

Coalition for National Security Research (CNSR)
Prepared for the Subcommittee on Defense, Committee on Appropriations, U.S. Senate
Defense Basic Research and Science & Technology (S&T) Funding for Fiscal Year 2018

Chairman Cochran, Ranking Member Durbin, and distinguished Members of the subcommittee, thank you for the opportunity to submit outside witness testimony as you begin to craft the fiscal year (FY) 2018 Defense Appropriations bill. On behalf of the Coalition for National Security Research (CNSR), we respectfully request at least \$2.3 billion for the Defense basic research program elements (PE), \$14.5 billion for the Defense Science & Technology (S&T) program, \$3 billion for the Defense Advanced Research Projects Agency (DARPA), and \$1.3 billion for the Peer Reviewed Medical Research Programs among other defense medical research programs as outlined in this testimony. Throughout this statement you will find charts detailing specific recommendations for CNSR's priority PEs for FY 2018.

CNSR is a broad-based alliance of nearly 90 research organizations including the nation's top research universities and institutes, scientific and professional organizations, and non-profits committed to advocating for a strong Defense S&T enterprise. Based on the most recent data available, coalition members performed more than \$4.7 billion in Department of Defense (DOD) sponsored scientific research and technology development. Broadly, colleges and universities performed 23 percent of all DOD sponsored scientific research including nearly 50 percent of all DOD sponsored basic scientific research.

With the Trump Administration priority of increasing defense spending to help rebuild and restore the U.S. military, most people naturally believe the funding is necessary for building weapons systems and platforms, such as aircraft carriers, fighter planes and providing our military with the necessary equipment to be the world's most dominate fighting force. While each of these activities is vitally important, we urge the subcommittee to continue to support funding for the Defense scientific research and development that underpins these aircraft carriers, fighter planes and our military's equipment but just as important provide for research and discoveries that will enable the warfighter for 2030 and beyond where he/she will face threats that we can only fear today.

Our FY 2018 funding recommendations stem from [*Innovation: An American Imperative*](#) (Innovation Imperative), a statement signed by the CEOs of Northrop Grumman, Lockheed Martin, Boeing, Microsoft, and endorsed by over 500 other leading organizations from industry, research universities, and science and engineering organizations. Specifically, the Innovation Imperative urges Congress to end sequestration and provide steady and sustained growth in funding of at least four percent for basic scientific research at numerous agencies, including the DOD. As a cosigner of the Innovation Imperative, CNSR believes that if the U.S. is to maintain its technological superiority, we must prioritize federal scientific research investments and support policies that promote innovation. With countries like China more than tripling their spending on research and development over the past 17 years, now more than ever we need to support basic scientific research to enable discoveries and innovations that will provide the necessary military capabilities of tomorrow and help offset any technological innovations made by competitor nations. It is vital to our national security that the United States maintains its

technical superiority; investing in Defense basic research and Defense S&T now will ensure our national security well into the future.

Defense Basic Research PE Recommendations

Defense basic research provides the seed corn that enables discoveries that have led to paradigm shifts in the military's technological capabilities as well as trains our next generation science & engineering workforce. Basic scientific research is sometimes conducted with no specific technological product in mind, but has still led to the development of many tools used by today's warfighters. Night vision, lasers, stealth technology, missile defense capabilities, unmanned aerial and underwater vehicles, global positioning systems, and precision guided munitions all trace their roots to basic Defense research, and have helped ensure our national security for decades. We cannot underinvest in the long-term basic research that will provide the military with the foundation for technologies of tomorrow that will ensure our technological and military superiority in the decades ahead.

While this subcommittee has shown strong support for Defense basic research, we remain concerned about overall funding levels. While we are appreciative that the FY 2017 Omnibus Appropriations bill did not align with the proposed reductions to Defense basic research in the FY 2017 budget request, we remain concerned that Defense basic research funding has not been trending in a positive direction in recent years. If these funding trends continue, we are concerned that the Defense research enterprise will be unable to support the innovative research that will enable scientific discoveries allowing for continued U.S. technological superiority in the future. In addition, we are concerned that we will not be able to support the world's most productive and innovative workforce if Defense basic research funding continues to decline as basic research continuously attracts the best and brightest minds.

Making significant breakthroughs in basic scientific research requires sustained long-term growth in funding that keeps pace with inflation and other cost-driving factors. For two of DOD's key basic research programs, we are seeing evidence of flat and declining support. Since FY 2014, the Multidisciplinary University Research Initiative (MURI) program has only been able to support slightly over 20 projects on an annual basis. Each year, there are roughly between 50 and 60 proposals that go unfunded. Additionally, FY 2017 awarded funding declined by 2.5 percent from FY 2014 and saw a decrease in university participation of approximately 16 percent. The MURI program is responsible for sponsoring research that led to the foundations in multidisciplinary research, such as artificial intelligence, created new possibilities for nano-manufacturing, and the software that formed the basis of computer-aided control of unmanned systems or military drones. From our perspective, underfunding this program could result in the military technologies of tomorrow being discovered by other nations willing to invest in fundamental scientific research.

Additionally, the Defense University Research Instrumentation Program (DURIP) sponsors the acquisition of state of the art equipment needed to support cutting edge defense research to enable discoveries for DOD technologies. Over the past three fiscal years, there has been a steady decline in support for DURIP. Awarded funding has declined by more than 44 percent from FY 2015 to FY 2017. Over the same time period, the number of researchers funded has

dropped by more than 65 investigators and the number of institutions participating in the program has been reduced by more than 32 percent. DOD relies on colleges and universities to perform nearly 50 percent of its sponsored basic scientific research. Given the nature of DOD research, unless there is sufficient support provided to acquire the necessary equipment to conduct DOD-needed scientific research, we are potentially jeopardizing future scientific discoveries that will ensure U.S. military technical superiority in the decades ahead.

We offer the following recommendations for the key Defense basic research PEs that serve as the foundation of the innovation pipeline.

Agency/Account	Program Element (PE) (\$ in Thousands)	FY16 Enacted	FY17 Enacted	FY18 Rec.
Army RDT&E	Defense Research Sciences	\$279,118	\$293,116	\$304,841
Army RDT&E	University Research Initiatives	\$72,603	\$69,166	\$71,933
Army RDT&E	University and Industry Research Centers	\$104,340	\$112,280	\$116,771
Navy RDT&E	University Research Initiatives	\$146,196	\$121,714	\$146,196
Navy RDT&E	Defense Research Sciences	\$506,553	\$422,748	\$506,553
Air Force RDT&E	Defense Research Sciences	\$374,721	\$380,812	\$396,044
Air Force RDT&E	University Research Initiatives	\$141,754	\$150,044	\$156,046
Air Force RDT&E	High Energy Laser Research Initiatives	\$13,778	\$14,168	\$14,735
Defense-Wide RDT&E	DTRA Basic Research Initiatives	\$38,436	\$35,436	\$36,853
Defense-Wide RDT&E	Basic Research Initiatives	\$71,940	\$68,154	\$70,880
Defense-Wide RDT&E	National Defense Education Program	\$54,355	\$79,345	\$82,519

We would like to mention specific concerns with reductions in funding for the Navy’s basic research programs. The FY 2017 Omnibus Appropriations bill reduced Navy basic research funding by more than 16 percent or \$108 million from FY 2016 enacted. Navy basic research funding provided in FY 2017 is below levels appropriated in FY 2010 enacted. This reduction came despite increases in the basic research accounts for the Army (+3.8%), Air Force (+2.8%) and Defense-Wide (+6.8%).

Specifically, the FY 2017 Omnibus funds the Navy’s University Research Initiatives program at levels below FY 2012 enacted. This will limit the program’s flexibility in supporting high-value scientific research of importance to the Navy. In addition, the Navy’s Defense Research Sciences program is funded below FY 2011 levels in the FY 2017 Omnibus and reduced by more than \$83 million relative to FY 2016 enacted. These reductions could result between 160 and 500 scientific research projects not being funded. This will likely impact research in key areas such as unmanned air vehicles, environmental quality, propulsion hydromechanics, power generation, human systems, bioinspired autonomous and surveillance systems, casualty care and management, and casualty prevention. Furthermore, the Navy may have to reduce its STEM activities, sponsor fewer graduate fellowships at HBCUs and decrease support for the Young Investigator Program.

Before new technologies can be developed, new knowledge must be created. This requires sustained investment across scientific disciplines to foster the internal (laboratory) and external (academic and industry) workforce and infrastructure that can anticipate and support the development of disruptive technologies while also ensuring superior knowledge of the battlespace environment, both above and below the ocean surface.

With much of the world's population living on or near the coast, 90 percent of global trade carried by ships, increasing access to the Arctic Ocean, a rapidly changing ocean environment -- warming and changing circulation and weather patterns-- and new anti-access, area denial challenges in critical regions, the need to advance and protect US maritime superiority is clear. We must ensure the Navy has the resources to support the necessary basic research required to develop the technologies that will help ensure the U.S. maintains its technological superiority in the seas.

Applied Research and Defense S&T Recommendations

Fundamental scientific research is just the first step in creating new military technologies. Researchers and scientists must apply the fundamental knowledge learned through basic research in order to solve military problems and develop the systems and components for potential solutions. The private sector is unable to assume the risk of applying fundamental knowledge to field the military technologies of tomorrow. In order to ensure that discoveries made through basic research are translated into practical military applications, we offer the following recommendations for our priority applied research PEs and overall S&T.

Agency/Account	Program Element (PE) (\$ in Thousands)	FY16 Enacted	FY17 Enacted	FY18 Rec.
Army RDT&E	Materials Technology	\$68,314	\$82,533	General Support
Army RDT&E	Sensors and Electronic Survivability	\$58,374	\$51,109	General Support
Army RDT&E	Advanced Weapons Technology	\$38,028	\$53,803	General Support
Army RDT&E	Advanced Concepts and Simulation	\$27,862	\$30,688	General Support
Army RDT&E	Human Factors Engineering Technology	\$23,681	\$23,671	General Support
Army RDT&E	Computer and Software Technology	\$12,656	\$13,811	General Support
Army RDT&E	High Performance Computing Modernization	\$222,159	\$222,190	General Support
Navy RDT&E	Marine Corps Land Force Technology	\$51,708	\$69,765	General Support
Navy RDT&E	Common Picture Applied Research	\$42,551	\$41,185	General Support
Navy RDT&E	Warfighter Sustainment Applied Research	\$45,056	\$50,467	General Support
Navy RDT&E	Electromagnetic Systems Applied Research	\$115,051	\$120,941	General Support
Navy RDT&E	Ocean Warfighting Environmental Applied Research	\$72,252	\$81,618	General Support
Navy RDT&E	Future Naval Capabilities Applied Research	\$179,686	\$157,103	General Support
Navy RDT&E	Manufacturing Technology Program	\$57,074	\$56,712	General Support
Navy RDT&E	Advanced Undersea Prototyping	N/A	\$59,479	General Support
Air Force RDT&E	Materials	\$133,734	\$159,152	General Support
Air Force RDT&E	Human Effectiveness Applied Research	\$110,530	\$111,647	General Support
Air Force RDT&E	Aerospace Sensors	\$152,291	\$162,674	General Support
Air Force RDT&E	Directed Energy Technology	\$115,604	\$127,163	General Support
Air Force RDT&E	Dominant Information Sciences and Methods	\$169,409	\$166,650	General Support
Air Force RDT&E	High Energy Laser Research	\$41,855	\$42,300	General Support
Defense-Wide RDT&E	Cyber Security Research	\$13,701	\$12,183	General Support
Defense-Wide RDT&E	Defense-Wide Manufacturing S&T Program	\$156,743	\$158,398	General Support
Defense-Wide RDT&E	Engineering Science and Technology	\$18,341	\$22,659	General Support
--	Overall Defense Science & Technology Program	\$13,250,806	\$14,011,229	\$14,571,678

The coalition would like to specifically highlight its support for the Defense-Wide Manufacturing Science and Technology PE, which provides resources for DOD’s contribution to the Manufacturing USA Network. The Network acts as a catalyst to spur private investment in our national security technology. In fact, every federal dollar invested in the Manufacturing USA Network so far has spurred \$2.05 of private sector investment into technologies to further our national security. Initiatives such as Manufacturing USA allow the federal government to leverage its partnerships with industry to enable innovation throughout the entire manufacturing ecosystem, ensuring the U.S. is able to domestically manufacture the world’s most respected and capable weapons systems, such as the F-35 fighter jet, the M1-A2 tank, and the Ohio Class submarine, while also securing our economic prosperity.

DARPA Recommendation

DARPA’s ability to create truly revolutionary new capabilities is well documented. The Internet, stealth technology, nearly all the technologies found in mobile phones and more recently an upper-limb prosthesis for military amputees inspired by the limb that Luke Skywalker wore in the *Star Wars* films. The U.S. needs organizations like DARPA that specialize in undertaking high-risk, high-reward research and development to create game-changing technologies. DARPA’s unique research model helps ensure that we remain ahead of our adversaries.

We recommend a funding level of \$3 billion for DARPA in FY 2018.

Defense Medical Research Recommendations

In order to maintain a strong military, the U.S. must have healthy families and soldiers. It is imperative for DOD to contribute to curing diseases that affect not only men and women in the military, but also the public since we have an all-volunteer force. Defense medical research programs help ensure the United States has the medical technologies necessary to enable military readiness and serve those who have been wounded on the battlefield. Developments in battlefield medicine also contribute to significant advances which benefit civilian trauma-related medical practice, such as regenerative medicines, vaccine developments, battlefield dressings, and one-handed tourniquets. We offer the following recommendations for CNSR priority Defense medical research PEs.

Agency/Account	Program Element (PE) (\$ in Thousands)	FY16 Enacted	FY17 Enacted	FY18 Rec.
Army RDT&E	Medical Technology	\$76,853	\$79,111	\$82,275
Army RDT&E	Medical Advanced Technology	\$108,584	\$107,365	\$111,660
Army RDT&E	Medical Systems Advanced Development	\$31,962	\$54,120	\$56,285
DHP RDT&E	Research, Development, Test and Evaluation Research	\$10,996	\$9,097	\$9,461
DHP RDT&E	Exploratory Development	\$59,471	\$58,517	\$60,858
DHP RDT&E	Undistributed Medical Research/Peer-Reviewed/CDMRPs	\$1,150,800	\$1,279,200	\$1,330,368

Again, thank you for allow us to submit outside testimony as you begin developing the FY 2018 Defense Appropriations bill. Please do not hesitate to contact us if we can be of any assistance during the FY 2018 appropriations process.