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ON

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Promoting DoD's Culture of Innovation

Chairman Thornberry and Ranking Member Smith, thank you for the opportunity to testify on this incredibly important subject.

The United States Military remains the best fighting force in the world. We are proud of our men and women who are willing to make the ultimate sacrifice for our country, and we do everything possible to provide them with the absolute best training, equipment, and medical care possible. Despite all our efforts, we are constantly challenged to maintain science and technology superiority.

For decades, our adversaries have studied our methods and invested specifically in capabilities that mitigate our strengths. They have witnessed our equipment, watched our tactics, techniques and procedures, and learned our concepts of operation. Unfortunately, and as expected, our adversaries continue to exploit our weaknesses. They are systematically and strategically developing and fielding advanced systems more rapidly than us. This erodes the advantage that DoD has maintained in conventional warfare and impedes upon our ability to project power.

The incremental democratization of technology has fostered global and easy access to cutting edge capabilities, which has in turn contributed to the ability of our adversaries to achieve technology parity. As a result, our military's advanced technical capabilities and unmatched technological superiority is being challenged by the investments of competing powers. Given the leveled playing field, speed in developing new technologies and delivering capabilities to the warfighter is more critical now than ever.

In this increasingly competitive environment, the Department must pay much more attention to future readiness and regaining our Joint Force conventional overmatch. We must be willing and able to tap into commercial research, recognize its military potential, and leverage it to develop new capabilities, while also accounting for the operational and organizational constructs to employ them faster than our competitors.

The department has realized rapid technological developments in advanced computing, big data analytics, artificial intelligence, autonomy, robotics, miniaturization, additive manufacturing, meta-materials, directed energy, and hypersonics. These are the very technologies that ensure we will be able to fight and decisively win the wars of the future.

Many of these advances are driven by commercial sector demands, as well as research and development. New commercial technologies have the potential to change society, and in turn change the character of war. The fact that many technological developments will continue to come from the commercial sector means that state competitors and non-state actors will also have access to them, eroding the conventional overmatch our Nation has grown accustomed to.

Now more than ever is the time to look at ourselves in the same way our adversaries look at us. We are and must remain open-minded to new ways of executing missions. Key DoD laboratory research coupled with industry and academic partnerships, stable budgets, sound investment decisions, and effective acquisition processes are all critical to sustain U.S. technical superiority.

Determining Strategic Priorities in a Global Context

At the beginning of the year, President Trump released the National Security Strategy (NSS) and Secretary Mattis released the National Defense Strategy (NDS). These are two very important documents for the safety and security of the country, and there are strong ties between them. They continue to shape where the innovation enterprise is heading. The common theme in the NSS and NDS is a strong focus on threat-based mission scenarios.

Immediate threats to our security are apparent, as our adversaries and malignant actors use all instruments of power projection to shape societies, markets, international rules and institutions, and international hot spots to their advantage. To ensure a global society governed by ethical and rules-based institutions, it is vital the U.S. remain engaged and prepared for any and all contingencies. We must develop new lethal capabilities and accelerate the pace in which we get that capability to the warfighter to ensure our qualitative military edge.

Members of Congress, specifically this subcommittee, have received a lot of information on the current threats and where the U.S. stands on the technology spectrum. The creation of the Under Secretary of Defense for Research and Engineering (USD(R&E)) ensures U.S. technology dominance remains a top priority within the Department of Defense. Building upon our strengths and pivoting to an emphasis on lethality, surprise, and speed will help us become a mission-focused innovative department that puts kill chains over systems, heterogeneity over uniformity, and adaptability over performance. In short, this allows us to realize warfighting constructs like networked adaptive multi-domain joint battle. The enterprise continues under the USD(R&E) to assess capability gaps and needs by missions vice system or Service, and we remain committed to leveraging Service efforts for resourced integrated prototyping and experimentation activities with outcomes focused on mission effectiveness.

To ensure warfighters have what they need, we have to continue to engage with them. The USD(R&E)'s mission is to work with operations to develop new concepts of operations through mission analysis and experimentation, and pilot new acquisition pathways to speed up delivery of capability to the warfighter. It is important for our enterprise to utilize intelligence products, technology forecasting, and analysis to inform decisions on technology investment, prototyping, experimentation, emerging capabilities, and concepts of operation. We will focus on driving effectiveness and affordability by addressing drivers in acquisition, testing, and sustainment into the system design phase, setting and adhering to open architectures and interface standards while implementing best systems engineering and cyber resiliency practices.

We continue to pursue breakthrough research into new technologies, including autonomous and unmanned systems, artificial intelligence, biotech, cyber, electronic warfare, and hypersonics, among others, to preserve the U.S. technological advantage. These technology focus areas are not just important to the Department of Defense, they are the focus of global industry. Many of these efforts are maturing rapidly and are likely to offer viable partnering solutions to enhance warfighter capabilities in the near term. Identifying centers of excellence to spearhead investment portfolios is a way to maximize our agility in innovation and to pursue diverse investment strategies. Several of the Department's initiatives (i.e., the Army Research Lab Open Campus, the Defense Innovation Unit-Experimental (DIUx), and the pilot program with In-Q-

Tel) are expanding avenues to grow Department and industry partnerships. Beyond technical innovation, the Department continues to pursue new practices and organizational structures to support a culture of innovation.

DoD's Culture of Innovation

The Department relies upon the science and technology (S&T) enterprise to research, develop, and demonstrate high pay-off technology solutions to the hard problems faced by our Warfighters in ever-changing, complex environments against an increasingly diverse set of threats. To do this, the R&E enterprise is pursuing solutions that are innovative, affordable, and versatile to ensure that our military remains the most capable in the world.

Given the breadth and depth of our competition, we are forced to stay vigilant in our efforts from basic research to advanced capabilities. The DoD R&E enterprise exists to provide the technological foundation that ensures the U.S. military of both today and tomorrow is the most capable in the world. DoD is pushing the envelope with innovative and cutting edge research coupled with new approaches to solving problems in order to ensure U.S. technical dominance.

The Department has long relied on high quality people, world class technological capabilities, innovative operational and organization constructs, and our unmatched ability to fight as a joint force. The Department's current focus on technical innovation reflects the belief that maintaining technological superiority is critical to the future security of the United States and its allies. Technological superiority directly correlates with healthy defense laboratories, a robust industrial base, sound technology investment decisions, stable and adequate budgets, and an effective defense acquisition system.

In my role as USD(R&E), I am charged with setting the Department's technical direction, addressing critical warfighting challenges, and enabling more rapid delivery of solutions to stay ahead of the threat for all warfighting domains. To achieve this, I am focusing on ensuring that the department strikes an appropriate balance between funding innovative, disruptive basic research likely to see long-term returns on investment and addressing near-term operational needs and military requirements. Our modernization efforts require that both short and long term needs to be addressed. These efforts are categorized into mission-focused and technology-focused efforts. Our mission-focused modernization efforts are Fully Networked Command, Control & Communications, Space Offense and Defense, Missile Defense – Evolved Midcourse and Airborne BPI, Cybersecurity – Offense and Defense, and Nuclear Modernization. Our technology-focused modernization efforts are Hypersonics (both Offense and Defense), Directed Energy, Machine Learning (Artificial Intelligence), Quantum Science (Including Encryption and Computing), and Microelectronics. In all of these areas, we are establishing near, mid, and long term goals that are measurable.

One of my key priorities is to enable the Department to drive the military innovation cycle faster than any adversary to sustain technological superiority. Our competitors are closing the gap because of our processes, not our talent. We are striving to both develop innovative capabilities AND be innovative in our processes. We have already proven our willingness to adapt and open the aperture to new sources of ideas. The Department continues to cultivate new mechanisms to

reach non-traditional partners, such as grants to universities, industry partnerships, experiments, and other mechanisms that engage a broader community.

DoD has the third largest investment among Federal agencies in Basic Research at U.S. universities, who have, through years of continued investments, been the source of many of today's transformational Warfighter technologies. Traditionally, the Department has viewed the role of universities as producing the research innovation, the DoD labs as the mechanism to nurture these findings and to render them Defense-applicable, and the Defense Industrial Base to integrate these new technologies into acquisition programs. The Department is currently exploring opportunities to consider less linear processes and to have more cross fertilization between these communities. DoD also funds university researchers in areas that have military-relevance or may eventually impact capability development of military relevance. These researchers maintain a close and continuing relationship with the DoD and serve as an outside source of innovative capabilities.

Investments in efforts such as the Strategic Capabilities Office (SCO) and the Defense Innovation Unit Experimental (DIUx) have enabled the department to reach to non-traditional sources of innovation and collaborate with industry. SCO continues to rapidly identify, prototype, and transition game-changing applications of existing technology and capabilities that counter near-peer adversaries and address Combatant Commanders' top priorities. SCO is a critical investment in achieving near-term technology superiority over our adversaries, and is an inherently innovative effort to rethink and repurpose existing capabilities. DIUx has been successful in leveraging and facilitating commercial technologies coming from sources traditionally not available to the Department, with the ultimate goal of accelerating those technologies into the hands of warfighters. They have engaged hundreds of non-traditional companies across the country to compete for contracts with DoD. DIUx has been highly successful in reenergizing private sector interest in working with the DoD.

Enabling the transformational capabilities needed to meet emerging Joint Force challenges requires innovative business practices to provide the speed and agility necessary to outpace our adversaries' capabilities. The department has already made strides in this arena, such as initiating a RDT&E program of $1million for the Defense Digital Service (DDS), which will apply best-in-class private sector practices, skills, and technology to transform the way software products are developed and delivered for the DoD. The DDS is charged with examining the way the Department works with cloud-based services and to think more deliberately and innovatively about cloud and information technology implementation practices and policies. In addition, efforts of DIUx and other Service-specific rapid capabilities offices have increased the utilization of Other Transaction Authorities (OTAs), speeding up the contracting process and leveraging previously underutilized authorities granted to the DoD. One of the greatest second-order effects of the use of OTAs has been the increased linkages between the contracting staff and the S&T mission, improving the seamlessness of our processes.

The Department is investing in war gaming, operational exercises, and intelligence collection for projected adversary threat systems and continues to emphasize the use of prototyping, demonstrations, experimentation, and game-changing technology. For instance, the Army Technology Maturation Initiatives program is conducting experimental prototyping and

demonstration of selected technology enabled capabilities to support advanced ground systems, aviation systems, command, control, communications and reconnaissance systems and equipment, precision weapons, high energy laser systems, and soldier equipment.

Additionally, the Navy Rapid Prototyping, Experimentation, and Demonstration and Advanced Combat Systems Technology programs are exploring fleet-proposed capability concepts and enabling technologies, such as directed energy weapons, hypersonics, unmanned systems, artificial intelligence, and machine learning. The Air Force Technology Transition program is conducting experimentation and prototyping efforts to stimulate and explore new innovative concepts and their applications in potential future operating environments and accelerate future concepts and technologies into acquisition programs and/or operational use while mitigating technical and integration risk.

Large-scale experimentation sponsored by R&E has significantly accelerated the fielding of capabilities by concurrently exploring myriads of potential approaches in operationally realistic conditions with the level of complexity and fidelity that Service/Industry developers could not otherwise replicate. One example of this is the Black Dart experiment in 2007-2010, which sought to improve capabilities to detect, track, and engage UAS threats and obtain data on commercially-available and state-sponsored small UAS. The experiment demonstrated novel detection, kill, and EW interdiction capabilities, and transitioned to the Joint Integrated Air and Missile Defense Organization (JIAMDO) thereafter. The Services all leverage experimentation to explore the full range of innovative and possible solution options across the doctrine, organization, training, materiel leadership, personnel facilities, and policy spectrum.

Conclusion

Fostering a culture of innovation in the DoD is occurring through both innovative business practices and innovative capability development. Every day, the enterprise seeks to leverage in new ways the diverse knowledge, skills, and ideas of DoD's research and engineering personnel and organizations. Global trends and fast-moving competitors are threatening the U.S. military's technological dominance. To sustain U.S. technological superiority in coming decades, the DoD R&E Enterprise will continue to work in unison to leverage our unmatched strengths and the innovative talents of our people to develop innovative capabilities that will be decisive in future conflicts. We are striving to eliminate performance obstacles and enable and empower the Department's intrinsic creativity and ingenuity through deploying transformative business practices that strengthen and grow our workforce's talents and skills, while also speeding up the discovery, development, and transition of breakthrough science and technology to our warfighters.

As the Department looks to the future, we strive to ensure that the nation is the first to develop and adopt the novel capabilities made possible by bold, risk-tolerant investments in high impact technologies. The innovation enterprise remains committed to not only creating new potential technologies, but also to help transition those technologies to the Services or other sectors where they can be implemented in support of national security.