PREPARED STATEMENT

OF

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Chairman Langevin, Ranking Member Stefanik, and distinguished members of this Committee:

I appreciate the opportunity to speak with you today in my personal capacity about innovation opportunities and a vision for the S&T enterprise. During my tenure in the Department of Defense and through my current position at the Johns Hopkins University Applied Physics Lab, I have had the pleasure of working closely with scientists and engineers who are innovating with new technologies. It is clear to me that incorporating innovation into DoD programs and harnessing the creativity of the S&T enterprise are more important than ever. Thank you for the opportunity to share my personal observations and current thinking on these issues.

I would start with the observation that the principal challenge DoD faces is NOT a lack of innovation. New technologies — and potential military applications of those technologies — are plentiful. The traditional government-funded sources which gave us the internet, satellite navigation, and stealth are as robust and productive as ever. These include DARPA, the Office of Naval Research, government-run labs, and federally funded and university affiliated research centers. A sampling of APL's work funded by our military sponsors includes brain-computer interfaces, additive manufacturing, biotechnology-based naval sensors, the first dogfight between an AI-driven combat aircraft and a human pilot, and much more. Then there is commercially developed technology. With the help of farsighted leadership — in the Pentagon and in Congress — under the past two administrations, we have seen a greater engagement with commercially derived innovation in areas like C4ISR, artificial intelligence (AI), space, and more. So, innovation abounds today — in fact, my colleagues call it a technology explosion.

As the members of this Committee know better than most, the tougher task is how to adopt all this new innovation more rapidly and productively into DoD programs. At this point, the conversation usually turns to the shortcomings of the defense acquisition system — the bureaucratic hurdles faced by nontraditional vendors, or the proverbial "valley of death" preventing new technology from receiving funding or adoption in a program of record. In recent years, these barriers have been lowered a bit with new acquisition authorities and the stand-up of organizations like the Defense Innovation Unit or the Strategic Capabilities Office. But, while the barrier is a little lower, it is certainly not gone. Many are appropriately focused on this challenge; however, it is not my focus today.

In my view, the principal S&T challenge facing defense leaders today is less about supply and more about priorities. There is broad agreement that America is engaged in great power competition. DoD's highest priority is deterring and, if necessary, defeating China or Russia in a major conflict. Many argue that DoD must shed much of the existing military force structure and related platforms and "leap ahead" to a highly autonomous force optimized for the highest-tech combat. While some divestiture of outdated systems would be desirable, the reality is that there is a near-insatiable demand for ready U.S. forces to defend vital American interests at home and abroad. We don't have the option of taking a break to reequip the entire U.S. military. We will need manned ships, tactical aircraft, ground units, and more for the foreseeable future — all of which require considerable resources for training, equipping, and sustainment and an integrated concept of operations for their employment. We should not

underestimate the enormity of this task. It is all-consuming and, too often, is given short shrift in discussions about military innovation.

Yet the "technology explosion" is here and, even if the U.S. may find it hard to adopt new capabilities, our potential adversaries are not standing still. So, this brings us back to the question of not *whether* to move forward but *how* to do it.

To make progress despite intense demands and limited resources requires a vision for what a future force should look like — for all the things it must be able to do — and, as important, for a path to get there. A big part of that journey will entail incorporating innovations such as cognitive communications, cyber, AI, zoomorphic robots, and more into new concepts of operation. Developing this vision of the future force will define the priorities for new technology adoption and reveal the capability gaps that should drive future S&T investment. Some of my colleagues at APL and I are working through this process — we call it "here to there."

When it comes to future military forces, visions abound inside and outside the Pentagon. So, you might ask, what are we suggesting that is different? Many visions fall into what I would call the "near here" — concepts of operations, such as distributed warfare, that are designed to maximize the utility of the existing force structure while incorporating new technologies. This "near here" force will operate much as it does today — think of multidomain brigades in the Army, manned-unmanned teaming in the Air Force, and autonomous surface vessels in the Navy.

These shifts are significant — and needed — but they don't take full advantage of new and envisioned technologies to fundamentally alter the character of warfare. Here is where the more futuristic visions come in, for example, replacing entire categories of military platforms with massive swarms of expendable robots. These kinds of visions are exciting and inspiring — and potentially transformational. Too often, however, they are not grounded in operational realities.

Unmanned aerial systems — to simplify things I'll refer to them as drones — provide a case in point. At the Lab, we are taking a comprehensive look at all the drone-related innovations underway and how they may add up to a new vision of warfare. The technologies being developed are very impressive — mind-blowing in some cases. However, time and again, I find myself coming back to questions like these:

- How do the drones get to the fight, say from a warehouse in California to the South China Sea?

- What are they supposed to do when they get there? Drop ordinance? Carry supplies? Shoot down other aircraft? Sink ships in blue water? Or are they intended to provide intelligence and communications links? In that case, what *does* in fact project combat power?

- Are these drones really disposable? For the advanced missions, you would need a highly capable, even exquisite platform — one that is quite costly as well.

- How will the drones be controlled? Or will they operate autonomously? These questions raise a host of other practical and ethical questions.

The point here is not to drop a wet blanket on unmanned aerial systems or any other transformative technology. These kinds of questions can be answered and, in many cases, answers are in the works. The point is to ask them.

It is imperative, then, for the S&T community to marry up more closely with operational forces — the same people who may have to take these innovations to war and trust them. Innovation that is not grounded in operational realities will not ultimately make a difference. Likewise, new concepts of operation developed without an understanding of new technologies will fail to make revolutionary change — the kind of change America needs to sustain our military preeminence.

As mentioned before, we don't have the luxury of standing down the existing force to start over according to a new vision — and likely we never will. But we can certainly evolve more rapidly and purposefully than we do today. Innovation is no longer a limiting factor; only our vision and wisdom in determining where and how to use it.

Thank you.

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