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THE FUTURE OF U.S. DEFENSE STRATEGY: A CONVERSATION WITH GENERAL PAUL J. SELVA

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Discussion:

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P R O C E E D I N G S

MR. O'HANLON: Good morning, everyone, and welcome to Brookings. I'm Mike O'Hanlon with the Foreign Policy program, and I have the distinct honor of welcoming General Paul Selva to Brookings today, the vice chairman of the Joint Chiefs of Staff, as he prepares to enter into his last month in that job. And so before I say anything further, could you please join me in welcoming the general and thanking him for his service to the country. (Applause)

I just wanted to give a quick work of background as to how we're going to try to proceed today, and also General Selva's background that is so well suited to the topic before us, because even though we'll save the second half of the hour for you and your questions, I want to have a little bit of a focused conversation of issues of where we stand in defense technology. And there are a lot of things that the vice chairman has to worry about, but as you know, in many of the recent periods in American history since we've had this position for the last 30-some years, the vice chairman has often been seen as sort of the lead technology guy among the Joint Staff, the person who's able to think about strategic issues, technological issues, and so forth. And that's never been more true than with General Selva, who has been at the center of the third offset concept in the latter Obama years, who has been at the center of a lot of the National Defense Strategy thinking on reviving our focus on technology in competition with great power threats in the National Defense Strategy of the Trump administration. And this builds on his career in the Air Force, where many of his jobs have been focused on strategic planning or some other kind of technology related subject.

And so I just want to, very quickly, by way of introducing the General and then starting the conversation, pint out a couple of what I consider the most interesting parts of his bio. He's had a lot of operational assignments in the tanker and air lift worlds and also in Pacific Command and elsewhere, but if you look through his bio there are a lot of jobs that really got him thinking about long-term strategic trends, including technology, including great

power competition, whether it was with the Pacific Command, as I just mentioned, whether it was with Andy Marshall back in the day at Net Assessment with the Air Force QDR office at one point in his career, and his various key positions as assistant to the chairman of the Joint Chiefs, for example, thinking about all the things the chairman has to think about, including modernization, technology, innovation, and the future of warfare.

So, with that as a backdrop, general, I just wanted to begin by asking for your overview on how you feel that we're doing with this 2020 budget, with the last couple of years of budget trends as they match up against the third offset and the National Defense Strategy. Are you seeing meaningful change in how we're allocating defense resources and doing defense planning?

GENERAL SELVA: First of all, thanks for the question. I want to start by apologizing to all of you because I know you had to flex your schedule as a consequence of my schedule exploding yesterday afternoon. So I appreciate your indulgence in making this happen.

Michael, to your question, I think we are making progress, but I am impatient. The progress is simply not fast enough. That's not a judgment on the allocation of the budget or the effort, it's a judgment on the cultural changes required to take advantage of the speed of change that's happening in the technology sector. So if you think about what the Department looked like when I was in it 20 years ago working for Andy Marshall, we were still at least on par with commercial industry as the driver of technological change. That's no longer true. We put demand signals on industry for specific changes in technology. An example would be hypersonics. But the technology sector is moving today largely as a consequence of private investment, 10 to 1 private investment. That ratio is almost completely the opposite in the '70s, '80, and early '90s. About 20-30 percent of the hardcore technical change that we needed in the military was funded by the private sector and 70-80 percent was funded exclusively by the military.

So we have to learn how to take advantage of these cycles of innovation

and change in the commercial sector. And to be honest, that's difficult for the military. It's not that we don't want to take the risk of bringing in new technologies, we don't actually have a mechanism to assess the value of the new technologies and the potential risks that might accrue to them. So that's the part where the budgets don't fix that, that's a cultural issue that we have to fix inside of the Services and inside of the Department. We're pushing pretty hard on it. It's still going to take a little bit of time.

To the core of your question about the allocation of resources, there's a substantial amount of resources going into technology advancement to experimentation. And driven by the guidance of the National Defense Strategy, we're focusing specific experiments on the complexity of our peer competitors. So the complexities that are presented by the military forces that Russia and China can field are complexities that we know how to deal with today, but as they advance -- and they will -- we have to advance at a similar or a faster pace. That's going to cause us to come back to my original proposition, which is we have to incorporate new technologies faster because that pace of change is not going to slow down.

MR. O'HANLON: When you talk about the private sector driving innovation, is that especially true in sort of the dot com and electronics world, or is it even true in vehicles, in propulsion, in many of the other areas of defense technology?

MR. O'HANLON: So it is true, except in the most elegant military technologies. Our civilian counterparts don't develop better explosives, they don't develop better targeting systems, they don't develop better sensors to guide weapons to the targets. Those are, I would argue, uniquely military things. There's a whole menu of those that our commercial counterparts are simply not interested in.

But if you just use autonomous vehicles, self-driving cars, as an example, the integration of the sensor systems that allow those vehicles to operate safety in and amongst the rest of us, that set of technologies, sensors, sensor integration, artificial intelligence to make sense of what the sensors are seeing, those have some inherently

military utility. And we ought to be figuring out how to bring that technology in.

And so there are two ends of the spectrum. The things that are uniquely military, we will have to push. We also have to figure out how to embrace and use the tools that are not uniquely military.

MR. O'HANLON: One more thing caught my attention in your first answer, which was you said we don't have the mechanisms we need and we also don't have the right culture. You made both those points.

On mechanisms, to what extent has breaking down the Under Secretary for AT&L into two separate component areas of specialization -- has that progressed, has that helped, is that just not adequate to the scale of the challenge before us?

GENERAL SELVA: So I would say it is still progressing. The wisdom in breaking out the research and engineering expertise in the Department, as the representatives of what is technically possible and also empowering them to push the edge of that technology to say if it's technically possible today what would you change, what new things would you invent that would allow you to move even further and faster. I think the wisdom of doing that will stand the test of time.

I'm actually a product of the Department when we had a director of research and engineering and a separate acquisition arm within the Department. And it is my firmly held opinion that our ability to move from the post-Viet Nam Era of essentially what I would call truly industrial age warfare to a much more fused understanding of the battle space, through the late '80s and into the early '90s, which we called air-land battle at the time, that would not have happened if we had not allowed DDR&E to move down a path of looking at what it would mean to be able to strike our adversary deep into their second and third echelon, to prevent their reinforcements from ever making it to the front lines. And that is the recipe we have been living off of for the better part of the last 30-40 years. We have to refresh. And moving R&E into a place where they can truly experiment and prototype with new technologies puts us in a better place.

MR. O'HANLON: The second offset, Bill Perry and so forth.

GENERAL SELVA: The third.

MR. O'HANLON: Those great stories from the '70s and '80s.

If I could, I'd like to work through some areas of specific technology and just ask you how things are going, if there are any particular comments you'd make on the pace of change or any specific stories you want to tell.

So I've got four or five dyads in my mind. If I could, I'll just maybe walk through them and then finish up with a question about the operational level of war before going to the audience.

So if I could start with satellites and space launch. And I could just leave it at that, but I'll add one more hypothesis to let you challenge or support or -- it strikes me that in satellites and space launch what we are seeing is satellite technology is progressing in very interesting ways, largely through miniaturization. Space launch, even though we hear a lot of exciting talk about reusable rockets and so forth, it's basically not changing that fast compared to what it has been really in the Apollo and post Apollo age in terms of cost per pound getting things into orbit.

So it strikes me that satellites are changing pretty fast, space launch not so fast, but I want to hear your view.

GENERAL SELVA: So I kind of agree and disagree. So satellites are becoming smaller. So miniaturization is a key piece of what's happening in the satellite sector, but it's not just miniaturization, it's integration. So the capacity to make a small satellite that will do multiple things. Similarly, if you want to specialize that same satellite, the integration of sensors into storage and transmission methodologies that allow you to build a much more elegant sensor on a smaller platform that demands less power. And so the value of each pound you put in space is rising. So the value of each satellite is going up. And in a venue not unlike this one, I called them trash can sized satellites. I was making a reference to their size, not their utility, and then that turned into to trash-sats. (Laughter) So

I don't do that anymore. I actually call them beer keg size satellites, because that's sort of a universal picture in everybody's head. And that's about the size of the average commercial satellite. They stand about this tall and they do some really elegant things.

So if you can imagine in your mind's eye launching a school bus sized satellite or a collection of beer keg sized satellites, that's an entirely different architecture. So the value per pound of what's going into space has gone way up.

We're turning a corner in two ways in the development of new rocket technologies. One is simplicity. So imagine a 3D printed disposable rocket that has no moving parts. Those actually exist. There's a company that builds those. They build two a week. They're capable of launching a set of satellites, a collection of about 1,500 kilograms of beer keg sized satellites every 6 days. So a relatively cheap rocket, still the same energy per pound to get it to where we send it, but it's a completely expendable -- it's a throwaway rocket.

At the other end of the spectrum, you have people like Space X and others, who are developing reusable boosters à la the model of the return the space shuttle to earth and reuse it, only they've chosen to use autonomous landing technology to return boosters and fly them again. The cost of the fuel that goes into them is the same, but the fact that you don't have to replace all that hardware actually gives you a model that says over time you'll reduce the price per pound of quality that you put into orbit. And that makes possible conversations like broadly distributed low earth orbit constellations that can provide broadband internet on a global scale. People imagined that in the late '90s, but because it was so expensive to put a satellite on orbit, fiber killed the satellite constellations. We may be approaching a break point in the cost of the technologies that says a proliferated low earth orbiting constellation of broadband internet satellites will be much more useful than a web of fiber that circles the earth.

I'm not suggesting for the moment that that's an absolute, but when you get to that break point you're in a different business model. And those are the convergences of

technology just in the space launch and satellite space that are really promising over the course of the next decade.

MR. O'HANLON: That's great. Let me move to missiles and missiles and missile defense. And I'll put another conjecture before you and ask you to respond however you like.

It looks to me as if we are seeing quite exciting things in missiles, especially hypersonic missiles. They're expensive, they're technologically sophisticated, they're not going to be used routinely against each and every target, but for certain high priority targets. They are becoming more feasible, you're putting a lot of effort into it, there are some exciting programs. By contrast, missile defense looks to me to be an area where we've seen hit to kill technology sort of arrive and look pretty good, but you still have the dilemma of having to use one interceptor per incoming, which tends to still mean that the offense has the edge. And until we get to a place where directed energy is more doable on a larger scale over longer distances than is currently the case, the offense still has the advantage.

So it looks to me as if hypersonics are impressive, missile defense is still, while impressive, trying to compete in an area where it's sort of behind and probably going to stay that way for a while.

Any thoughts?

GENERAL SELVA: I think your observation is right on, Michael. The missile defense game, even strategically, is about responding to changes in your adversary's behavior. So the fact of it's a hit to kill today is because that's the best we can do.

Directed energy, as you pointed out, has not scaled. It has some promise, but it has not scaled to an end game solution that gives us confidence that it is a viable defense.

Where I think we're losing a little bit of our intellectual advantage is thinking about missile defense as only a hit to kill problem. So in the hit to kill solution, the offense

always has the advantage because it's a numbers game. If you don't have as many defenders as they have shooters, you're doomed to eventually running out of ammo.

I liken this to what's more fruitful, killing the arrow or killing the archer. And so I view missile defense as an end-to-end solution. It's our obligation to think about what are the things that empower your opponent's offensive capacity. So it's not just the missile, it's their knowledge of the battle space, it's their ability to close the kill chain. And so I agree with you completely, hit to kill, we will always be behind the power curve, by definition, because you're adapting to the enemy's behavior. What I'm suggesting is that we break the link, that we get inside of their command and control architectures, that we get inside of their missile control capability and capacity, and that we even target the launchers.

So I'm fond of saying in the missile defense game you have to be good enough to let your opponent throw the first punch and then you have to be smart enough to prevent them from throwing the second punch. So whatever the size of that first punch is, whether it's a multiple missile volley or a single rocket attack on a valuable asset, we must be able to defend against that initial punch. And then nothing we do after that should rely completely on defense. There should be an offensive component to a ballistic missile fight and we have to be in that game.

And so that's why we're pushing so hard on developing hypersonics, on developing the capacity to close kill chains quickly. So if somebody does shoot, they expose their position. We have to be able to respond in the timeline that allows them to conceal that position. And those are fairly short kill chains. If we press on that end of the game, then we're addressing both book ends to try and come up with a solution.

MR. O'HANLON: And you mentioned command control as well, which leads naturally to a question about cyber. So if I could ask you about cyber offense and cyber defense. And it looks to me as if -- again I don't want to sound like I'm a broken record -- but again the offense would seem to have a certain amount of the advantage with the caveat that often with cyber you don't really know how effective the attack is going to be until you

carry it out because you don't know what the ripple effects will be through the system and you also don't know how long the adversary will require to repair whatever damage you've done.

So in that sense there are uncertainties to the offense, but it still looks as if the offense in today's world has an advantage over the defense. For example, if I look at the Defense Science Board study of two years ago on cyber deterrence, they basically said they can't really vouch for the cyber resilience of any major U.S. military system whatsoever. That may have been slightly dramatic, but it was pretty stark.

So I wondered how you would react on the cyber front to those hypotheses.

GENERAL SELVA: Thanks for that. Drama does move us to action. And yes, that is a dramatic description of our systems. To be fair, we have a menu of cyber vulnerabilities. I won't discuss the details here, but we are aware of what those vulnerabilities are and we are moving pretty quickly to close them. But given the breadth of the technology that we deploy, so -- I use my favorite example, we have at the very same time the newest tanker in the world, the KC-46, and we are operating the KC-135, which is 65 year old technology. The engineers that designed that airplane had it on the drawing board in 1955. And we are obliged to maintain both the cyber security of that weapons system with a 65 year lineage and one that has just come off the assembly line. And I could draw that example for the F-35 and the F-15 and F-16. I could do the same thing with the Aegis class cruiser and some of our aircraft carriers. The fact of the Ohio Class Submarine being in the water for 42 years when we finally retire it means we have a menu of systems that depend on software and hardware that have inherent vulnerabilities for which we must field a defense.

And this is where operating at machine speed matters, because if you can't defend all of the subsystems on a particular weapons system or a particular command and control network, you have to build a system around it, almost like the layers of an onion. You want to protect the center, you have to build enough layers of defense around it. And

those layers must operate at a fast enough speed to detect intruders. And humans are not very good at this. We will react to the attack if we see it.

Machines inherently react to abnormalities in their environment because we program them to do it. And this is a place where an awful lot of commercial work has been done to protect intellectual property. Those same methodologies are useful for protecting military command and control networks and military hardware and software.

And so the idea that we would necessarily build an architecture inside the Defense Department out of whole cloth to help us with cyber defense is one of those places where we have to get over this cultural sort of proclivity to say if we didn't build it we won't trust it. Commercial industry has done this in the banking sector, in the IT sector, in many industrial sectors. They are protecting their information at levels much more significant than the way we protect our information, and we just have to get on board.

MR. O'HANLON: Two more dyads and then we'll wrap it up and then go to the audience.

I want to ask about stealth and counter-stealth. And I'm thinking about aircraft. I'm also thinking about submarines, quietness for submarines and how we build B-21 bombers and F-35s and so forth.

And, again, just to give you something to react to, not that you need it, but it looks to me as if aircraft stealth technology remains quite impressive. Every so often an Aviation Week or Defense News or Jane's you see a report about how somebody is going to render stealth obsolete, but it's never really true. I mean there are ways in which any given stealth aircraft is more visible in certain frequency realms than others, or maybe its e-signature can be picked up, but stealth still looks pretty good by comparison against the technologies that are out there to try to defeat it, it appears to me.

And, likewise, we seem to be in a pretty good place on submarine quieting. People talk about how quantum computing is going to make submarines easier to find and so forth. I think we're still a ways away from that. But the other dimension of submarine

quieting that's notable is that the technology is spreading and the Chinese and others are getting quieter. That strikes me as the more significant recent development on the submarine stealth and quieting front.

Any reactions?

GENERAL SELVA: Several. One is stealth is not a cloak of invisibility. So I love sharing the story that one of my predecessors would tell if he were sitting here. And it was in the early days of the F-22. As we deployed the airplane a couple of young action officers from one of our most classified sections of the joint staff just ran breathless into the vice chairman's office and they said, oh, Mr. Vice Chairman, we have some intelligence that tells us that one of our allies has actually tracked an F-22. And he went, well, okay. And they said aren't you undone by that and he said well, no. Because it's not invisible. There are signatures that it creates that can be exploited.

The value of stealth isn't that it makes the airplane invisible, it is that it gives you an advantage over your adversary's detection and targeting systems, not dissimilar to quieting in submarines. If it's a competition between two submarines, the quieter submarine with the better trained crew will always win. It is not true that a stealthy airplane with an inferior pilot will always win. It is not true that the quieter submarine with an inferior crew has an advantage over the noisier submarine by definition, if the crew is better trained.

So part of the mystique of stealth and the mystique of quietness, it actually hides the fact of the training and the experience of the crews that are exploiting that quietness and that stealth. How do you mission plan -- what tactics, techniques, and procedures do you do to take advantage of the inherent advantage of stealth and not give up the vulnerabilities. And that is the competition that happens every day.

If you think about it in terms of the F-16 and similar fighters that were deployed by our competitors in the '70s and '80s, the advantages that the F-16 had were speed, G tolerance -- so it had more thrust than it had weight, so it could turn in a really tight circle. If you could exploit those two things as the pilot, it was very hard to defeat the F-16.

But if you didn't know how to exploit them, the F-16 was a target like every other airplane.

And so the same dynamic attaches to stealth. It is a competition. It will always be a competition. But we are all very, very wide eyed and clear eyed about what stealth is. It is not a cloak of invisibility and it never will be. So our competitors will constantly look for the things that they can use to detect the airplane. What we have to do is advance our tactics, techniques, and procedures to defeat the detection of the airplane and prevent it from becoming an ability to target the airplane. Because that's where the advantages attaches. If you can't target me, I can -- you can see me all you want, but if you can't shoot me I'm going to win. And if I can prevent you from getting a firing solution with whatever weapons system you're going to use to prosecute me, I'm happy that you can see me. Because if you can see me, I can see you.

So that's the dynamic. We're going to have to continue to stay on the cutting edge of how we exploit those technologies to provide a tactical advantage. And they are about tactical advantage not operational strategic advantage.

MR. O'HANLON: My last sort of dyad of technology to ask you about is -- and maybe it's not really a dyad, but I'm going to put them together -- robotics and artificial intelligence.

AI tends to get a lot of the hype and the breathless discussion today. And if you listen to the radio every new company is solving some AI algorithm problem and that's why you should want to partner with them and so forth. But it strikes me that, for the moment at least, while there are important things and interesting things happening in AI, and you and others have talked about the importance of staying ahead of that and staying ahead of others in that domain, that many of the deployable technologies that we're talking about now are not necessarily reliant on AI so much as they're doing interesting things with robotics. And the difference being that a robotic doesn't really necessarily have to have a thinking process, it can have sophisticated algorithms that tell it to do many things, look for many different sensor signals, you know, scan a certain space. That's not really AI, that's

algorithm. And the robotics that we're seeing developed, not just in the air with remotely piloted aircraft, but underwater systems, ground systems, these are actually in many ways more exciting now for the potential they offer and what we're able to build than IA per se. But I just wanted to see how you would react.

GENERAL SELVA: So I try to think of that as two ends of a spectrum. One is simple AI, not an elegant sort of multilayered decision process, but I'm going to build an algorithm to do a specific thing. This is a horrible example, but I'm going to use it anyway -- Match.com. (Laughter) A simple set of algorithms that look through your preferences and look through the preferences of other people and actually delimit the number of names that they will put together. And because they've picked some number of those variables, they're actually quite successful. And they've monetized their ability to put likeminded people together who might actually get along. Those are fairly simple algorithms.

The kinds of algorithms that I value and that we would value from a military perspective in this space help us make really hard complex decisions that have multiple simultaneous variable that change as they are executing. So, for example, if you like puppies and not kitty cats, that's probably not going to change over the course of a meeting relationship with another human being. But if you're trying to kill me and I'm trying to kill you, our behavior is going to change. It's inherently defensive. If you don't believe me, just watch a boxing match or a wrestling match. The athletes compete with one another and the variable change in a very fluid way.

The current state of AI, in my opinion, is not adaptable to that kind of multi-varied solution where all the variables are changing at the same time. But there are some places where we're seeing developments that are quite helpful.

So one of my dear friends, Bob Work, if you were sitting in this chair a couple of years ago, would have talked to you about the game Go. The game Go is a very complex strategy game, but it has on the order of 16 million definable moves, and you can build an algorithm that will allow an unsophisticated person who's never played Go to beat a

master. But it's an extremely predictable environment.

In the last several years we've had a handful of researchers build artificial intelligence algorithms and models that win at games that have rules, but the key to winning in those games is you cheat. 5-card draw is one of those games. 5-card draw has a set of rules that say which hands beat which hands. But that's not how you win at 5-card draw. You win by bluffing, you win by convincing your opponent that they can't win in a situation where they may have the superior hand. A young programmer recently wrote an algorithm, a set of algorithms, that will let an untrained card player beat the best players in the world at 5-card draw. That's the kind of evolutionary change that we're looking for in AI.

It's much harder to defeat a piece of AI that's designed around the human condition. It is less complex to defeat simple AI. I'll give you this example. The difference between a stop sign and a 55 mile an hour sign in most of the automated driving technology today is four pixels, two white and two black. So if I go up to a stop sign and you're driving your brand new automated car, and I very carefully place the two white pixels and the two black pixels in the area that could defeat that algorithm, your car will blow through that stop sign at 55 miles an hour. It will do exactly what it was programmed to do unless you stop it. Now, if you see that stop sign, you'll say what knucklehead put those four one squares on it, but the algorithm in the vehicle doesn't know how to discern between the two. And so as we look at simple AI to complex AI, we also have to do some risk analysis on how good the performance of the AI is.

My brother and I don't look the least bit alike, but we are sons of the same parents. Sixty percent of the time that one of the most popular facial recognition algorithms in the country identifies us, it identifies us incorrectly. So I am now given credit for going to concerts that he goes to and he gets credit for going to concerts that I go to. If you take that uncertainty and you lay it across robotics, we have to be really careful.

So we are currently using robots to do dull, dirty, risky jobs that they can do in a narrow sense, that prevent us from having to put people harm's way to do that work.

Think about explosive ordnance disposal detection and pointing an x-ray at a box that might have an explosive in it, or going in and using an explosive charge to disarm a roadside improvised explosive device that you don't want to go in and inspect. Robots are very good at that work. And it's a combination of remote control and artificial intelligence that allows that to happen, but there is a human in that process. We're not in the position right now of developing robots that go out and completely autonomously do tasks without human intervention. And I'm convinced that we have to have a very deep conversation about when we get there.

One last comment on robotics, and that's bio robotics. If you haven't seen some of the prostheses that amputees wear today, those are a combination of simple robotics, simple AI, to accomplish bio robotics that lets those prostheses operate very close to human limbs, simply by exploiting the signals that muscles can send them. I have seen everything from what would appear to be a fairly simple operating leg to a fully functional hand that are all a consequence of linking AI to robotics and connecting to the human body to send signals to those devices. To me there is a huge piece of research there that can help expand the boundaries of what we think about in terms of AI and robotics that is reasonably benign, but it has potential applications into the future.

MR. O'HANLON: Fantastic. Just one last question and then we'll open it up. And you can see I'm having fun on technology, learning a lot. By the way, I've encouraged General Selva to think about writing, after his retirement, some kind of a book on physics for poets, or some other way to keep up with technology the way he's managed to do while doing a million other things, and not really being a full-time scientist, even though he certainly sounds like one when he talks so eloquently about these topics.

But my last question is now to tie all the pieces together and think about the operational level of warfare and especially thinking about Russia and China and scenarios that we have to plan for. And, as you know, I've been trying to think about this in my own way here at Brookings with my "Senkaku Paradox" book, but you've been thinking about it

more importantly in war planning. And while we can't get into details in an unclassified setting, I wonder if there are any sort of broad comments you can make about qualitative changes in war plans. For example, let me just look at Taiwan. Taiwan is a place where if it had been blockaded by China 30 years ago we could have easily broken the blockade. A lot more complicated today. The Baltic States, clearly we need some kind of a forward defense against possible Russian attack. So that's gotten more complicated as Russia has rebuilt some of its missile and submarine capabilities.

Are there some at least general shifts in the way we're thinking about these kinds of scenarios that you can describe today that really try to take stock of all these changes in technology, both in our military and also in those of Russia and China?

GENERAL SELVA: So there are a whole menu of changes that are happening in how we would apply military force. And I'll avoid the detail, but talk more sort of in broad brushes.

In most of our past war plans logistics were an assumption. That is no longer true. In most of our past war plans there was an assumption that we would have significant indications of warning of a potential adversary or competitor's behavior. We have shortened those timelines. Because those assumptions actually caused us to behave in ways that might not be useful in signaling to those potential adversaries that we are in fact serious about the potential for conflict and we're serious about being able to get there and help a partner or an ally.

Because if they saw us make those long assumptions about things like indications in warning and our ability to deploy over months or even years to affect the outcome, they would make assumptions about just getting inside that decision cycle. So what we are attempting to do is take away from adversaries and competitors their assumptions of our benign intent. That's a significant change in the quality of the planning and the actual work that has to be done to examine our preparedness for the potential of conflict. And in the game of deterrence your adversary has to believe that you not only have

the capacity, but you have the will to resist whatever it is they're going to do and that they can't win.

And if you don't have all those in the formula, because they can assume away your capacity or your ability or your will, then you can't actually deter. You can bluff, you can assert, but if they can actually do the math and figure out that you're not able to resist the imposition of their will on whatever their objective is, then they'll do it anyway.

So we have this -- and you outlined it in the "Senkaku Paradox" in lining up all of the things that are necessary to deter an adversary or prevent miscalculation when you're in a deep competition, you actually have to clearly signal your intentions. And the extent to which we obscure those intentions by burying them in assumptions and war plans, we don't actually prepare ourselves for the right outcome, which is if all else fails, we are going to go to war.

In the end that is what actually deters your adversary from taking that last step. So we have to be able to do that. And all of our war planning has shifted to that singular focus, how do we prevent miscalculation and signaling to our adversary or to our competitor that we're not actually on the playing field. And we have to be really careful with that.

MR. O'HANLON: Fantastic. Thank you.

Okay, I'm going to open things up now. We'll begin here in the third row with the woman in the blue jacket please.

MS. ROQUE: Hi, General Selva, Ashley Roque with Jane's Defense.

I wanted to ask on great power competition, more troops going into the CENTCOM region, looking at Iran, how does that chart sort of change the calculus as you look at Russia and China and preparing for our conflict and providing the right resources to those combatant commanders?

And then also, on the technology front, as you look at some of these high tech weapons of the future, how do you sort of strike the right balance of producing these

but also maintaining platforms and technologies that are right for low counterinsurgency operations?

GENERAL SELVA: So two very good questions. So in terms of great power competition, we have laid out in our National Defense Strategy that we can be singularly focused on China and Russia. And it's very purposeful. So we do call out the potential for Iranian misconduct for miscalculation with the DPRK and for the sort of continuing level of violent extremism that's going to exist for some time. And we're very explicit in calling it out that way to put the chairman in the position of actually doing the risk calculus for the secretary to make recommendations on when we have to reallocate force.

And so there are those who would say, oh, the movement of forces out of PAYCOM will inherently make China a more risk proposition. I'm not a subscriber to that kind of thinking. So the forces that are allocated and apportioned to PACOM in its current incarnation are there to accomplish specific missions, not all of which are oriented around the China problem set. And the extent to which we have to reallocate those forces to deal with a real crisis that's ongoing today, that's just a requirement. The chairman and I have to be able to articulate to the secretary what risks attach to that particular set of decisions and whether those are long-term or short-term risks, whether they change the trajectory of our position in the Pacific, for example, or not.

And so the necessity to make real-time adjustments on any strategic journey are actually real. So any of you who have planned a family vacation know that the journey is as important as the destination and along the way you're going to make adjustments. If you have children you're going to make more adjustments than if you don't, because they're going to want to do things you hadn't planned for. And I'm not suggesting that any of our near peer competitors are children (laughter), but it's a variable that gets introduced and you have to deal with it.

So, today we are dealing with a real crisis in the Persian Gulf. We're dealing with a real crisis fomented by the Iranians, because they took a hostile shot at an

airplane in international airspace. You can dispute the facts all you want, I will stipulate that those are facts. There are six tankers that were damaged. Everything we have points to Iran. So Iran is engaging in behavior that is threatening to its neighbors and threatening to our interests in the region. We're going to make Force adjustments to be ready to defend ourselves if in lashing out the Iranian government chooses to attack American interests or American citizen or American armed forces in the region. And that's just a fact, we're going to have to do that.

MR. O'HANLON: Okay. Let's go over here to my friend in the blue shirt please.

MR. NICHOLSON: Sir, George Nicholson, Washington rep for the Global Special Operations Forces Foundation.

Two days ago at a breakfast at the Capitol Club with General Goldfein he made the statement that the future is not platform but network users that are connected and use an AIC. You mention about Bob Work. A year ago at SAIS he made the comment that the problem we've got at the Pentagon are the three big tribes, modernization at all costs, readiness at all costs, but the worse tribe we've got is force structure at all costs.

The last thing, excellent -- and, Michael, correct me if I'm wrong -- had an excellent session with your boss, General Dunford -- what was it about -- three weeks ago -- when he talked about one of the big problems we've got is the balance between capacity and capability. He says it's fine to say I need 100 platforms, but if you've got a 50 percent readiness rate you better look at reducing the capacity to get the assets you need to increase the capability.

Your comments?

GENERAL SELVA: So a couple of things. One, I would agree with my colleague, Dave Goldfein, the future is about connecting. The future is also about connecting platforms. So it's not enough to have a network if you can't convert the network into action. This is the industrial age versus the information age, right. So I won't tell you

what companies I'm a stockholder in, but I find it absolutely amazing that we have companies that do nothing but connect people that are worth more than companies that actually make things. Monetizing connectedness is interesting, but they don't actually create any outcome. And in warfare, the physical outcome is the manifestation of victory or defeat.

So we're going to have to have the right platforms connected to the right network to empower them to do the work that must be done if we ever find ourselves in a situation where we are called upon to defend our national interests.

I tell people, you know, as much as I get credit for being a technologist, I'm a pretty simple guy. I kill people and break things. That's my end product, right. My end product is peace, because I'm willing to say if I am called upon to do the work of the Nation I will be ready and I will have the tools to do it.

And that gets to the chairman's comment, which is capacity versus capability. You can have all the capacity in the world, if it's not available to actually accomplish something, it's just a set of bright shiny objects. So if in your weapons system inventory you have 100 units of eggs but you can only deploy 50 of them, then your net impact on your adversary is 50 percent of what you have advertised to your adversary and to the American people. And that's an unacceptable situation to be in.

Now, it is true that some of our weapons systems are so elegant and so complex and require so much tender loving care, that in order to put 50 on the battlefield we actually have to own 100. That's a calculated risk that we take, but we should explain. Others are just a matter of deciding, is 80 units at 100 percent availability better than 100 units at 50 percent. And we have to make those hard decisions. And when you think about the chairman and the joint staff as the global integrators and explainers of risk to the secretary, that's the kind of stuff we actually have to be able to quantify for.

So if you were in the J8 as an analyst, five years ago you would be talking about the value of modernization and the value of structure. Those analysts today are talking about the value of available firepower. And we're directing the services at what level

we want that firepower to be available. And it's an exceedingly uncomfortable place to be.

So if the secretary were to say I want every weapons system in the Department to be available at 80 percent, what do you say to the service that funds at 100 percent and what do you say to the service that funds at 70 percent? It's a different conversation with each service. I'm not going to suggest to you how we're doing that, but you have to get at that.

So I'm in the build the capability to be able to address the adversary threat and size the capacity to that threat, and don't buy any more than you need. And then what you size, make it available.

MR. O'HANLON: Let's go to the woman in the sixth row please. Yeah, you.

GENERAL SELVA: You count a lot faster than I do.

MR. O'HANLON: It was a guess. (Laughter)

MS. CROWE: Hi, thank you. So let's talk about a different capability, the electromagnetic spectrum. So --

MR. O'HANLON: Can you identify yourself please?

MS. CROWE: Oh, sorry. I'm Amanda Crowe with the Association of Old Crows.

So almost our entire portfolio is dependent upon the freedom of action in the spectrum, but the Department hasn't really been actively managing under that assumption. And so I was wondering if you could give your thoughts on maybe what the new cross functional team might be doing to kind of break that paradigm and bring us towards EMS Superiority and things like that.

GENERAL SELVA: Yeah, so a couple of things. One, I am the senior defense official for electromagnetic spectrum because the secretary signed a memo that says so. All the credit I get for being a smart guy, I know next to nothing about how we fight and prevail in the electromagnetic spectrum. It's just not where I've been educated.

That said, the team that's on that cross functional group of individuals who

bring subject matter expertise to the work that they're doing are truly experts. And so I've learned an awful lot in the last four months -- and I'm overstating the fact that I don't know much about EMS. I spent an awful lot of time beating on the services to try to get them to a place that says all of us have an interest in how we manage the electromagnetic spectrum, from light to RF and beyond. All of those are mechanisms to share, transmit, and digest information. And we do all of them in that spectrum.

So we've been less than organized as a Department, in part because we let every service decide how to manage their subscription and contribution to operations inside the electromagnetic spectrum. So the biggest piece of work that the cross functional team is doing on the front end of their task is to lay out a governance structure that give us visibility into what have been very, very compartmented service stovepipes. And that's not a value judgment on the services, because each service's access -- I use the word subscription too and defense of electromagnetic spectrum -- is necessarily different.

So if I just give you three examples. A ground maneuver unit, Marine or Army, that depends on its radios to provide command and control and close kill chains. That's one dynamic in the RF spectrum that we have to pay attention to. The aircraft that's flying at near the speed of sound that's trying to defeat systems that are trying to detect it and prosecute it. In a system as complex as a carrier battle group with its aegis class cruisers that's operating across the entire spectrum, to defend the carrier and project force ashore.

Those are the three broad examples of very different uses of the spectrum that all have to be accounted for. And our prior behavior was Navy you deal with the carrier battle group, sort of Navy you deal with the airplane because the Air Force has a whole different set of system that they're doing in the electromagnetic spectrum, and Army, well, you figure out how your radios work and everything else will be okay.

Let me add a layer of complexity. Precision navigation timing and encryption. I'm not even going to address those, I'm just going to lay them out there. If they

depend on electromagnetic spectrum for synchronization and execution, we ought to have a layer over the top that governs the whole thing. And that's just one example of kind of crosscutting ESM activities.

MR. O'HANLON: We have time for one more question. So let's go to the gentleman here I guess in about the seventh row, please. Yes, this way. Thank you.

MR. PRICE: Thanks. Jeff Price, Johns Hopkins SAIS.

Going back to potential adversary capabilities, if the INF Treaty goes away, which it likely will do, what new Russian capabilities do you need to anticipate, think about, plan for? And I'm thinking there's a wide range. One possibility is conventional A2/AD type capabilities that we don't currently face, but what's the range of issues that you need to plan for and think about?

GENERAL SELVA: I think assuming for the moment that the treaty goes away, that the Russians don't come back into compliance, then there already exists a set of capabilities that the Russians have fielded which are precisely the reason we're leaving the Treaty. So those capabilities exist today, subsonic, high subsonic, long range cruise missiles for which our NATO allies and the United States are going to have to figure out a methodology to deal with. And I don't even put those in the bin of A2/AD, they're destabilizing escalatory weapons that all of us said we wouldn't field and the Russians fielded them. So we're having to deal with that today.

We have not, as a matter of course, had to prepare ourselves for that density of cruise missile defense across the entire continent of Europe. Given that those systems can range almost all of Europe from sovereign Russian territory, we're going to have to figure out, as an alliance and as an individual contributor to that alliance, how are we going to deal with that threat.

But the rest of your question is actually the part that could be inherently and increasingly more destabilizing. Remember, the reason INF came into force was less about the cruise missiles that took, you know, 45 minutes to several hours to reach their targets,

than it was the ballistic missiles that put Europe and Russia, then the Soviet Union, in a position to actually have an all out nuclear fight that lasted about 11 minutes. Moscow feared that technology. It was Pershing II. We were equally cautious about the capacity of the Russians to inflict significant nuclear harm on Europe with short range, 500 kilometers or so, ballistic missiles that had a time of flight that was measured in low double digits of minutes.

And so INF has been an inherently stabilizing agreement across the European continent, to include European Russia, since its inception. When the Russians decided to break out of the treaty and attempted to hide it, it put us in a position where we didn't really have a choice. They are quite literally a month and change away from the treaty going out of force. They maintain that they haven't violated, they accuse us of violating. The fact of the matter is the only weapons system that exists today that violates the treaty is in the hands of the Russians.

And so if you stipulate all of those as fact, then we really do have to deal with that. What are we going to do to defend against those assets, is there an offense and defense component to that -- I will suggest there is. I don't suggest for any time that that improves their ability to do their area denial and anti access strategy. What it does give them is the capacity to make real what General Gerasimov has said for many, many years, which is they believe they can escalate to low end nuclear warfare to deescalate a situation where they might be losing ground in Europe. And we now know they have in their hands to tools to do that. So there is a doctrine and a strategy that a military level that actually matches the tools they've deployed.

To the rest of your question about some of the other sort of -- I used the "innovation weapons that they have deployed". The extent to which those weapons cross the nuclear threshold, we need to be absolutely clear that crossing the nuclear threshold is just that and we reserve the right to reply in kind. So a small scale nuclear attack is crossing the nuclear threshold. And that willingness and determination to answer in kind has been

the bedrock of deterrence for as long as nations have been pointing nuclear weapons at each other.

So I think before we even think about walking away from that, we have to not get all jazzed up about well they have this new innovative way to deliver a nuclear weapon. The act of delivering it is crossing the line. That's unacceptable. And that has served us well for nearly 70 years and I would suggest it should serve us well with every nuclear capable nation in the world. If you cross that line, we will respond in kind. And that's an important dynamic in how we articulate the fundamentals of deterrence. So it is sad that the Russians felt like they could surreptitiously break out of INF and we wouldn't figure it out. It's equally sad for the world that they didn't cure their misbehavior. That gives us a tactical and operational challenge that we're going to have to step up to, and that's back to some of Michael's observations about the dynamic of missile defense versus missile offense. And we're just going to have to address that in Europe, with our allies, as a NATO alliance, not as an individual country.

Thanks for your question.

Thank you all for being able to do this and for being able to adjust your schedules on relatively short notice to accommodate a conversation between Mike and I.

MR. O'HANLON: And thanks to all of you from me as well, and please join me in thanking General Selva.

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