

Testimony

Before the Senate Appropriations Subcommittee on Defense

Witness Statement of

HON Frank Kendall, Under Secretary of Defense for Acquisition, Technology & Logistics

Mr. Alan Shaffer, Principal Deputy Assistant Secretary of Defense for Research & Engineering

Dr. Arati Prabhakar, Director, Defense Advanced Research Projects Agency

April 22, 2015

Chairman Cochran, Vice Chairman Durbin and distinguished members of the subcommittee, we appreciate the opportunity to testify today. I am joined here with Mr. Alan Shaffer, Acting Assistant Secretary for Research and Engineering and Dr. Arati Prabhakar, Director of the Defense Advanced Research Projects Agency. Together, with the Research and Engineering enterprise, we work hard every day to advance our nation's defense technologies. The Department's current and planned innovation initiatives reflect our belief that the future security of the United States and our allies depends upon maintaining our technological superiority. Our superiority directly correlates with a healthy and robust industrial base, stable and adequate budgets, and an effective defense acquisition system. We look forward to the opportunity to discuss the Department's progress in each of these areas, and our roles in supporting the Department of Defense (DoD) Defense Innovation Initiative.

The following written testimony includes a summary of the actions being taken under the Department's Better Buying Power 3.0 set of initiatives, which are focused on innovation and technical excellence, other measures including the Research and Engineering Strategy and an overview of our Research, Development, Test and Evaluation (RDT&E) investments promulgated by the Assistant Secretary for Research and Engineering (ASD(R&E)), and the program being pursued by the Director, Defense Advanced Research Projects Agency (DARPA). All of these efforts are connected parts of a larger whole.

We would like to begin, however, by discussing the reason it is so crucial for our acquisition system to be more productive; that is the clear risk the United States faces today of losing military technological superiority when compared to our nation's potential adversaries. Controlling cost and increasing efficiency and productivity are always important, and the Department remains focused on improvements in these areas. Our first responsibility, however, is to ensure the United States has, and will continue to have, dominant military capabilities relative to any potential adversary. We are deeply concerned about the adverse trends in U.S. military technological superiority. The recently released Better Buying Power 3.0 set of initiatives is focused on innovation, technical excellence and technological superiority largely because of these concerns. Secretary Carter will be speaking tomorrow about the importance of bringing advanced technology into the Department more effectively, and about some steps we can take to make that happen. However, nothing the Department, or any of us testifying today can do possibly overcome the negative impact of sequestration. Our budget request for FY16 includes a significant recovery in procurement and research and development investments. If sequestration is allowed by the Congress to occur in FY 2016, the combined demands of global operations, a readiness deficiency caused by sequestration in FY13, the expenses associated with force structure we are still in the process of reducing, and the Congress' refusal to accept

recommended sources of savings will all combine to ensure a disproportionate and devastating impact on our modernization accounts.

### **THE RISK OF LOSING MILITARY TECHNOLOGICAL SUPERIORITY**

The U.S. and our allies have long enjoyed a military capability advantage over any potential adversary. The military capabilities of long-range precision strike weapons, stealth, wide area surveillance, and networked forces emerged from what Deputy Secretary Work describes as a “technology offset strategy” that had its origins in the 1970s. This mix of capabilities was originally designed to deal with the overwhelming number of Warsaw Pact mechanized forces. The First Gulf War in 1991 demonstrated the unprecedented impact of these technologies and marked the beginning of a period of unchallenged American military dominance that has lasted a quarter of a century and served us well in several conflicts. We used the same capabilities, with some notable enhancements, in Serbia, Afghanistan, Libya and Iraq. The U.S. has had a good run, but the contest is not one sided, and all military advantages that rely on a technology advantage are temporary. Globalization has leveled the technology field. Potential adversaries have taken good advantage of fast moving commercial technology, acquired technology through cyber theft and espionage, and carefully studied the American way of war to identify weaknesses and vulnerabilities.

In the First Gulf War, the United States put a new suite of technologies and associated operational concepts on display for the world to observe and study. No nation paid more attention to the results of the First Gulf War than China. The intelligence estimates in the early 1990s suggested that, while China might be a concern in the future because of its accelerating economic growth, it would take 15 to 20 years for China to become a peer competitor. It is now 20 years later and the intelligence estimates were accurate. China has developed and fielded a number of advanced weapons designed to defeat U.S. power projection forces. Many more are in development. These systems include a range of capabilities, but foremost among them are accurate and sophisticated cruise and ballistic missiles designed to attack high value assets, particularly the aircraft carriers and forward bases that we depend on for power projection. These missiles, fielded in large numbers, coupled with advanced electronic warfare (EW) systems, modern air-to-air missiles, extensive counter-space capabilities, improved undersea warfare capabilities, fifth generation fighters, and offensive cyber weapons pose a serious and growing threat to U.S. and allied forces.

To be clear, we do not anticipate or foresee a military conflict with China. That would not be in any one’s interest. However, we do not want the United States to be in a situation of inferiority or even parity with respect to military technology and capability. If this came to pass

the United States would lose influence, regional rivalries and security dilemmas would compound, and the possibility of a conflict due to a miscalculation would increase.

China is not the only nation of concern. Russia is fielding or developing advanced systems including unmanned air vehicles, highly effective air defense systems, fifth generation fighters, and state-of-the art submarines. Russian doctrine, organization, and equipment while placing greater emphasis on conventional deterrence, continues to feature the possibility of a first strike with nuclear weapons in its doctrine.<sup>1</sup> North Korea is increasing its nuclear and ballistic missile capabilities. Iran is acquiring precision missiles that threaten our forces in the Persian Gulf and our allies and friends in the region. Globally, the United States' technological superiority is being challenged today in ways not seen since the Cold War. As all of this is occurring, the Department lives under the debilitating threat of sequestration.

Taken together, the foreign modernization programs referred to here are clearly designed to counter American power projection forces. They are intended to ensure that the U.S. does not interfere in what Russia calls "the near abroad" and China refers to as inside "the first island chain." Even if our relationships with these states remain peaceful and military confrontation with them never occurs, the capabilities we are concerned about will inevitably proliferate to other states where the likelihood of conflict may be greater.

#### **DOD RESPONSE TO EMERGENT CHALLENGES**

The Department is taking several steps to better respond to the emerging challenges – most notably through the Defense Innovation Initiative and the recently released Better Buying Power 3.0. Secretary Carter is also expected to discuss other steps the Department will taking when he speaks at Stanford later this week.

##### *The Defense Innovation Initiative*

In November 2014, Secretary Hagel announced the Defense Innovation Initiative (DII) as an ambitious Department-wide effort to identify and invest in novel ways that sustain and advance the Department's military superiority and improve business operations throughout the Department. An ultimate aim is to help craft 'offset strategies' that maximize our strengths and exploit the weaknesses of potential adversaries. The initiative also focuses on attracting, developing and retaining innovative leaders; improving internal business practices; reinvigorating wargaming across the Defense enterprise; developing new operational concepts and investing in leap-ahead technologies. Last fall the Department also announced the next

---

<sup>1</sup> See 2014 military doctrine, paragraphs 26 and 27

version of the series of USD (AT&L) acquisition improvement initiatives, Better Buying Power 3.0, which is focused on innovation and technical excellence. One shared aspect of DII and BBP 3.0 is the Long Range Research and Development Planning Program (LRRDPP), a focused effort to identify innovative and game changing technologies that can be matured over the next 3 to 5 years.

Through LRRDPP, the Department has reached out to the broadest possible community to identify technologies that can shape future military systems and capabilities. The LRRDPP effort will help the RDT&E community prioritize its investments, identify the S&T investments with the highest potential impact, and prepare the Department for development of new innovative capabilities. To support the LRRDP effort, the Department released a Request For Information in December 2014 to solicit broad input on five focus areas: Space Technology, Undersea Technology, Air Dominance and Strike Technology, Air and Missile Defense Technology, and general “Other” Technology-Driven Concepts. The LRRDPP will complete this summer in time to inform the FY17 budget.

Through the overall DII effort, the Department is investigating new technologies and operational concepts that will provide an enduring military advantage. One goal is to identify weapons and systems in the force today that can be used in more innovative ways. The Department will also look for promising technologies, including commercial technologies that can be accelerated into products. Finally, longer range science and technology investments that will have a high payoff in the future will be identified. The Department is also devising new ways of engaging the commercial sector. To be successful, the Department also has to attract and retain high quality scientists, engineers, and technical managers. This focus on *achieving dominant capabilities through technical excellence and innovation* is the new emphasis now being implemented in Better Buying Power 3.0.

### *Better Buying Power 3.0*

The Department’s continuous improvement approach to obtaining better results from the defense acquisition system and in everything the Department obtains by contracting with industry, has been formulated in a series of initiatives originally called “Better Buying Power” by then Under Secretary Carter. The three versions of Better Buying Power to date are more about continuity than change. Efficiency and productivity are at the core of all three versions of Better Buying Power and many core initiatives appear in all three versions – and almost certainly would be in any future version. The evolution from BBP 1.0 to 2.0 to 3.0 is based on the premise that emphasis should shift as initiatives are put in place, experience is accumulated, data is collected and analyzed, and conditions change. Each iteration of BBP is characterized by

strong continuity with previous iterations. Areas of continuity include: an emphasis on competition and competitive environments, incentives linking profit to performance, cost consciousness demonstrated by active management including targets for cost reduction, improving the management of contracted services, utilization of small businesses, and strengthening the professionalism of the acquisition workforce. BBP 3.0, which was released in its final version with implementing instructions last week, maintains that approach, with an increased emphasis on achieving dominant capabilities through innovation and technical excellence.

The draft of BBP 3.0 was released in the fall of 2014 when it was distributed for comments from the workforce, industry and other key stakeholders. Feedback was received from industry, think tanks and other institutions and the Department worked with the Congress on legislative portions of the initiatives. BP 3.0 does not reflect everything that the Department will do to increase innovation in industry and government, but it is a significant subset of the actions being taken to enhance innovation and technical excellence in the Department. The USD (AT&L) will utilize the Business Senior Integration Group, originally formed under then Under Secretary Carter, as the management forum to implement the BBP 3.0 initiatives, track them and identify new opportunities to improve acquisition outcomes. The Department's management approach remains one of continuous improvement, with the focus of this iteration of BBP on innovation and technical excellence.

We have submitted the BBP 3.0 "implementation instructions," which describes BBP 3.0 in more detail for the record.<sup>2</sup> The following is a brief summary of key components in the Better Buying Power 3.0 Initiatives that will have impact to the Department's ability to innovate<sup>3</sup>. There are seven major areas of emphasis that have a number of individual initiatives associated with each area. For the purposes of this statement we will highlight examples of efforts focused on innovation and technological superiority.

The Department is increasing its emphasis on responsiveness to threat changes through tighter integration of requirements, intelligence, and acquisition. When the Department introduces a system to the field, its capabilities cannot be assumed to remain adequate against advancing threats. The threat is dynamic, and the Department must stay ahead of the threat curve. The Department will increase the use of modular designs, open architectures, and

---

<sup>2</sup> Frank Kendall, *Better Buying Power 3.0: Implementation Guidance*, Office of the Under Secretary of Defense, Acquisition, Technology and Logistics, April 9, 2015

[http://www.acq.osd.mil/fo/docs/betterBuyingPower3.0\(9Apr15\).pdf](http://www.acq.osd.mil/fo/docs/betterBuyingPower3.0(9Apr15).pdf)

<sup>3</sup> Frank Kendall, *Better Buying Power 3.0 Fact Sheet* (9 April 2015)

<http://www.acq.osd.mil/fo/docs/BBP3.0FactSheetFINAL.PDF>

competition to spur innovation and ensure that our designs can accommodate upgrades that keep us ahead of potential adversaries at affordable cost.

BBP 3.0 adds a specific initiative on cybersecurity. Innovation that is stolen before it is fielded, and systems whose capabilities can be negated by cyber-attack offer no advantage to the United States. Cyber security is a pervasive problem for the Department. It is a concern for our programs from inception through retirement. The cyber-security of the industrial base that supports the department, and the ability to protect even unclassified technical information, including design, supply chain, and logistics support systems for our weapons systems, will be addressed more effectively. Everything associated with a weapons system is a potential point of attack. The Department has taken steps to address these concerns, but more action is needed.

The Department intends to make it easier for people to do business with the government. Under BBP 3.0, barriers to doing business with the department will be reduced so that we can engage new, innovative suppliers, especially small businesses. The Department is also working to find ways to transition commercial technology more effectively, so that we can leverage a vibrant, innovative commercial technology sector and get capability into the hands of warfighters more quickly. Outreach to commercial firms has already increased, as demonstrated in the LRRDPP initiative which will inform the FY17 process.

BBP 3.0 is also increasing the Department's focus on getting the most out of all of our various research and development investments leading up to actual product development. This includes the science and technology, advanced component, and early prototype investments. The productivity of our in house laboratories, external research efforts funded through contracts and grants, and the Independent Research and Development (IR&D) conducted as a reimbursable expense by private industry are all of concern. Each of these investments will be assessed and evaluated with a goal of getting as much from them as possible.

BBP 3.0 includes several initiatives designed to encourage innovation in industry. One is the direction to provide industry with draft requirements earlier on in the process, allowing industry the opportunity to provide feedback and to make well informed investment decisions. The Department will also contract with industry for early concept definition work to better inform requirements decisions and analyses of alternatives. Finally the Department will expand the process of defining "best value" in monetary terms so that industry will know what the government is willing to pay for enhanced performance. This knowledge will spur innovation by giving industry a solid understanding of the competitive advantage available to firms offering innovative ways of achieving higher performance at acceptable costs.

BBP 3.0 also continues to emphasize professionalism in the acquisition workforce, with a specific focus in this version on technical excellence. A strong engineering and scientific government acquisition workforce is a necessary for effective innovation and management of development programs. Technical risk management is at the core of cutting edge weapon system development programs, and the Department cannot just transfer this responsibility to industry. Well qualified technical managers, normally with relevant engineering backgrounds, should be running our development programs. The Department cannot be an intelligent customer who insists on high levels of performance and knows how to get the most out of industry, without well qualified technical managers. The Department would like to work with the Congress to create greater incentives to recruit, grow, and retain professionals with these capabilities.

In summary, BBP 3.0 does not end the Department's focus on controlling costs, critical thinking and sound professional management. It shifts the emphasis toward the products the Department acquires for our customers: the warfighters who depend on us to give them dominant capabilities on the battlefields of the future. BBP 3.0 continues the effort to strengthen the Department's culture of cost consciousness, professionalism and technical excellence.

#### **OTHER INITIATIVES IMPACTING INNOVATION**

In the spring of 2014, the Department released the Defense R&E Strategy, which described the technical priorities for the Department. The first R&E priority is to develop capabilities that mitigate existing and emergent threats. This effort includes innovation in electronic warfare, missile defense (both cruise and ballistic), cyber, preservation of space capabilities, and countering weapons of mass destruction. The Department is also committed to developing capabilities that build innovation into existing and future systems. This includes expanding the use of prototypes and demonstrations to reduce risk in early acquisition, expanded use of open systems, modeling and simulation, developmental planning, and systems engineering. Lastly, the R&E strategy includes a focus on developing capabilities that deliver technological surprise to potential adversaries. This includes research in subjects such as autonomy, human cognition, quantum sciences, and hypersonic flight.

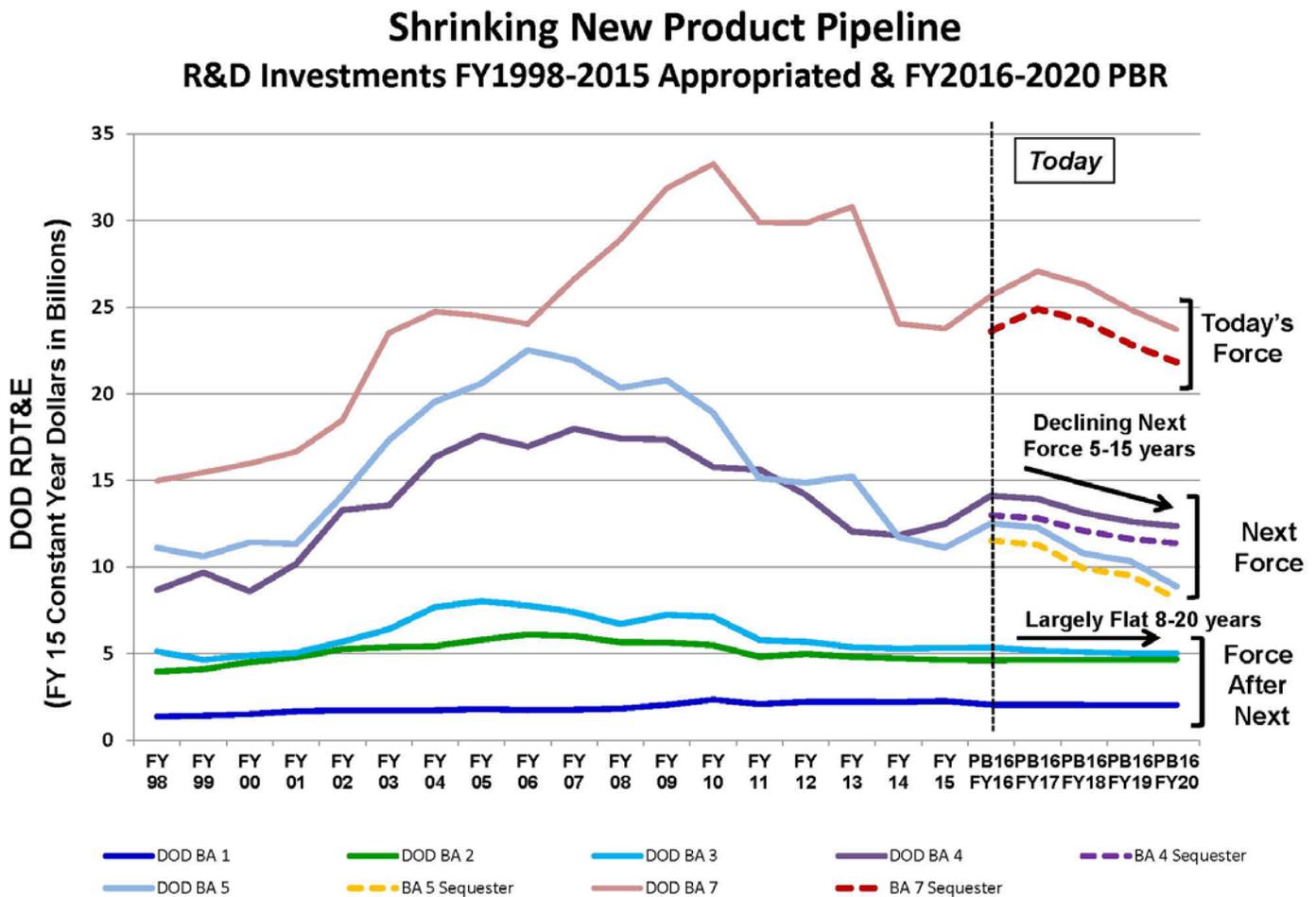
##### **Prototyping and Demonstration Efforts**

The Department has increased prototyping where possible within its budget constraints. This will help to preserve key capabilities in our industrial base by keeping our design teams healthy while advancing the state of the art to reduce development lead time and hedge against threat developments. The Department is focusing these efforts to support innovation, mitigate current and near future threats, enhance affordability and develop technological surprise

whenever and wherever possible. The President’s FY16 budget includes an “Aerospace Innovation Initiative,” a new joint program led by DARPA in partnership with the Navy and Air Force that is intended to develop the technologies and address the risks associated with the air dominance platforms that will follow the F-35. This initiative will culminate with the development of two “X” plane prototypes.

**INVESTMENTS**

The Department's Fiscal Year 2016 budget request for Research, Development, Test, and Evaluation is \$69.8B. This includes investments of Science and Technology (S&T) at \$12.3B. The chart below shows the evolution of RDT&E budget lines over the past several decades. Briefly, the accounts “Advanced Capabilities Development (6.4), and Engineering, Manufacture and Development (6.5) are the accounts that prepare the next force. These accounts have been in decline over the past decade. In Constant Year (FY15) the overall RDT&E appropriations have declined from \$89B in FY2009 to \$64B in FY2015.



The FY 2016 budget request has largely protected S&T, and has also preserved DARPA at \$2.973M. The table below shows the investment trends in the last two years. While this budget request is sufficient, the investment request for S&T in Constant Year FY 2015 dollars peaked in Fiscal Year 2012 at \$12.9B.

**S&T BUDGET**

*Table 1: Defense Budget for Science & Technology; Research & Engineering; and DoD Top Line Budget (FY 2015 Appropriated and PBR 2016)*

	PBR 2015 (\$M)	FY 2015 Appropriated (\$M)	PBR 2016 (FY 2015 CY \$)	% Real Change from FY 2015 Appropriated (FY 15 CY \$)
Basic Research (BA 1)	2,018	2,278	2,089 (2,049)	-10.05%
Applied Research (BA 2)	4,457	4,648	4,713 (4,622)	-0.55%
Advanced Technology Development (BA 3)	5,040	5,326	5,464 (5,359)	0.61%
<b>DoD S&amp;T</b>	<b>11,515</b>	<b>12,252</b>	<b>12,266 (12,030)</b>	<b>-1.81%</b>
Advanced Component Development and Prototypes (BA 4)	12,334	12,491	14,402 (14,125)	13.08%
<b>DoD R&amp;E (BAs 1 – 4)</b>	<b>23,849</b>	<b>24,743</b>	<b>26,668 (26,155)</b>	<b>5.71%</b>
DoD Topline	495,600	497,396	534,313 (524,029)	5.35%

*Table 2: Service and Agencies S&T Budgets (FY 2015 Appropriated and PBR 2016)*

	PBR 2015 (\$M)	FY 2015 Appropriated (\$M)	PBR 2016 (FY 2015 CY \$)	% Real Change from FY 2015 Appropriated (FY 15 CY \$)
Army	2,205	2,555	2,201 (2,159)	-15.51%
Navy	1,992	2,155	2,114 (2,073)	-3.80%
Air Force	2,129	2,282	2,378 (2,332)	2.22%
DARPA	2,843	2,845	2,901 (2,845)	0.00%
Missile Defense Agency (MDA)	176	195	224 (220)	12.61%
Defense Threat Reduction Agency (DTRA)	473	481	485 (476)	-1.09%
Chem Bio Defense Program (CBDP)	407	430	394 (386)	-10.12%
Other Defense Agencies	1,289	1,310	1,569 (1,539)	17.47%

DoD S&T	11,515	12,252	12,266 (12,030)	-1.81%
---------	--------	--------	-----------------	--------

Within the S&T accounts, roughly 50% is spent in DoD laboratories and universities, and roughly half (\$6B) is invested in Industrial Contracted R&D (CRAD). Industry also spends roughly \$4-5B in reimbursable Independent R&D (IRAD). Among DoD’s investments in innovation, DARPA plays a unique role. DARPA’s mission is to explore high risk high payoff technologies.

### DARPA STRATEGIC INVESTMENTS

DARPA’s strategic priorities can be grouped within four areas, each one focused on developing and ensuring a family of key capabilities. The first priority, *rethink complex military systems*, includes goals like assuring dominance of the electromagnetic spectrum; improving position, navigation, and timing without GPS; maintaining air superiority in contested environments; and asserting a robust capability in space among others. Second, *master the information explosion*, aims to derive meaning from big data and build trust into information systems. Third, *harness biology as technology*, which includes accelerating progress in synthetic biology, outpacing infectious diseases, and mastering new neurotechnologies. Lastly, *expand the technological frontier*, which includes applying deep mathematics, inventing new chemistries, processes and materials, and harnessing quantum physics effectively.

DARPA also continues to focus on the important work of transitioning its technologies to the Services or to other outlets in support of national security. One of the ways DARPA achieves this goal is through its Open Catalog—a publicly accessible database of published papers, open-source code and other resources generated by DARPA-funded research. Some months ago, for example, DARPA published the open-source code it developed through formal methods that can render complex software systems unhackable for given applications. That code is already being incorporated into a range of devices on the commercial market, including the automotive industry, changing the economics and incentives for those who might otherwise seek to disrupt critical cyber systems.

Further details on each of these areas are available in the recently released “Breakthrough Technologies for National Security<sup>4</sup>” report. However even through effective collaboration between the Office of the Secretary of Defense, the Services and Agencies, our strategic choices will only go so far without consistent funding.

---

<sup>4</sup> DARPA “Breakthrough Technologies for National Security” (25 March 15)  
<http://www.darpa.mil/WorkArea/DownloadAsset.aspx?id=2147488951>

As such, it is essential to remember three facts about research and development investments. *First, our technological superiority is not assured.* It takes active investments in both government and industry to keep our critical capabilities superior to those of potential adversaries. We have come to assume technological superiority is a given; it is not. *Second, research and development is not a variable cost.* The number of items we would like to procure or the size of our force has nothing to do with how much research and development we should fund. It takes as much research and development to buy one production asset as it does to buy 1000s. Despite this fact we have a tendency to cut research and development proportionately to other budget accounts that do represent variable costs. *Third, time is not a recoverable asset.* It takes a certain amount of time to develop a new weapon system. Once that time is lost it can never be recovered. Today the Department of Defense is being challenged for technological superiority in ways we have not seen for many years. Our ability within the Department to respond to that challenge is severely limited by the current budget situation. While we try to resolve the issue of the future size of the Department, so we can plan effectively and execute our budgets efficiently, we are losing time, a highly perishable asset.

The combined impact of reduced budgets, even without sequestration, on-going combat operations, and our global commitments significantly impact US investment in new technology and weapon systems. The rise of foreign capability, coupled with the overall decline in U.S. research and development investments, is jeopardizing our technological superiority. The Defense Department has to balance among many competing requirements and the President's Budget will, as it always has, reflect the best balance of force structure, readiness, and modernization available. Our responsibility is to use the available resources as efficiently and effectively as possible to deliver needed capability to our warfighters.

## CONCLUSION

All of our efforts to increase innovation and improve acquisition outcomes are efforts to swim against the current of inefficiency caused by the threat of sequestration and constant budget uncertainty and turmoil. We must restore balance to the Department, but we cannot do so until our plans and future budgets are better aligned. Until that occurs, modernization investments, particularly research and development, will suffer. This means that development programs will be stretched out inefficiently and that production rates will be well below optimal for many programs. The uncertainty about whether or not sequestration will be imposed makes it impossible to determine where the optimal balance between force structure, readiness and modernization lies. In this environment the tendency is to hang on to assets that the Department may not ultimately be able to afford. We need a certain level of funding to sustain the force that

is necessary to execute our national security strategy and we need to remove the threat of sequestration so that our planning can be on a sound basis.

The Department continues to make the health of our industrial base a top priority; at the most senior level, the Deputy's Management Action Group continues to meet specifically to review industrial base budget implications and the Deputy Secretary and Secretary have taken action to ensure we are doing what we can to protect critical companies that make up this important part of what we consider our "total force structure." The U.S. is well into the process of losing tens of thousands of engineers and skilled production workers from our industrial base – this community matched with our technical managers is essential to continued technological superiority of the Nation.

Given the Department's five-year plan through 2020, we can tell you right now what capabilities the Department will have in 2025. If a weapon system is not in our five-year plan as a development program today, the Department will not have that capability in meaningful quantities within the next decade. It is possible to move a complex weapon system through development in those additional five years from 2021 to 2025, but we are unlikely to be able to also produce and field a useful inventory within that same period of time. Technological superiority is not a tomorrow problem; it is here today. The Department remains committed to working with the Congress on acquisition improvement, particularly to stimulate innovation, and we are confident that the initiatives being pursued under the Defense Innovation Initiative, Better Buying Power, the R&E Strategy, and DARPA's Strategic Plan will lead to improvements.

Nothing we can do, however, will overcome the harm done through sequestration and the resulting lack of adequate research and development funding. We conclude with three truisms about research and development – the source of all our innovation. First, that technological superiority against competitive adversaries is not assured; it depends on a healthy and continuing pipeline of new product development. Second, that research and development is not a variable cost; foregoing research and development doesn't lower the quantity we will have in our inventory-it eliminates future products entirely. Third, time is not a recoverable asset; the time to develop a new product is not something we can purchase later, and technological superiority, once lost is almost impossible to recover.

HOLD UNTIL RELEASED BY THE COMMITTEE