	3,983		3,983
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	**1,998,539**	**27,500**	**2,026,039**
		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**	**0**	**46,445**
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, ARMY	**12,587,343**	**123,000**	**12,710,343**
		RESEARCH, DEVELOPMENT, TEST & EVAL, NAVY			
		BASIC RESEARCH			
1	0601103N	UNIVERSITY RESEARCH INITIATIVES	116,816	2,000	118,816
		Defense University Research and Instrumentation Program		[2,000]	
2	0601152N	IN-HOUSE LABORATORY INDEPENDENT RESEARCH	19,113		19,113
3	0601153N	DEFENSE RESEARCH SCIENCES	467,158	13,000	480,158
		Increase in basic research		[10,000]	
		Predictive modeling for undersea vehicles		[3,000]	
		SUBTOTAL BASIC RESEARCH	**603,087**	**15,000**	**618,087**
		APPLIED RESEARCH			
4	0602114N	POWER PROJECTION APPLIED RESEARCH	17,792		17,792
5	0602123N	FORCE PROTECTION APPLIED RESEARCH	122,281	18,000	140,281
		Direct air capture and blue carbon removal technology program		[8,000]	
		Electric propulsion for military craft and advanced planning hulls		[2,000]	
		Expeditionary unmanned systems launch and recovery		[5,000]	
		Testbed for autonomous ship systems		[3,000]	
6	0602131M	MARINE CORPS LANDING FORCE TECHNOLOGY	50,623	3,000	53,623
		Interdisciplinary cybersecurity research		[3,000]	
7	0602235N	COMMON PICTURE APPLIED RESEARCH	48,001		48,001
8	0602236N	WARFIGHTER SUSTAINMENT APPLIED RESEARCH	67,765	7,000	74,765
		Humanoid robotics research		[4,000]	
		Social networks and computational social science		[3,000]	
9	0602271N	ELECTROMAGNETIC SYSTEMS APPLIED RESEARCH	84,994		84,994
10	0602435N	OCEAN WARFIGHTING ENVIRONMENT APPLIED RESEARCH	63,392		63,392
11	0602651M	JOINT NON-LETHAL WEAPONS APPLIED RESEARCH	6,343		6,343
12	0602747N	UNDERSEA WARFARE APPLIED RESEARCH	56,397	7,500	63,897

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		Navy and academia submarine partnerships		[7,500]	
13	0602750N	FUTURE NAVAL CAPABILITIES APPLIED RESEARCH	167,590		167,590
14	0602782N	MINE AND EXPEDITIONARY WARFARE APPLIED RESEARCH	30,715		30,715
15	0602792N	INNOVATIVE NAVAL PROTOTYPES (INP) APPLIED RESEARCH	160,537	7,300	167,837
		Thermoplastic materials		[7,300]	
16	0602861N	SCIENCE AND TECHNOLOGY MANAGEMENT—ONR FIELD ACITIVITIES	76,745		76,745
		SUBTOTAL APPLIED RESEARCH	**953,175**	**42,800**	**995,975**
		ADVANCED TECHNOLOGY DEVELOPMENT			
17	0603123N	FORCE PROTECTION ADVANCED TECHNOLOGY	24,410		24,410
18	0603271N	ELECTROMAGNETIC SYSTEMS ADVANCED TECHNOLOGY	8,008		8,008
19	0603640M	USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)	219,045	3,000	222,045
		Mission planning advanced technology demonstration		[3,000]	
20	0603651M	JOINT NON-LETHAL WEAPONS TECHNOLOGY DEVELOPMENT	13,301		13,301
21	0603673N	FUTURE NAVAL CAPABILITIES ADVANCED TECHNOLOGY DEVELOPMENT	246,054		246,054
22	0603680N	MANUFACTURING TECHNOLOGY PROGRAM	60,122		60,122
23	0603729N	WARFIGHTER PROTECTION ADVANCED TECHNOLOGY	4,851		4,851
24	0603758N	NAVY WARFIGHTING EXPERIMENTS AND DEMONSTRATIONS	40,709		40,709
25	0603782N	MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY	1,948		1,948
26	0603801N	INNOVATIVE NAVAL PROTOTYPES (INP) ADVANCED TECHNOLOGY DEVELOPMENT	141,948		141,948
		SUBTOTAL ADVANCED TECHNOLOGY DEVELOPMENT	**760,396**	**3,000**	**763,396**
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
27	0603178N	MEDIUM AND LARGE UNMANNED SURFACE VEHICLES (USVS)	464,042	–464,042	
		Excess procurement ahead of satisfactory testing		[–464,042]	
28	0603207N	AIR/OCEAN TACTICAL APPLICATIONS	35,386		35,386
29	0603216N	AVIATION SURVIVABILITY	13,428		13,428

30	0603239N	ISO NAVAL CONSTRUCTION FORCES	2,350		2,350
31	0603251N	AIRCRAFT SYSTEMS	418		418
32	0603254N	ASW SYSTEMS DEVELOPMENT	15,719		15,719
33	0603261N	TACTICAL AIRBORNE RECONNAISSANCE	3,411		3,411
34	0603382N	ADVANCED COMBAT SYSTEMS TECHNOLOGY	70,218	–14,100	56,118
		Project 3416: HIJENKS insufficient schedule justification		[–7,000]	
		Project 3422: SHARC excess platforms ahead of satisfactory testing		[–7,100]	
35	0603502N	SURFACE AND SHALLOW WATER MINE COUNTERMEASURES	52,358	–28,200	24,158
		Project 2989: Barracuda program delay		[–28,200]	
36	0603506N	SURFACE SHIP TORPEDO DEFENSE	12,816		12,816
37	0603512N	CARRIER SYSTEMS DEVELOPMENT	7,559		7,559
38	0603525N	PILOT FISH	358,757		358,757
39	0603527N	RETRACT LARCH	12,562		12,562
40	0603536N	RETRACT JUNIPER	148,000		148,000
41	0603542N	RADIOLOGICAL CONTROL	778		778
42	0603553N	SURFACE ASW	1,161		1,161
43	0603561N	ADVANCED SUBMARINE SYSTEM DEVELOPMENT	185,356	10,000	195,356
		Out-of-autoclave submarine technology development		[20,000]	
		Project 9710: EDMs early to need		[–10,000]	
44	0603562N	SUBMARINE TACTICAL WARFARE SYSTEMS	10,528		10,528
45	0603563N	SHIP CONCEPT ADVANCED DESIGN	126,396	–63,100	63,296
		Project 2196: Future surface combatant early to need		[–19,100]	
		Project 3161: Program increase for CBM+ initiative		[16,000]	
		Project 4044: Medium amphibious ship early to need		[–30,000]	
		Project 4045: Medium logistics ship early to need		[–30,000]	
46	0603564N	SHIP PRELIMINARY DESIGN & FEASIBILITY STUDIES	70,270	–41,300	28,970
		Project 0411: LSC preliminary design and CDD early to need		[–41,300]	
47	0603570N	ADVANCED NUCLEAR POWER SYSTEMS	149,188		149,188
48	0603573N	ADVANCED SURFACE MACHINERY SYSTEMS	38,449	200,000	238,449
		Accelerate ITF to achieve full test capability in FY23		[75,000]	
		Accelerate qualification of silicon carbide power modules		[10,000]	
		USV autonomy development		[45,000]	

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		USV engine and generator qualification testing		[70,000]	
49	0603576N	CHALK EAGLE	71,181		71,181
50	0603581N	LITTORAL COMBAT SHIP (LCS)	32,178	–5,000	27,178
		Project 3096: Available prior year funds		[–5,000]	
51	0603582N	COMBAT SYSTEM INTEGRATION	17,843		17,843
52	0603595N	OHIO REPLACEMENT	317,196		317,196
53	0603596N	LCS MISSION MODULES	67,875	–35,000	32,875
		Project 2550: LCS MCM MP outdated IMS and TEMP		[–20,000]	
		Project 2551: LCS ASW MP available prior year funds due to testing delays		[–15,000]	
54	0603597N	AUTOMATED TEST AND ANALYSIS	4,797		4,797
55	0603599N	FRIGATE DEVELOPMENT	82,309		82,309
56	0603609N	CONVENTIONAL MUNITIONS	9,922	–7,800	2,122
		Project 0363: Insufficient justification		[–7,800]	
57	0603635M	MARINE CORPS GROUND COMBAT/SUPPORT SYSTEM	189,603		189,603
58	0603654N	JOINT SERVICE EXPLOSIVE ORDNANCE DEVELOPMENT	43,084		43,084
59	0603713N	OCEAN ENGINEERING TECHNOLOGY DEVELOPMENT	6,346		6,346
60	0603721N	ENVIRONMENTAL PROTECTION	20,601		20,601
61	0603724N	NAVY ENERGY PROGRAM	23,422		23,422
62	0603725N	FACILITIES IMPROVEMENT	4,664		4,664
63	0603734N	CHALK CORAL	545,763		545,763
64	0603739N	NAVY LOGISTIC PRODUCTIVITY	3,884		3,884
65	0603746N	RETRACT MAPLE	353,226		353,226
66	0603748N	LINK PLUMERIA	544,388		544,388
67	0603751N	RETRACT ELM	86,730		86,730
68	0603764M	LINK EVERGREEN	236,234		236,234
70	0603790N	NATO RESEARCH AND DEVELOPMENT	6,880		6,880
71	0603795N	LAND ATTACK TECHNOLOGY	10,578		10,578

72	0603851M	JOINT NON-LETHAL WEAPONS TESTING	28,435		28,435
73	0603860N	JOINT PRECISION APPROACH AND LANDING SYSTEMS—DEM/VAL	33,612		33,612
74	0603925N	DIRECTED ENERGY AND ELECTRIC WEAPON SYSTEMS	128,845	–15,000	113,845
		Project 3402: Excess engineering and sustainment support		[–15,000]	
75	0604014N	F/A –18 INFRARED SEARCH AND TRACK (IRST)	84,190		84,190
76	0604027N	DIGITAL WARFARE OFFICE	54,699		54,699
77	0604028N	SMALL AND MEDIUM UNMANNED UNDERSEA VEHICLES	53,942		53,942
78	0604029N	UNMANNED UNDERSEA VEHICLE CORE TECHNOLOGIES	40,060		40,060
79	0604030N	RAPID PROTOTYPING, EXPERIMENTATION AND DEMONSTRATION.	12,100		12,100
80	0604031N	LARGE UNMANNED UNDERSEA VEHICLES	78,122	–36,000	42,122
		Project 2094: Excess procurement ahead of phase 1 testing		[–36,000]	
81	0604112N	GERALD R. FORD CLASS NUCLEAR AIRCRAFT CARRIER (CVN 78—80)	107,895		107,895
82	0604126N	LITTORAL AIRBORNE MCM	17,366		17,366
83	0604127N	SURFACE MINE COUNTERMEASURES	18,754		18,754
84	0604272N	TACTICAL AIR DIRECTIONAL INFRARED COUNTERMEASURES (TADIRCM)	59,776		59,776
86	0604292N	FUTURE VERTICAL LIFT (MARITIME STRIKE)	5,097		5,097
87	0604320M	RAPID TECHNOLOGY CAPABILITY PROTOTYPE	3,664		3,664
88	0604454N	LX (R)	10,203		10,203
89	0604536N	ADVANCED UNDERSEA PROTOTYPING	115,858	–20,000	95,858
		Orca UUV testing delay and uncertified test strategy		[–10,000]	
		Snakehead UUV uncertified test strategy		[–10,000]	
90	0604636N	COUNTER UNMANNED AIRCRAFT SYSTEMS (C-UAS)	14,259		14,259
91	0604659N	PRECISION STRIKE WEAPONS DEVELOPMENT PROGRAM	1,102,387	–57,000	1,045,387
		Lack of hypersonic prototyping coordination		[–5,000]	
		Project 3334: Excess Virginia-class CPS modification and installation costs		[–52,000]	
92	0604707N	SPACE AND ELECTRONIC WARFARE (SEW) ARCHITECTURE/ENGINEERING SUPPORT	7,657		7,657
93	0604786N	OFFENSIVE ANTI-SURFACE WARFARE WEAPON DEVELOPMENT	35,750		35,750
94	0303354N	ASW SYSTEMS DEVELOPMENT—MIP	9,151		9,151
95	0304240M	ADVANCED TACTICAL UNMANNED AIRCRAFT SYSTEM	22,589		22,589
97	0304270N	ELECTRONIC WARFARE DEVELOPMENT—MIP	809		809
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	**6,503,074**	**–576,542**	**5,926,532**

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		SYSTEM DEVELOPMENT & DEMONSTRATION			
98	0603208N	TRAINING SYSTEM AIRCRAFT	4,332		4,332
99	0604212N	OTHER HELO DEVELOPMENT	18,133	5,000	23,133
		Program increase for Attack and Utility Replacement Aircraft		[5,000]	
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		477,680
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		386,225
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		93,097
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		259,443
133	0604562N	SUBMARINE TACTICAL WARFARE SYSTEM	63,878	–5,000	58,878
		AN/BYG–1 APB17 and APB19 testing delays		[–5,000]	
134	0604567N	SHIP CONTRACT DESIGN/ LIVE FIRE T&E	51,853	14,900	66,753
		Advanced degaussing DDG–51 retrofit and demonstration		[14,900]	
135	0604574N	NAVY TACTICAL COMPUTER RESOURCES	3,853		3,853
136	0604601N	MINE DEVELOPMENT	92,607		92,607
137	0604610N	LIGHTWEIGHT TORPEDO DEVELOPMENT	146,012	–30,000	116,012
		Project 1412: HAAWC operational testing delays		[–10,000]	
		Project 3418: Mk 54 Mod 2 contract delays		[–20,000]	
138	0604654N	JOINT SERVICE EXPLOSIVE ORDNANCE DEVELOPMENT	8,383		8,383
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		2,120
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

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
152	0605013N	INFORMATION TECHNOLOGY DEVELOPMENT	356,173		356,173
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 (JLTV) SYSTEM DEVELOPMENT & DEMONSTRATION	2,541		2,541
165	0204202N	DDG–1000	208,448		208,448
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**	**–15,100**	**6,248,783**
		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	RDT&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**	**0**	**991,222**
		OPERATIONAL SYSTEMS DEVELOPMENT			
199	0604227N	HARPOON MODIFICATIONS	697		697
200	0604840M	F–35 C2D2	379,549		379,549
201	0604840N	F–35 C2D2	413,875		413,875
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	–8,000	61,190
		CRAW EDM (TI–2) early to need		[–8,000]	
207	0101402N	NAVY STRATEGIC COMMUNICATIONS	42,277		42,277
208	0204136N	F/A–18 SQUADRONS	171,030		171,030
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	50,000	152,975
		Accelerate sensor and signal processing development		[25,000]	
		Program increase for spiral 1 TRAPS units		[25,000]	
213	0204313N	SHIP-TOWED ARRAY SURVEILLANCE SYSTEMS	10,873		10,873
214	0204413N	AMPHIBIOUS TACTICAL SUPPORT UNITS (DISPLACEMENT CRAFT)	1,713	5,000	6,713
		Program increase for LCAC composite component manufacturing		[5,000]	
215	0204460M	GROUND/AIR TASK ORIENTED RADAR (G/ATOR)	22,205	83,600	105,805

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		Program increase for G/ATOR and SM–6 stand-alone engagement analysis		[10,000]	
		Program increase for USMC G/ATOR and SM–6 demonstration		[73,600]	
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		41,978
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 (STUASL0)	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	10,000	44,967
		Cyber tool development		[10,000]	
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
999	9999999999	CLASSIFIED PROGRAMS	1,795,032		1,795,032
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	**5,327,043**	**140,600**	**5,467,643**
		SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS			
258	0608013N	RISK MANAGEMENT INFORMATION—SOFTWARE PILOT PROGRAM	14,300		14,300
259	0608231N	MARITIME TACTICAL COMMAND AND CONTROL (MTC2)—SOFTWARE PILOT PROGRAM	10,868		10,868
		SUBTOTAL SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS	**25,168**	**0**	**25,168**
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, NAVY	**21,427,048**	**–390,242**	**21,036,806**
		RESEARCH, DEVELOPMENT, TEST & EVAL, AF			
		BASIC RESEARCH			
1	0601102F	DEFENSE RESEARCH SCIENCES	315,348	10,000	325,348
		Increase in basic research		[10,000]	
2	0601103F	UNIVERSITY RESEARCH INITIATIVES	161,861		161,861
3	0601108F	HIGH ENERGY LASER RESEARCH INITIATIVES	15,085		15,085
		SUBTOTAL BASIC RESEARCH	**492,294**	**10,000**	**502,294**
		APPLIED RESEARCH			
4	0602020F	FUTURE AF CAPABILITIES APPLIED RESEARCH	100,000		100,000

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
5	0602102F	MATERIALS	140,781	19,500	160,281
		High-energy synchotron x-ray program		[5,000]	
		Materials maturation for high mach systems		[5,000]	
		Metals Affordability Initiative		[5,000]	
		Qualification of additive manufacturing processes		[2,000]	
		Techniques to repair fasteners		[2,500]	
6	0602201F	AEROSPACE VEHICLE TECHNOLOGIES	349,225	10,000	359,225
		Hypersonic materials		[10,000]	
7	0602202F	HUMAN EFFECTIVENESS APPLIED RESEARCH	115,222		115,222
9	0602204F	AEROSPACE SENSORS	211,301		211,301
11	0602298F	SCIENCE AND TECHNOLOGY MANAGEMENT— MAJOR HEADQUARTERS ACTIVITIES	8,926		8,926
12	0602602F	CONVENTIONAL MUNITIONS	132,425		132,425
13	0602605F	DIRECTED ENERGY TECHNOLOGY	128,113		128,113
14	0602788F	DOMINANT INFORMATION SCIENCES AND METHODS	178,668		178,668
15	0602890F	HIGH ENERGY LASER RESEARCH	45,088		45,088
		SUBTOTAL APPLIED RESEARCH	**1,409,749**	**29,500**	**1,439,249**
		ADVANCED TECHNOLOGY DEVELOPMENT			
17	0603030F	AF FOUNDATIONAL DEVELOPMENT/DEMOS	103,280		103,280
18	0603032F	FUTURE AF INTEGRATED TECHNOLOGY DEMOS	157,619	–50,000	107,619
		Golden Horde too mature for science and technology prototype		[–50,000]	
19	0603033F	NEXT GEN PLATFORM DEV/DEMO	199,556	9,000	208,556
		B–52 pylon fairings		[3,000]	
		C–130 finlets		[3,000]	
		KC–135 aft body drag		[3,000]	
20	0603034F	PERSISTENT KNOWLEDGE, AWARENESS, & C2 TECH	102,276		102,276
21	0603035F	NEXT GEN EFFECTS DEV/DEMOS	215,817		215,817

		SUBTOTAL ADVANCED TECHNOLOGY DEVELOPMENT	**778,548**	**–41,000**	**737,548**
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
38	0603260F	INTELLIGENCE ADVANCED DEVELOPMENT	4,320		4,320
39	0603742F	COMBAT IDENTIFICATION TECHNOLOGY	26,396		26,396
40	0603790F	NATO RESEARCH AND DEVELOPMENT	3,647		3,647
41	0603851F	INTERCONTINENTAL BALLISTIC MISSILE—DEM/VAL	32,959		32,959
43	0604002F	AIR FORCE WEATHER SERVICES RESEARCH	869		869
44	0604003F	ADVANCED BATTLE MANAGEMENT SYSTEM (ABMS)	302,323		302,323
45	0604004F	ADVANCED ENGINE DEVELOPMENT	636,495	50,000	686,495
		AETP program acceleration		[50,000]	
46	0604015F	LONG RANGE STRIKE—BOMBER	2,848,410		2,848,410
47	0604032F	DIRECTED ENERGY PROTOTYPING	20,964	5,000	25,964
		Directed energy counter-Unmanned Aerial Systems (CUAS)		[5,000]	
48	0604033F	HYPERSONICS PROTOTYPING	381,862	65,000	446,862
		HAWC program increase		[65,000]	
50	0604257F	ADVANCED TECHNOLOGY AND SENSORS	24,747		24,747
51	0604288F	NATIONAL AIRBORNE OPS CENTER (NAOC) RECAP	76,417		76,417
52	0604317F	TECHNOLOGY TRANSFER	3,011		3,011
53	0604327F	HARD AND DEEPLY BURIED TARGET DEFEAT SYSTEM (HDBTDS) PROGRAM	52,921		52,921
54	0604414F	CYBER RESILIENCY OF WEAPON SYSTEMS-ACS	69,783		69,783
55	0604776F	DEPLOYMENT & DISTRIBUTION ENTERPRISE R&D	25,835		25,835
56	0604858F	TECH TRANSITION PROGRAM	219,252	236,000	455,252
		Agile software development and operations		[4,500]	
		Initial polar MILSATCOM capability		[46,000]	
		KC–135 vertical wipers		[2,000]	
		KC–135 winglets		[10,000]	
		LCAAT program acceleration		[128,000]	
		Long-endurance UAS		[33,500]	
		Rapid repair of high performance materials		[6,000]	
		Small satellite acceleration		[6,000]	
57	0605230F	GROUND BASED STRATEGIC DETERRENT	1,524,759		1,524,759

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
59	0207110F	NEXT GENERATION AIR DOMINANCE	1,044,089		1,044,089
60	0207455F	THREE DIMENSIONAL LONG-RANGE RADAR (3DELRR)	19,356		19,356
61	0207522F	AIRBASE AIR DEFENSE SYSTEMS (ABADS)	8,737		8,737
62	0208099F	UNIFIED PLATFORM (UP)	5,990		5,990
63	0305236F	COMMON DATA LINK EXECUTIVE AGENT (CDL EA)	39,293		39,293
65	0305601F	MISSION PARTNER ENVIRONMENTS	11,430		11,430
66	0306250F	CYBER OPERATIONS TECHNOLOGY DEVELOPMENT	259,823		259,823
67	0306415F	ENABLED CYBER ACTIVITIES	10,560		10,560
68	0401310F	C–32 EXECUTIVE TRANSPORT RECAPITALIZATION	9,908		9,908
69	0901410F	CONTRACTING INFORMATION TECHNOLOGY SYSTEM	8,662		8,662
74	1206427F	SPACE SYSTEMS PROTOTYPE TRANSITIONS (SSPT)	8,787		8,787
77	1206730F	SPACE SECURITY AND DEFENSE PROGRAM	56,311		56,311
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	**7,737,916**	**356,000**	**8,093,916**
		SYSTEM DEVELOPMENT & DEMONSTRATION			
82	0604200F	FUTURE ADVANCED WEAPON ANALYSIS & PROGRAMS	25,161		25,161
83	0604201F	PNT RESILIENCY, MODS, AND IMPROVEMENTS	38,564		38,564
84	0604222F	NUCLEAR WEAPONS SUPPORT	35,033		35,033
85	0604270F	ELECTRONIC WARFARE DEVELOPMENT	2,098		2,098
86	0604281F	TACTICAL DATA NETWORKS ENTERPRISE	131,909		131,909
87	0604287F	PHYSICAL SECURITY EQUIPMENT	6,752		6,752
88	0604329F	SMALL DIAMETER BOMB (SDB)—EMD	17,280		17,280
89	0604429F	AIRBORNE ELECTRONIC ATTACK	0	30,000	30,000
		STiTCHES integration		[30,000]	
90	0604602F	ARMAMENT/ORDNANCE DEVELOPMENT	23,076		23,076
91	0604604F	SUBMUNITIONS	3,091		3,091
92	0604617F	AGILE COMBAT SUPPORT	20,609		20,609

93	0604618F	JOINT DIRECT ATTACK MUNITION	7,926		7,926
94	0604706F	LIFE SUPPORT SYSTEMS	23,660		23,660
95	0604735F	COMBAT TRAINING RANGES	8,898		8,898
96	0604800F	F–35—EMD	5,423		5,423
97	0604932F	LONG RANGE STANDOFF WEAPON	474,430		474,430
98	0604933F	ICBM FUZE MODERNIZATION	167,099		167,099
100	0605056F	OPEN ARCHITECTURE MANAGEMENT	30,547		30,547
102	0605223F	ADVANCED PILOT TRAINING	248,669	6,000	254,669
		SLATE/VR training		[6,000]	
103	0605229F	COMBAT RESCUE HELICOPTER	63,169		63,169
105	0101125F	NUCLEAR WEAPONS MODERNIZATION	9,683		9,683
106	0207171F	F–15 EPAWSS	170,679		170,679
107	0207328F	STAND IN ATTACK WEAPON	160,438		160,438
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		106,262
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 A1 SYSTEMS	8,467		8,467
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	**2,615,359**	**36,000**	**2,651,359**
		MANAGEMENT SUPPORT			
131	0604256F	THREAT SIMULATOR DEVELOPMENT	57,725		57,725
132	0604759F	MAJOR T&E INVESTMENT	208,680	15,000	223,680
		Gulf Range telemetric modernization		[15,000]	
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		764,606
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

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
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	ENTEPRISE INFORMATION SERVICES (EIS)	9,883	–7,500	2,383
		Acq strat incompatible with AF digital mod strategy		[–7,500]	
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**	**7,500**	**2,898,780**
		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		785,336
166	0605018F	AF INTEGRATED PERSONNEL AND PAY SYSTEM (AF-IPPS)	27,035	–20,000	7,035
		Poor agile development strategy		[–20,000]	
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		520,023
173	0101122F	AIR-LAUNCHED CRUISE MISSILE (ALCM)	1,433		1,433
174	0101126F	B–1B SQUADRONS	15,766	10,800	26,566
		USAF-requested transfer from APAF Lines 22, 24		[10,800]	

175	0101127F	B–2 SQUADRONS	187,399	187,399
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–1N 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	665,038
191	0207142F	F–35 SQUADRONS	132,229	132,229
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

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
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		128,110
247	0304310F	COMMERCIAL ECONOMIC ANALYSIS	4,042		4,042
251	0305020F	CCMD INTELLIGENCE INFORMATION TECHNOLOGY	1,649		1,649
252	0305022F	ISR MODERNIZATION & AUTOMATION DVMT (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		23,640
256	0305114F	AIR TRAFFIC CONTROL, APPROACH, AND LANDING SYSTEM (ATCALS)	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		121,512
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	3,680	17,315
		PDI: Mission Partner Environment BICES-X Project 675898		[3,680]	
275	0305881F	RAPID CYBER ACQUISITION	4,262		4,262
276	0305984F	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 (IF)	32,560		32,560
280	0401130F	C–17 AIRCRAFT (IF)	9,991	3,000	12,991
		C–17 microvanes		[3,000]	
281	0401132F	C–130J PROGRAM	10,674		10,674
282	0401134F	LARGE AIRCRAFT IR COUNTERMEASURES (LAIRCM)	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	–20,000	15,225
		Poor agile development strategy		[–20,000]	
292	0708611F	SUPPORT SYSTEMS DEVELOPMENT	11,838		11,838

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
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 ACNTNG AND MGT SYS (DEAMS)	45,638		45,638
301	1201017F	GLOBAL SENSOR INTEGRATED ON NETWORK (GSIN)	1,889		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
999	9999999999	CLASSIFIED PROGRAMS	15,777,856	62,000	15,839,856
		Air-to-air weapons development increase		[62,000]	
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	**21,466,680**	**39,480**	**21,506,160**
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, AF	**37,391,826**	**437,480**	**37,829,306**
		RDTE, SPACE FORCE			
		APPLIED RESEARCH			
1	1206601SF	SPACE TECHNOLOGY	130,874	3,000	133,874
		Small satellite mission operations facility		[3,000]	
		SUBTOTAL APPLIED RESEARCH	**130,874**	**3,000**	**133,874**
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
2	1203164SF	NAVSTAR GLOBAL POSITIONING SYSTEM (USER EQUIPMENT) (SPACE)	390,704	–20,000	370,704

		MGUE program slip		[–20,000]	
3	1203710SF	EO/IR WEATHER SYSTEMS	131,000		131,000
4	1206422SF	WEATHER SYSTEM FOLLOW-ON	83,384		83,384
5	1206425SF	SPACE SITUATION AWARENESS SYSTEMS	33,359		33,359
6	1206427SF	SPACE SYSTEMS PROTOTYPE TRANSITIONS (SSPT)	142,808		142,808
7	1206438SF	SPACE CONTROL TECHNOLOGY	35,575		35,575
8	1206760SF	PROTECTED TACTICAL ENTERPRISE SERVICE (PTES)	114,390		114,390
9	1206761SF	PROTECTED TACTICAL SERVICE (PTS)	205,178		205,178
10	1206855SF	EVOLVED STRATEGIC SATCOM (ESS)	71,395		71,395
11	1206857SF	SPACE RAPID CAPABILITIES OFFICE	103,518		103,518
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	**1,311,311**	**–20,000**	**1,291,311**
		SYSTEM DEVELOPMENT & DEMONSTRATION			
12	1203269SF	GPS III FOLLOW-ON (GPS IIIF)	263,496		263,496
13	1203940SF	SPACE SITUATION AWARENESS OPERATIONS	41,897		41,897
14	1206421SF	COUNTERSPACE SYSTEMS	54,689		54,689
15	1206422SFZ	WEATHER SYSTEM FOLLOW-ON	2,526		2,526
16	1206425SFZ	SPACE SITUATION AWARENESS SYSTEMS	173,074		173,074
17	1206431SF	ADVANCED EHF MILSATCOM (SPACE)	138,257		138,257
18	1206432SF	POLAR MILSATCOM (SPACE)	190,235		190,235
19	1206442SF	NEXT GENERATION OPIR	2,318,864		2,318,864
20	1206853SF	NATIONAL SECURITY SPACE LAUNCH PROGRAM (SPACE)—EMD	560,978	30,000	590,978
		NSSL Phase 3 integration activities program		[30,000]	
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	**3,744,016**	**30,000**	**3,774,016**
		MANAGEMENT SUPPORT			
21	1206116SF	SPACE TEST AND TRAINING RANGE DEVELOPMENT	20,281		20,281
22	1206392SF	ACQ WORKFORCE—SPACE & MISSILE SYSTEMS	183,930		183,930
23	1206398SF	SPACE & MISSILE SYSTEMS CENTER—MHA	9,765		9,765
24	1206860SF	ROCKET SYSTEMS LAUNCH PROGRAM (SPACE)	17,993		17,993
25	1206864SF	SPACE TEST PROGRAM (STP)	26,541		26,541
		SUBTOTAL MANAGEMENT SUPPORT	**258,510**	**0**	**258,510**

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		OPERATIONAL SYSTEM DEVELOPMENT			
26	1201017SF	GLOBAL SENSOR INTEGRATED ON NETWORK (GSIN)	3,708		3,708
27	1203001SF	FAMILY OF ADVANCED BLOS TERMINALS (FAB-T)	247,229		247,229
28	1203110SF	SATELLITE CONTROL NETWORK (SPACE)	75,480		75,480
29	1203165SF	NAVSTAR GLOBAL POSITIONING SYSTEM (SPACE AND CONTROL SEGMENTS)	1,984		1,984
30	1203173SF	SPACE AND MISSILE TEST AND EVALUATION CENTER	4,397		4,397
31	1203174SF	SPACE INNOVATION, INTEGRATION AND RAPID TECHNOLOGY DEVELOPMENT	44,746		44,746
32	1203182SF	SPACELIFT RANGE SYSTEM (SPACE)	11,020		11,020
33	1203265SF	GPS III SPACE SEGMENT	10,777		10,777
34	1203873SF	BALLISTIC MISSILE DEFENSE RADARS	28,179	18,500	46,679
		Cobra Dane service life extension		[18,500]	
35	1203913SF	NUDET DETECTION SYSTEM (SPACE)	29,157		29,157
36	1203940SFZ	SPACE SITUATION AWARENESS OPERATIONS	44,809	7,000	51,809
		Commercial SSA		[7,000]	
37	1206423SF	GLOBAL POSITIONING SYSTEM III—OPERATIONAL CONTROL SEGMENT	481,999	–65,000	416,999
		Funds available prioritized to other space missions		[–65,000]	
41	1206770SF	ENTERPRISE GROUND SERVICES	116,791		116,791
999	9999999999	CLASSIFIED PROGRAMS	3,632,866		3,632,866
		SUBTOTAL OPERATIONAL SYSTEM DEVELOPMENT	**4,733,142**	**–39,500**	**4,693,642**
		SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS			
42	1203614SF	JSPOC MISSION SYSTEM	149,742		149,742
		SUBTOTAL SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS	**149,742**	**0**	**149,742**
		TOTAL RDTE, SPACE FORCE	**10,327,595**	**–26,500**	**10,301,095**

		RESEARCH, DEVELOPMENT, TEST & EVAL, DW			
		BASIC RESEARCH			
1	0601000BR	DTRA BASIC RESEARCH	14,617		14,617
2	0601101E	DEFENSE RESEARCH SCIENCES	479,958		479,958
3	0601110D8Z	BASIC RESEARCH INITIATIVES	35,565	37,000	72,565
		DEPSCoR		[20,000]	
		Minerva Research initiative restore DWR cut		[17,000]	
4	0601117E	BASIC OPERATIONAL MEDICAL RESEARCH SCIENCE	53,730	5,000	58,730
		Traumatic brain injury medical research		[5,000]	
5	0601120D8Z	NATIONAL DEFENSE EDUCATION PROGRAM	100,241		100,241
6	0601228D8Z	HISTORICALLY BLACK COLLEGES AND UNIVERSITIES/MINORITY INSTITUTIONS	30,975	7,000	37,975
		Aerospace education, research, and innovation activities		[2,000]	
		HBCU/Minority Institutions		[5,000]	
7	0601384BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM	45,300		45,300
		SUBTOTAL BASIC RESEARCH	**760,386**	**49,000**	**809,386**
		APPLIED RESEARCH			
8	0602000D8Z	JOINT MUNITIONS TECHNOLOGY	19,409		19,409
9	0602115E	BIOMEDICAL TECHNOLOGY	107,568		107,568
11	0602230D8Z	DEFENSE TECHNOLOGY INNOVATION	35,000		35,000
12	0602234D8Z	LINCOLN LABORATORY RESEARCH PROGRAM	41,080		41,080
13	0602251D8Z	APPLIED RESEARCH FOR THE ADVANCEMENT OF S&T PRIORITIES	60,722		60,722
14	0602303E	INFORMATION & COMMUNICATIONS TECHNOLOGY	435,920		435,920
15	0602383E	BIOLOGICAL WARFARE DEFENSE	26,950		26,950
16	0602384BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM	201,807		201,807
17	0602668D8Z	CYBER SECURITY RESEARCH	15,255		15,255
18	0602702E	TACTICAL TECHNOLOGY	233,271		233,271
19	0602715E	MATERIALS AND BIOLOGICAL TECHNOLOGY	250,107	40,000	290,107
		Increase in emerging biotech research		[40,000]	
20	0602716E	ELECTRONICS TECHNOLOGY	322,693		322,693
21	0602718BR	COUNTER WEAPONS OF MASS DESTRUCTION APPLIED RESEARCH	174,571		174,571
22	0602751D8Z	SOFTWARE ENGINEERING INSTITUTE (SEI) APPLIED RESEARCH	9,573		9,573

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
23	1160401BB	SOF TECHNOLOGY DEVELOPMENT	42,464		42,464
		SUBTOTAL APPLIED RESEARCH	**1,976,390**	**40,000**	**2,016,390**
		ADVANCED TECHNOLOGY DEVELOPMENT			
24	0603000D8Z	JOINT MUNITIONS ADVANCED TECHNOLOGY	22,920		22,920
25	0603121D8Z	SO/LIC ADVANCED DEVELOPMENT	4,914		4,914
26	0603122D8Z	COMBATING TERRORISM TECHNOLOGY SUPPORT	51,089		51,089
27	0603133D8Z	FOREIGN COMPARATIVE TESTING	25,183		25,183
29	0603160BR	COUNTER WEAPONS OF MASS DESTRUCTION ADVANCED TECHNOLOGY DEVELOPMENT	366,659		366,659
30	0603176C	ADVANCED CONCEPTS AND PERFORMANCE ASSESSMENT	14,910		14,910
32	0603180C	ADVANCED RESEARCH	18,687		18,687
33	0603225D8Z	JOINT DOD-DOE MUNITIONS TECHNOLOGY DEVELOPMENT	18,873		18,873
34	0603286E	ADVANCED AEROSPACE SYSTEMS	230,978	–20,000	210,978
		OpFires lack of transition pathway		[–20,000]	
35	0603287E	SPACE PROGRAMS AND TECHNOLOGY	158,439		158,439
36	0603288D8Z	ANALYTIC ASSESSMENTS	23,775		23,775
37	0603289D8Z	ADVANCED INNOVATIVE ANALYSIS AND CONCEPTS	36,524		36,524
38	0603291D8Z	ADVANCED INNOVATIVE ANALYSIS AND CONCEPTS—MHA	14,703		14,703
39	0603294C	COMMON KILL VEHICLE TECHNOLOGY	11,058		11,058
40	0603338D8Z	DEFENSE MODERNIZATION AND PROTOTYPING	133,375	–7,000	126,375
		Lack of hypersonic prototype coordination efforts		[–20,000]	
		Stratospheric balloon research		[13,000]	
42	0603342D8Z	DEFENSE INNOVATION UNIT (DIU)	26,141		26,141
43	0603375D8Z	TECHNOLOGY INNOVATION	27,709		27,709
44	0603384BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM—ADVANCED DEVELOPMENT	188,001		188,001
45	0603527D8Z	RETRACT LARCH	130,283		130,283
46	0603618D8Z	JOINT ELECTRONIC ADVANCED TECHNOLOGY	15,164		15,164

47	0603648D8Z	JOINT CAPABILITY TECHNOLOGY DEMONSTRATIONS	85,452		85,452
48	0603662D8Z	NETWORKED COMMUNICATIONS CAPABILITIES	5,882		5,882
49	0603680D8Z	DEFENSE-WIDE MANUFACTURING SCIENCE AND TECHNOLOGY PROGRAM	93,817	5,000	98,817
		Rapid prototyping using digital manufacturing		[5,000]	
50	0603680S	MANUFACTURING TECHNOLOGY PROGRAM	40,025	15,000	55,025
		Defense supply chain technologies		[5,000]	
		Steel performance initiative		[10,000]	
52	0603712S	GENERIC LOGISTICS R&D TECHNOLOGY DEMONSTRATIONS	10,235		10,235
53	0603716D8Z	STRATEGIC ENVIRONMENTAL RESEARCH PROGRAM	53,862		53,862
54	0603720S	MICROELECTRONICS TECHNOLOGY DEVELOPMENT AND SUPPORT	124,049		124,049
55	0603727D8Z	JOINT WARFIGHTING PROGRAM	3,871		3,871
56	0603739E	ADVANCED ELECTRONICS TECHNOLOGIES	95,864		95,864
57	0603760E	COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS	221,724		221,724
58	0603766E	NETWORK-CENTRIC WARFARE TECHNOLOGY	661,158	–10,000	651,158
		Lack of coordination		[–10,000]	
59	0603767E	SENSOR TECHNOLOGY	200,220		200,220
60	0603769D8Z	DISTRIBUTED LEARNING ADVANCED TECHNOLOGY DEVELOPMENT	6,765		6,765
61	0603781D8Z	SOFTWARE ENGINEERING INSTITUTE	12,598		12,598
64	0603924D8Z	HIGH ENERGY LASER ADVANCED TECHNOLOGY PROGRAM	105,410		105,410
65	0603941D8Z	TEST & EVALUATION SCIENCE & TECHNOLOGY	187,065		187,065
67	0604055D8Z	OPERATIONAL ENERGY CAPABILITY IMPROVEMENT	0	65,000	65,000
		Restoration of funds		[65,000]	
70	1160402BB	SOF ADVANCED TECHNOLOGY DEVELOPMENT	89,072		89,072
71	1206310SDA	SPACE SCIENCE AND TECHNOLOGY RESEARCH AND DEVELOPMENT	72,422		72,422
		SUBTOTAL ADVANCED TECHNOLOGY DEVELOPMENT	**3,588,876**	**48,000**	**3,636,876**
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
72	0603161D8Z	NUCLEAR AND CONVENTIONAL PHYSICAL SECURITY EQUIPMENT RDT&E ADC&P	32,636		32,636
73	0603600D8Z	WALKOFF	106,529		106,529
75	0603851D8Z	ENVIRONMENTAL SECURITY TECHNICAL CERTIFICATION PROGRAM	61,345	15,000	76,345
		Joint Storage Program		[15,000]	
76	0603881C	BALLISTIC MISSILE DEFENSE TERMINAL DEFENSE SEGMENT	412,627		412,627

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
77	0603882C	BALLISTIC MISSILE DEFENSE MIDCOURSE DEFENSE SEGMENT	1,004,305		1,004,305
78	0603884BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM—DEM/VAL	76,167		76,167
79	0603884C	BALLISTIC MISSILE DEFENSE SENSORS	281,957		281,957
80	0603890C	BMD ENABLING PROGRAMS	599,380		599,380
81	0603891C	SPECIAL PROGRAMS—MDA	420,216		420,216
82	0603892C	AEGIS BMD	814,936		814,936
83	0603896C	BALLISTIC MISSILE DEFENSE COMMAND AND CONTROL, BATTLE MANAGEMENT AND COMMUNICATI.	593,353		593,353
84	0603898C	BALLISTIC MISSILE DEFENSE JOINT WARFIGHTER SUPPORT	49,560		49,560
85	0603904C	MISSILE DEFENSE INTEGRATION & OPERATIONS CENTER (MDIOC)	55,356		55,356
86	0603906C	REGARDING TRENCH	11,863		11,863
87	0603907C	SEA BASED X-BAND RADAR (SBX)	118,318		118,318
88	0603913C	ISRAELI COOPERATIVE PROGRAMS	300,000		300,000
89	0603914C	BALLISTIC MISSILE DEFENSE TEST	378,302		378,302
90	0603915C	BALLISTIC MISSILE DEFENSE TARGETS	536,133		536,133
92	0603923D8Z	COALITION WARFARE	10,129		10,129
93	0604011D8Z	NEXT GENERATION INFORMATION COMMUNICATIONS TECHNOLOGY (5G)	449,000		449,000
94	0604016D8Z	DEPARTMENT OF DEFENSE CORROSION PROGRAM	3,325		3,325
95	0604115C	TECHNOLOGY MATURATION INITIATIVES	67,389		67,389
98	0604181C	HYPERSONIC DEFENSE	206,832		206,832
99	0604250D8Z	ADVANCED INNOVATIVE TECHNOLOGIES	730,508	–100,000	630,508
		Program decrease		[–100,000]	
100	0604294D8Z	TRUSTED & ASSURED MICROELECTRONICS	489,076		489,076
101	0604331D8Z	RAPID PROTOTYPING PROGRAM	102,023	–20,000	82,023
		Lack of hypersonic prototype coordination efforts		[–20,000]	
102	0604341D8Z	DEFENSE INNOVATION UNIT (DIU) PROTOTYPING	13,255		13,255
103	0604400D8Z	DEPARTMENT OF DEFENSE (DOD) UNMANNED SYSTEM COMMON DEVELOPMENT	2,787		2,787

105	0604672C	HOMELAND DEFENSE RADAR—HAWAII (HDR-H)	0	162,000	162,000
		Continue radar development		[162,000]	
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 HOMELAND DEFENSE INTERCEPTORS	664,138	–310,000	354,138
		Contract award delay		[–310,000]	
112	0604876C	BALLISTIC MISSILE DEFENSE TERMINAL DEFENSE SEGMENT TEST	7,768		7,768
113	0604878C	AEGIS BMD TEST	170,880		170,880
114	0604879C	BALLISTIC MISSILE DEFENSE SENSOR TEST	76,456		76,456
115	0604880C	LAND-BASED SM–3 (LBSM3)	56,628	76,800	133,428
		PDI: Guam Defense System—systems engineering		[76,800]	
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	110,000	325,994
		Execution of HBTSS by MDA		[–20,000]	
		Space-based target custody layer		[130,000]	
122	1206893C	SPACE TRACKING & SURVEILLANCE SYSTEM	34,144		34,144
123	1206895C	BALLISTIC MISSILE DEFENSE SYSTEM SPACE PROGRAMS	32,068	120,000	152,068
		Hypersonic and Ballistic Tracking Space Sensor (HBTSS)		[120,000]	
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	**9,416,712**	**53,800**	**9,470,512**
		SYSTEM DEVELOPMENT & DEMONSTRATION			
124	0604161D8Z	NUCLEAR AND CONVENTIONAL PHYSICAL SECURITY EQUIPMENT RDT&E SDD	7,173		7,173
126	0604384BP	CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM—EMD	319,976	3,000	322,976
		Stryker NBCRV sensor suite upgrade		[3,000]	
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	HOMELAND PERSONNEL SECURITY INITIATIVE	7,287		7,287

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
131	0605022D8Z	DEFENSE EXPORTABILITY PROGRAM	12,928		12,928
132	0605027D8Z	OUSD(C) IT DEVELOPMENT INITIATIVES	10,259		10,259
133	0605070S	DOD ENTERPRISE SYSTEMS DEVELOPMENT AND DEMONSTRATION	1,377		1,377
134	0605075D8Z	CMO 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 (EEIM)	3,275		3,275
144	0305310D8Z	CWMD SYSTEMS: SYSTEM DEVELOPMENT AND DEMONSTRATION	20,585		20,585
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	**603,808**	**3,000**	**606,808**
		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	30,000	452,451
		Joint Counter-UAS Office assessment infrastructure		[15,000]	
		Telemetry range extension wave glider relay		[15,000]	
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	2,000	7,777

		National Academies of Science study on comparison of talent programs		[2,000]	
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 (SBIR)/ 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	–50,000	9,369
		Insufficient progress on data sharing and open repositories		[–50,000]	
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	JOINT STAFF ANALYTICAL SUPPORT	3,058		3,058
182	0208045K	C4I INTEROPERABILITY	59,813		59,813
185	0303140SE	INFORMATION SYSTEMS SECURITY PROGRAM	1,112		1,112
186	0303166J	SUPPORT TO INFORMATION OPERATIONS (IO) CAPABILITIES	545		545
187	0303260D8Z	DEFENSE MILITARY DECEPTION PROGRAM OFFICE (DMDPO)	1,036		1,036
188	0305172K	COMBINED ADVANCED APPLICATIONS	30,824		30,824
190	0305208K	DISTRIBUTED COMMON GROUND/SURFACE SYSTEMS	3,048		3,048
194	0804768J	COCOM EXERCISE ENGAGEMENT AND TRAINING TRANSFORMATION (CE2T2)—NON-MHA	31,125		31,125
195	0808709SE	DEFENSE EQUAL OPPORTUNITY MANAGEMENT INSTITUTE (DEOMI)	100		100
196	0901598C	MANAGEMENT HQ—MDA	26,902		26,902
197	0903235K	JOINT SERVICE PROVIDER (JSP)	3,138		3,138
999	9999999999	CLASSIFIED PROGRAMS	41,583		41,583
		SUBTOTAL MANAGEMENT SUPPORT	**1,297,392**	**–18,000**	**1,279,392**

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		OPERATIONAL SYSTEMS DEVELOPMENT			
199	0604130V	ENTERPRISE SECURITY SYSTEM (ESS)	14,378		14,378
200	0604532K	JOINT ARTIFICIAL INTELLIGENCE	132,058		132,058
201	0605127T	REGIONAL INTERNATIONAL OUTREACH (RIO) AND PARTNERSHIP FOR PEACE INFORMATION MANA	1,986		1,986
202	0605147T	OVERSEAS HUMANITARIAN ASSISTANCE SHARED INFORMATION SYSTEM (OHASIS)	316		316
203	0607210D8Z	INDUSTRIAL BASE ANALYSIS AND SUSTAINMENT SUPPORT	9,151	61,000	70,151
		Advanced machine tool research		[20,000]	
		Cold spray manufacturing technologies		[5,000]	
		Domestic organic LED manufacturing		[5,000]	
		Implementation of radar supplier resiliency plan		[5,000]	
		Manufacturing for reuse of NdFeB magnets		[6,000]	
		Submarine industrial base workforce training pipeline		[20,000]	
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	20,000	66,577
		Workforce transformation cyber initiative pilot program		[20,000]	
217	0303140G	INFORMATION SYSTEMS SECURITY PROGRAM	356,713		356,713
218	0303140K	INFORMATION SYSTEMS SECURITY PROGRAM	8,922	10,000	18,922
		Execution of orchestration pilot		[10,000]	
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	–486	9,242
		JRSS SIPR funding		[–486]	
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		136,041
261	1160431BB	WARRIOR SYSTEMS	59,511	–1,200	58,311
		MMP-Light unexecutable, transfer to man-pack		[–1,200]	
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
999	9999999999	CLASSIFIED PROGRAMS	4,746,466		4,746,466
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	**6,161,946**	**89,314**	**6,251,260**
		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		86,750
272	0308588D8Z	ALGORITHMIC WARFARE CROSS FUNCTIONAL TEAMS—SOFTWARE PILOT PROGRAM	250,107		250,107
		SUBTOTAL SOFTWARE AND DIGITAL TECHNOLOGY PILOT PROGRAMS	**475,381**	**0**	**475,381**

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

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, DW	**24,280,891**	**265,114**	**24,546,005**
		OPERATIONAL TEST & EVAL, DEFENSE			
		MANAGEMENT SUPPORT			
1	0605118OTE	OPERATIONAL TEST AND EVALUATION	100,021		100,021
2	0605131OTE	LIVE FIRE TEST AND EVALUATION	70,933		70,933
3	0605814OTE	OPERATIONAL TEST ACTIVITIES AND ANALYSES	39,136	27,000	66,136
		Advanced satellite navigation receiver		[5,000]	
		Joint Test and Evaluation DWR funding restoration		[22,000]	
		SUBTOTAL MANAGEMENT SUPPORT	**210,090**	**27,000**	**237,090**
		TOTAL OPERATIONAL TEST & EVAL, DEFENSE	**210,090**	**27,000**	**237,090**
		TOTAL RDT&E	**106,224,793**	**435,852**	**106,660,645**

SEC. 4202. RESEARCH, DEVELOPMENT, TEST, AND EVALUATION FOR OVERSEAS CONTINGENCY OPERATIONS.

SEC. 4202. RESEARCH, DEVELOPMENT, TEST, AND EVALUATION FOR OVERSEAS CONTINGENCY OPERATIONS
(In Thousands of Dollars)

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		RESEARCH, DEVELOPMENT, TEST & EVAL, ARMY			
		APPLIED RESEARCH			
16	0602145A	NEXT GENERATION COMBAT VEHICLE TECHNOLOGY	2,000		2,000
		SUBTOTAL APPLIED RESEARCH	**2,000**	**0**	**2,000**
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
80	0603327A	AIR AND MISSILE DEFENSE SYSTEMS ENGINEERING	500		500
114	0604785A	INTEGRATED BASE DEFENSE (BUDGET ACTIVITY 4)	2,020		2,020
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	**2,520**	**0**	**2,520**
		SYSTEM DEVELOPMENT & DEMONSTRATION			
131	0604741A	AIR DEFENSE COMMAND, CONTROL AND INTELLIGENCE—ENG DEV	27,000		27,000
159	0605035A	COMMON INFRARED COUNTERMEASURES (CIRCM)	2,300		2,300
166	0605051A	AIRCRAFT SURVIVABILITY DEVELOPMENT	64,625		64,625
183	0304270A	ELECTRONIC WARFARE DEVELOPMENT	3,900		3,900
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	**97,825**	**0**	**97,825**
		MANAGEMENT SUPPORT			
198	0605709A	EXPLOITATION OF FOREIGN ITEMS	1,000		1,000
209	0606003A	COUNTERINTEL AND HUMAN INTEL MODERNIZATION	4,137		4,137
		SUBTOTAL MANAGEMENT SUPPORT	**5,137**	**0**	**5,137**
		OPERATIONAL SYSTEMS DEVELOPMENT			
239	0203802A	OTHER MISSILE PRODUCT IMPROVEMENT PROGRAMS	2,300		2,300

SEC. 4202. RESEARCH, DEVELOPMENT, TEST, AND EVALUATION FOR OVERSEAS CONTINGENCY OPERATIONS
(In Thousands of Dollars)

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
248	0303028A	SECURITY AND INTELLIGENCE ACTIVITIES	23,367		23,367
257	0305204A	TACTICAL UNMANNED AERIAL VEHICLES	34,100		34,100
258	0305206A	AIRBORNE RECONNAISSANCE SYSTEMS	15,575		15,575
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	**75,342**	**0**	**75,342**
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, ARMY	**182,824**	**0**	**182,824**
		RESEARCH, DEVELOPMENT, TEST & EVAL, NAVY			
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
39	0603527N	RETRACT LARCH	36,500		36,500
58	0603654N	JOINT SERVICE EXPLOSIVE ORDNANCE DEVELOPMENT	14,461		14,461
63	0603734N	CHALK CORAL	3,000		3,000
71	0603795N	LAND ATTACK TECHNOLOGY	1,457		1,457
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	**55,418**	**0**	**55,418**
		SYSTEM DEVELOPMENT & DEMONSTRATION			
142	0604755N	SHIP SELF DEFENSE (DETECT & CONTROL)	1,144		1,144
		SUBTOTAL SYSTEM DEVELOPMENT & DEMONSTRATION	**1,144**	**0**	**1,144**
		OPERATIONAL SYSTEMS DEVELOPMENT			
229	0206625M	USMC INTELLIGENCE/ELECTRONIC WARFARE SYSTEMS (MIP)	3,000		3,000
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	**3,000**	**0**	**3,000**
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, NAVY	**59,562**	**0**	**59,562**
		RESEARCH, DEVELOPMENT, TEST & EVAL, AF			
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			

65	0305601F	MISSION PARTNER ENVIRONMENTS		6,500	6,500
		EDI: Mission Partner Environment (MPE)		[6,500]	
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	**0**	**6,500**	**6,500**
		OPERATIONAL SYSTEMS DEVELOPMENT			
185	0205671F	JOINT COUNTER RCIED ELECTRONIC WARFARE	4,080		4,080
228	0208288F	INTEL DATA APPLICATIONS	1,224		1,224
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	**5,304**	**0**	**5,304**
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, AF	**5,304**	**6,500**	**11,804**
		RESEARCH, DEVELOPMENT, TEST & EVAL, DW			
		APPLIED RESEARCH			
10	0602134BR	COUNTER IMPROVISED-THREAT ADVANCED STUDIES	3,699		3,699
		SUBTOTAL APPLIED RESEARCH	**3,699**	**0**	**3,699**
		ADVANCED TECHNOLOGY DEVELOPMENT			
26	0603122D8Z	COMBATING TERRORISM TECHNOLOGY SUPPORT	19,288		19,288
28	0603134BR	COUNTER IMPROVISED-THREAT SIMULATION	3,861		3,861
		SUBTOTAL ADVANCED TECHNOLOGY DEVELOPMENT	**23,149**	**0**	**23,149**
		ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES			
97	0604134BR	COUNTER IMPROVISED-THREAT DEMONSTRATION, PROTOTYPE DEVELOPMENT, AND TESTING	19,931		19,931
		SUBTOTAL ADVANCED COMPONENT DEVELOPMENT & PROTOTYPES	**19,931**	**0**	**19,931**
	9999999999	CLASSIFIED PROGRAMS	24,057		24,057
		OPERATIONAL SYSTEMS DEVELOPMENT			
260	1160408BB	OPERATIONAL ENHANCEMENTS	1,186		1,186
261	1160431BB	WARRIOR SYSTEMS	5,796		5,796
263	1160434BB	UNMANNED ISR	5,000		5,000
		SUBTOTAL OPERATIONAL SYSTEMS DEVELOPMENT	**36,039**	**0**	**36,039**

SEC. 4202. RESEARCH, DEVELOPMENT, TEST, AND EVALUATION FOR OVERSEAS CONTINGENCY OPERATIONS
(In Thousands of Dollars)

Line	Program Element	Item	FY 2021 Request	Senate Change	Senate Authorized
		TOTAL RESEARCH, DEVELOPMENT, TEST & EVAL, DW	82,818	0	82,818
		TOTAL RDT&E	330,508	6,500	337,008