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Prepared remarks at the Space Symposium, Colorado Springs, Colo.

April 12, 2016

Good afternoon, it's a real pleasure to be back here in Colorado Springs.

I don't think I have to convince this crowd that our space capabilities are central to our ability to project power anywhere on the globe. They contribute to every aspect of the joint multi-dimensional battle networks we assemble to fight and prevail over any opponent. By battle network, I simply refer to three interconnected grids—a sensor grid, command, control, communications and intelligence, or c3i, grid, and an effects grid—working to apply and achieve campaign-level effects.

Space capabilities are an absolutely essential part of our sensor grids, providing exquisite information on what is happening in an area of operations. They are an essential part of our c3i grids, providing us with the ability to operate forces over global and theater ranges in a coherent fashion. And they are an essential part of our effects grids, providing information that make our application of force more precise and lethal.

So today I want to talk about the threats to those capabilities, and the changes we must make now to strengthen our space posture to make sure our warfighters can continue to count on the capabilities that have become so absolutely central to the American way of war.

Let's start with a little context. When Secretary Carter came in as secretary of defense, he asked us to focus on five evolving strategic challenges—namely Russia, China, North Korea, Iran, and countering violent extremism (C-SIL and other groups). And then he asked us the following question: "With respect to these challenges, how do we think the next 25 years will be different from the last 25 years in terms of defense planning?" he wanted the answers to inform DOD's planning and budgeting.

We concluded one likely key difference is that we would once again be forced to contend with the re-emergence of great power competition, as we face a resurgent Russia and a rising China. This competition will require exercising strategic muscles that we've allowed to atrophy since the end of the Cold War.

Now there are many interpretations of the term "great power." from a perspective of building a defense program, we believe Professor John Mearsheimer's definition is the best: a state having sufficient military assets to put up a serious fight in an all-out conventional war against the most powerful state in the world (that would be us), and possessing a nuclear deterrent force able to survive a nuclear strike against it. From DOD's standpoint, that's an ideal definition, because it focuses on the military capabilities that we must contend with and leaves out whether the country is an economic peer, or the relative strength of its soft power. Because from the department's perspective, the most worrisome scenario—even if it is a low probability one—is a conventional fight against a nuclear-armed great power. Nothing is as potentially so dangerous or disruptive to both our nation and the global system. That is why we think constantly about maintaining a safe secure and effective nuclear deterrent force and bolstering conventional deterrence.

So let's review the strength of our conventional deterrent. In the first 25 years after the Cold War ended, the United States enjoyed unparalleled conventional dominance across the spectrum. We could generally count on unimpeded freedom of access on land, in the air, and on the seas. Our global command and control network was without peer and largely unthreatened. We generally faced regional competitors and adversaries that were much weaker than us. Our space assets, which underwrote our ability to set up theater-wide guided munitions battle network operated in a virtual sanctuary.

Indeed, our conventional dominance caught the attention of both Russia and China. Over the past 15 years or so, both countries have pursued levels of advanced weapons development that we haven't seen since the Cold War era. Moreover, while this was happening, our attention has been rightly focused on the Middle East. The combination of a focus on CT operations and defense budget cuts have limited our own investments in high-end capabilities that underwrite conventional deterrence.

That is why secretary carter directed us to focus the defense program on countering new military capabilities being developed by China and Russia. Not because we think we're going to go to war with them, but because they are our most stressing competitors. Their advanced military systems challenge our advantages in specific areas and threaten our allies and partners. And both

countries are not just getting good in the usual domains of air, land, and sea, but also especially in cyber, electronic warfare, and space.

As a result, our margin of technological superiority is slowly eroding, and addressing this issue is one of our most important strategic tasks, because too great an erosion of our technological superiority would ultimately undermine our conventional deterrence, raise a competitor's incentives for preemption, contribute to crisis instability, and greatly raise the potential cost of any future U.S. military operation.

That's why we're exploring new "offset strategies"—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 own choosing.

Now, there are three reasons why I like the term "3rd offset strategy." first, it is grounded in history. When I was asked to become the deputy secretary; I spent a lot of time talking with people like Bill Perry, Paul Kaminski, and Andrew Marshall, all of whom had spent a lot of time thinking about the Cold War competition. They were the ones who came up with the terms "first and second offset strategies." the second reason I like it comes from the word "offset", which implies we'll approach this problem without trying to match potential competitors tank-for-tank, airplane-for-airplane, missile-for-missile, person-for-person. Rather, we'll offset their strengths in ways that give us an advantage. And the third comes from the term strategy, which is tied to the idea that this is as much about pursuing a "competitive strategy" for a very different environment than we had in the Cold War—where we had one single opponent and a very stable competition. Today, we're in a much more dynamic environment where many militarily relevant technologies are driven by the commercial sector, things like: artificial intelligence, autonomy, robotics, biotechnology, satellite communications and imaging. And any competitor can combine them in ways that could really cause problems on the battlefield.

The 3rd offset strategy focuses on strengthening conventional deterrence within the framework of comprehensive stability, which strives to eliminate any incentive for preemption or aggression, convince our competitors to change their strategic calculus, and reduce the chances that a miscalculation could lead to major power conflict. Just so I'm clear, this is not about us

planning for war against great powers. This is about strengthening conventional deterrence and reducing the chances it would occur, or, if deterrence fails, enabling us to end a clash quickly before it escalates.

Now, let me explain how we intend to develop an offset strategy for space. As I discussed earlier, space has allowed us to project power, more precisely, and more swiftly, at less cost, with less force structure, and with fewer casualties than would otherwise be possible. In short, space has become deeply enmeshed in our plans, training, and operations and is central to our ways of deterring conflict, assuring allies, and ultimately to our warfighting. We want to keep it this way. If an adversary were able to take space away from us, our ability to project decisive military power across transoceanic distances – the very essence of our conventional deterrence – would be critically weakened.

Now during the Cold War, although both the Soviet Union and the us developed ASATs, attacks on space systems were deterred by their linkage to nuclear warfighting. Both we and the Soviets understood the “red lines” in terms of attacks on space systems that we dared not cross.

Then, after the Cold War ended, with no credible threat to our space constellation, we began to regard space as a sanctuary. As a result, we fielded relatively small numbers of extremely capable systems that traded off mission assurance to constrain costs and to achieve improved performance.

So, even as space became central to conventional warfighting, we spent little time thinking about how to protect these capabilities. Air force space support became mostly a function—providing weather, precision, navigation and timing, protected communications, nuclear command and control, and missile warning. The air force’s requirements for space control were reduced, and infrastructure and personnel were shifted to other priorities. Greater capability was put in orbit without proper regard for operational resilience and overall mission assurance.

As a result, our constellations were optimized for an anomalous world, a brief blip of time when our obvious advantages in space-based capabilities could be fielded and operated with impunity.

No longer.

Setting aside intent for the moment, one of the problems we face today is that cutting edge military technology is providing competitors with the capabilities to take out our space assets—at very low cost. An advanced U.S. satellite can cost upwards of \$1 billion—even more when you factor in launch and operating costs. Missiles that could destroy that satellite cost a small fraction of that sum; co-orbital microsattellites that could conduct kamikaze attacks cost even less; and lasers that might blind or damage satellites have an unlimited magazine of relatively low-cost shots.

The growing vulnerability of our space assets is both a strategic and operational problem. Strategically, space system vulnerability contributes to crisis instability because it provides incentives for preemption of our space assets. The temptation will be mighty strong for an adversary to try and take out what has become an absolutely critical capability for the joint force. And operationally, the loss of these capabilities will critically undermine our warfighting plans and operations, thereby undermining conventional deterrence.

Now, one of the fundamentals of deterrence is that people are more likely to attack you if they see you as weak and vulnerable – in other words, don't be the injured gazelle on the Serengeti, you're just inviting attack. In the logic of deterrence, it's all about perceptions. A perception that our space systems are vulnerable leads to a destabilizing reality—an adversary might think that by attacking, or even threatening, our space systems they may deter U.S. entry into a conflict.

So, to begin with, we must remove the likelihood that attacks on our space capabilities could succeed. This will require a multipronged approach. We need a diverse set of resilience measures that complicate the technical, political, and force structure calculus of any competitor considering attacking our space constellation.

Strangely, there are some who believe we cannot do this. That pursuing defensive measures and spending the money to improve resilience is a waste of time, or provocative. They remind me of the reaction of some in the British royal navy when submarines were developed. These submarines represented a grave threat to British battleships and battlecruisers, the powerful but

relatively limited number of platforms upon British command of the seas depended. And many in the royal navy didn't really want to think about how the appearance of these submarines might threaten command of the seas. As one admiral declared, submarines were: "underhanded, unfair, and damned un-English."

So now we find ourselves in a situation similar to the royal navy regarding anti-satellite weapons, which apparently some regard as: "underhanded, unfair, and un-American." but we cannot afford to wait, like the British royal navy did, for a war to show us we must deal with a new threatening capability, regardless of how underhanded or unfair we might consider them to be. We need to develop space mission assurance capabilities analogous to the convoy system, and defensive capabilities like ASDIC and depth charges. In other words, we need to put our best minds to work to develop an offset strategy that deals with growing threats to our space capabilities.

Defending against these new threats will require different techniques, but rest assured, despite what the naysayers say, we can and will assure our space systems against these threats. Again, our efforts will be guided by the first rule of structural stability: to reduce your vulnerability, in all domains, through dispersal, hardening, warning, and active defense – reducing incentives for preemption and escalation. While doing so, we are working to strike the right balance between those assurance efforts that are understandable and measurable by the adversary, and those that must remain more ambiguous. Central to third offset thinking is the idea of revealing capabilities for deterrence, and concealing capabilities for warfighting advantage.

One thing that will be evident is we will begin to make our space architectures and our operations more resilient: hard to find, hard to catch, hard to hit, hard to kill. The lone freighter crossing the North Atlantic on a predictable course was an easy and inviting target for U-boats; the convoy protected by fast destroyers and long-range bombers was not. We're going to build a dynamic, layered, defense-in-depth that encompasses the full range of passive measures required for denial—such as different orbits, mobility, deception, distributed architectures—as well as active measures, such as threat suppression and damage limitation. Over the course of the next decade, we'll be making changes to our space capabilities, posture, and operating practices to improve

their affordability, capability, agility, and resilience. It's all about making the anticipated benefits of aggression too difficult or expensive for an adversary to achieve.

Another structural change is we will improve battle management and command and control of the space assets. This new BMC2 approach will both look up to "fight through" attacks on our assets, and look down to continue to provide support to joint warfighters even while under attack. Today we have an experimental platform to tell us best how to do this called the joint interagency combined space operations center, or JICSPOC. Using this experimental platform, we're continuing to refine our concepts for space BMC2 to more fully integrate DOD space operations with those of the intelligence community.

The second thing we're going to do is tap into the amazing advances that are happening in the private space sector. Now, it used to be that the space industry had a trickle-down effect of technology transfer where everything flowed from government to the commercial sector. Now it's working the other way, with consumer demand for ever smaller devices with greater computing power and more functionality leading to advances in space that we then adapt to address government needs.

We're seeing this innovation in new concepts for commercial launch, for proliferated constellations for a truly worldwide internet on orbit, for more persistent space-based imaging, for space situational awareness, for on-orbit servicing, for hosted payloads, and much more.

DOD already depends on commercial satellite communications to meet our worldwide needs with companies such as Intelsat and Viasat among others. The same is true for remote sensing where operators like Skybox and Planet Labs are adding to the already substantial capabilities of DigitalGlobe, flying dozens of satellites with plans to add hundreds, even thousands more.

I believe we're on the verge of a revolution in space flight driven by a new generation of private rocket builders. Last week, I visited Blue Origin, Jeff Bezos' state-of-the-art rocket factory. Earlier this month they launched their reusable rocket into space and then successfully landed it vertically out in west Texas—the third time they've done this. And last Friday, Elon Musk's

SpaceX launched their reusable Falcon 9 rocket and successfully landed it on a barge out at sea, after a number of tries. And they're not the only billionaires out there pushing private space flight. Richard Branson's Virgin Galactic is also in the game.

All this activity in the private sector reminds me of the old railroad magnates of the 19th century, names like Vanderbilt and Harriman, those who financed and constructed the trans-continental railroad. The railroad network built by those 19th century "first movers" dramatically lowered shipping costs, greatly expanded freedom of travel and opened up the west. If tomorrow's space magnates, like Jeff Bezos, Elon Musk, Richard Branson, and others can deliver on the promise of reusable rockets, and we can truly drive down the costs of space launch, well we could be looking at a true revolution in space flight.

DOD is rooting from the sidelines as we're as eager as anybody to see the cost of spaceflight drop and the frequency of launches go way up. From our standpoint, we need two reliable space launch companies, whoever they might be. To help spur these companies, we are pursuing space launch products and services and will partner with anyone who can deliver them at affordable prices.

Another thing we intend to do is to better leverage our international partnerships and strong alliances. When we operate today, on land, sea, and air, we do so in coalitions. We hope the same thing will happen in space. Our allies and partners allow us to add redundancy and resiliency, and they offer opportunities for hosting payloads that will proliferate what we have on orbit. And they're joining us in training and exercises and in our space operations centers, giving us a greater ability to operate as a coalition. This offers huge advantages—as it's one thing to have to deny the U.S. the use of a few government owned imagery systems; it's quite another to take on tens or even hundreds of allied and U.S. government and commercial remote sensing systems all at the same time. And we recognize that while we have made progress in working with our allies and partners, we need to do much more to coordinate our space operations, share situational awareness, and exercise together while accounting for the challenges we may face in space. Space cannot be the only domain where we fail to operate in a coalition.

So, by enhancing the resiliency of our own constellation, improving our space BMC2, operating as a space coalition, and investing the resources necessary to capitalize on and strengthen our own space-based capabilities and capacities as well as those of the commercial space, we're absolutely confident we're going to be able to survive any type of concerted attack, and continue to provide the space-based support that our war-fighters need.

In conclusion, let me say that the secretary and I take this issue seriously. The president takes it seriously. Deterrence depends on preparedness and the blunt reality is we must be prepared to deal with adversaries who are willing to initiate terrestrial conflicts that extend to the space domain. We must be prepared to deny adversaries the benefits they hope to achieve by attacking us in space and thereby ensure that we remain able to dominate such conflicts and ideally deter any adversaries from starting one.

Thank you.