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Subcommittee on Defense

Defense Innovation and Research

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Chairman Cochran, Vice Chairman Durbin, and distinguished Members of the Subcommittee, thank you for the opportunity to testify before you today on the Department's innovation initiatives. I am joined here today by Dr. Will Roper, Director of the Strategic Capabilities Office, and Dr. Steve Walker, Acting Director of the Defense Advanced Research Projects Agency. They will discuss their teams' accomplishments, with due consideration for classification concerns. We are always available to provide more details in a closed briefing as well. The topic of innovation is especially important to both Secretary Mattis and I appreciate that your committee is holding this hearing. I also want to acknowledge this committee's support of many of the innovation initiatives we have pursued during my time as Deputy Secretary.

As you know from Secretary Mattis' testimony to this sub-committee in March, the Department of Defense is executing on his direction to restore the readiness of the force, both for today's fights, and tomorrow's. This is a three-phased multi-year effort:

- Phase one is this year's appropriation with added money to get aircraft back in the air, ships back to sea, and our troops back in the field with the right equipment and training;
- Phase two, starts with the President's FY2018 budget request to prepare for sustained growth and to adapt to the changing character of war by providing new capabilities to the Joint Force; and
- Phase three looks beyond FY 2018 to ensure we stay ahead of our advanced competitors in the long-term military technical competition.

This longer-term planning will be informed by the National Defense Strategy review currently underway and that will be completed by this fall. Without presupposing the results, I can say that Secretary Mattis is looking to this review – and others like the Nuclear Posture Review and BMDR – to ensure we build a more advanced and more lethal future force. No other nation in the world can compete with our young men and women in uniform; they are a high quality, highly trained, battle-hardened force. It is DoD's responsibility to ensure the Joint Force has, and will continue to have, military capabilities that are superior to any potential adversary. For that, we rely on the scientists and engineers from across the Department's Research and Development enterprise and with our partners in industry.

Since the end of the Cold War, we have enjoyed military technical dominance over all potential adversaries. The impressive capabilities the Joint Force possesses in precision strike, stealth, advanced sensors, and networked command and control emerged from what is called the 2nd Offset Strategy. Designed to counter the overwhelming quantitative advantage possessed by the Warsaw Pact, these capabilities proved their worth when unveiled in the First Gulf War in 1991. And by virtue of our being an aggressive first mover in these capabilities, we have dominated guided munitions warfare for the past 25 years. We have continually improved them during operations over the past 16 years of war, moving from the 2nd Offset ability to track and target tanks to today where we can track and target individuals – as seen in the global high-value terrorist hunting network that SOCOM uses today in Iraq and Syria.

As they say, nothing invites imitation quite like success and our competitors have set about developing their own suite of 2nd Offset capabilities. No two nations have paid more attention to the capabilities and concepts we demonstrated in the First Gulf War than China and Russia. They are making enormous investments in precision strike, advanced sensors,

networking, and stealth. In some areas, they are pursuing advanced weapons development to an extent that we haven't seen since the mid-1980s, near the peak of the Soviet Union's surge in Cold War defense spending. And in the process of developing their own facsimiles of our 2nd Offset Strategy capabilities and concepts, they identified weakness and potential vulnerabilities in our own – and focused their investments in those areas. They combined our 2nd Offset capabilities in ways to deny us access to theaters, and then to deny us freedom of maneuver and action once there. Foremost among these capabilities are advanced electronic warfare systems, extensive counter-space capabilities, offensive cyber weapons, accurate and sophisticated cruise and ballistic missiles, and improved undersea warfare capabilities. Unsurprisingly then, given our competitors' focus, level of investment, and determination to close the gap with the world's lone superpower, the overwhelming technical dominance we have maintained across operating domains for the past 25 years is eroding.

That's why we launched the 3rd Offset Strategy (3OS) – new combinations of technologies, operational concepts, and organizational constructs to maintain our ability to project overwhelming combat power into any theater and at times of our choosing. Such new approaches will require us to leverage commercial innovation and to greatly accelerate the refresh cycle of new weapons and systems. In this more competitive world, DoD must move faster to stay ahead of emerging threats.

The 3OS is based on the premise that advances in artificial intelligence and autonomy will allow the joint force to develop and operate advanced joint, collaborative human-machine battle networks of even greater power. These battle networks will be able to synchronize simultaneous operations conducted in space, air, sea, undersea, land, and cyber domains using manned and unmanned systems. We believe these capabilities will be critical in this new era of

warfare where operations, particularly cyber and electronic warfare, move at machine speeds. These emerging concepts will support faster and more effective decision-making, enable improved coordination of operations across domains, support the use of collaborative teams of manned and unmanned systems, and integrate electronic warfare and cyber operations.

Just last month we stood up an Algorithmic Warfare Cross Functional Team to accelerate DoD's integration of big data and machine learning into tis operations and to turn the enormous volume of data available to DoD into actionable intelligence and insights at speed. The Department's significant investments in collectors and sensors is generating an ability to collect more imagery, from more sensor types, than at any time in history. This is creating mounting challenges of scale for analysts faced with the labor-intensive task of sifting through the sheer volume of data collected. In this data driven world, providing our analysts with advanced machine-learning tools will improve our ability to observe, orient and, when necessary, decide and act better and faster than our adversaries. This is just one example of where we are bringing in rapidly advancing commercial technology to dramatically improve our operations.

Because so much of today's technology is being driven by the commercial world, to which all nations have access, I believe the emerging competitive environment will be much more of a level playing field than in the Cold War. But I'm okay with that because the United States tends to do better when we're in a competitive contest. We haven't been challenged by peer competitors since the Cold War. We are now. Today's competitive environment is akin to the 1920s and 1930s inter-war period when significant advances were made in new technologies and weapons, including aircraft, armored vehicles, submarines, aircraft carriers, radio, and radar. Every military had access to these very same tools, but not every nation was able to harness those new technologies and develop effective new ways of fighting as the Germans did with

Blitzkrieg, the American Navy with carrier aviation, or RAF Fighter Command with an integrated air defense system. What we do know is that the military that can best capture a set of ideas about how to use new technology and develop new operational concepts will have a big advantage on any future battlefield.

And in a world of equal access to technology, innovation is important but speed becomes the differentiating factor. How quickly we can translate technology into a fielded capability is where we can achieve and maintain our technological edge. This isn't just speed of discovery – it is speed of delivery to the warfighter. Sustaining U.S. technological superiority hinges on our ability to out innovate our adversaries, but it is important to remember innovation is more than just technology – it could be using existing technology in a new way – such as how SCO repurposes existing weapons to provide them new and asymmetric capabilities.

Moving faster is also the reason we are pushing more prototyping; demonstration and experimentation efforts that are intended to mature technologies demonstrate their core technical capabilities and deliver a limited number of representative system prototypes that can be exercised by operators. Our pursuit of a 3rd Offset Strategy has opened the flood-gates to innovative approaches, and we have inspired people to be more creative in how they approach solving DoD problems – whether they are technical, programmatic, or organizational. Pilot programs are a small fraction of DoD overall investment, yet they have sparked a wealth of new ways to think about our problems and our way of doing acquisition. They allow us to try before we buy and gather lessons learned before we scale up. We have found that strategic use of pilot projects and prototyping can speed innovation to market – it allows us to drive down technical risk; refine requirements, evaluate new concepts and get warfighter feedback before we commit to a major acquisition program.

Those are the obvious benefits – the less obvious benefits include stimulating industry design teams, contributing to new methods and manufacturing, and increasing the likelihood of a successful Program of Record by ensuring that we better understand what the requirements actually demand when made into a real system, and the cost of doing so. I appreciate this committee's efforts in support of innovation to include the addition of $100 million in Fiscal Year 2017 funds for the Rapid Prototyping Program. We'll work closely with you and your staff to be transparent in how we apply our prototyping funds to accelerate needed capabilities to our warfighters.

As you know, FY17 NDAA, Section 901 specifically devolves the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) into two new Under Secretaries of Defense (USDs); one for Research and Engineering and one for Acquisition and Sustainment. This restructuring initiates a change in the role played by AT&L. Under this new structure, the USD(R&E) will be empowered to take suitable risks to achieve outcomes. They will shed the risk-averse mantel of traditional acquisition and pursue innovative technology and concepts that can result in dramatic increases in capability and new ways to achieve mission objectives. They will champion the 'hard thinking' necessary to facilitate a change in how we operate. The likelihood of successful programs will increase through up-front trial and error, learning from mistakes and factoring what they learn into realistic requirements. This path to increased capability leverages the expertise within the Department of Defense and the broader Research and Engineering Enterprise to ensure that the U.S. military remains the pre-eminent fighting force in the world.

The Joint Force depends on the S&T Enterprise to research, develop, and demonstrate high pay-off technology solutions for hard problems faced by our troops in ever-changing,

complex environments against an increasingly diverse set of threats. Uncertainty and complexity are at the heart of the military's challenges. To better prepare for operational and technical surprise requires that we up our game in identifying, leveraging and deploying innovative disruptive technologies that may have been developed outside of the Department of Defense. That is why efforts like Defense Innovation Unit Experimental (DIUx) are so important – they are able to scout for disruptive technologies among cutting-edge commercial companies that have not previously engaged with the Department or have not focused on national security. Out-innovating our competitors will require us to be increasingly open and collaborative, it will push us to execute transitions from concept to field at a much faster pace, and engage the Department's extended S&T community to help drive the pace of innovation in areas that will yield long-term military advantage.

Again, the Secretary and I are grateful that this committee included Fiscal Year 2017 funding to allow us to build on DIUx's success – to date, 356 companies across 36 states have provided proposals to DIUx. It is working on the most important priorities of the Department — including counter-UAS, missile defeat in the Pacific Command area of responsibility, and new tools for our special operations forces battling ISIS. Several of its projects are in the final phases of testing and close to transitioning to become programs of record — the ultimate goal of DIUx's mission to bring commercial technology to the warfighter.

I strongly believe that since its formation in 1947, the Department of Defense has been an engine of innovation that should be the envy of any organization – government or commercial – anywhere on this planet. Today, the DOD Laboratory Enterprise comprises some 38,000 scientists and engineers at more than 60 labs across 22 states. For decades, our labs have been at the forefront of science and technology research, developing technology we use every day like

GPS, unmanned aircraft, and the Internet itself. They are working hard every day to ensure U.S. technological superiority, to prepare for an uncertain future, and to accelerate delivery of technical capabilities to the warfighter. Our efforts to tap into non-traditional performers through DIUx complements but could never replace that significant expertise and superb facilities resident in our laboratories.

At least since World War II we have made it a national priority to never allow our troops to go into combat without the absolute finest equipment that America's genius scientists and engineers can develop. Because we know we will have the best people in the world. Marry the two of them up and you have a force that can dominate on any battlefield. I firmly believe, as does Secretary Mattis, that in this competitive world we must continue to push the edges of innovation. The challenge to our military's technological superiority is not a tomorrow problem – it is here today.

As it has in the past, technological innovation can serve as a catalyst to new ways of fighting, but there are no silver bullet solutions. Our innovation must be broad-based and rooted in realistic wargaming, experimentation, and new concept and leadership development, which enables our people to adapt to situations we can't yet imagine. Ultimately, we must provide our service members with an unfair competitive advantage, so that they will never find themselves evenly matched in a conflict – that is the essence of deterrence and what will ultimately safeguard all of our interests

The Department remains committed to ensure the Joint Force is prepared for any future conflict and we are committed to working closely with Congress to stimulate innovative capabilities that preserve our technological edge. In this regard, the DoD Science and

Technology (S&T) community has been extremely fortunate to benefit from strong congressional support over the last twenty years – particularly from this subcommittee. That strong support has resulted in a stable budget – the kind that Secretary Mattis desires for the entire Department.

Thank you for your support.

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