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WEBINAR

REMEMBERING THE FIRST "SPACE WAR": A DISCUSSION WITH LT. GEN. B. CHANCE SALTZMAN

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P R O C E E D I N G S

MR. ROSE: Good afternoon and welcome to today's event on Operation Desert Storm and its implications for national security space. My name is Frank Rose and I'm a senior fellow here at the Brookings Institution and I'll serve as your moderator for today's event.

This year marks the 30th anniversary of Operation Desert Storm. Due to the U.S. military's successful use of space-based capabilities during the conflict, many experts consider Operation Desert Storm to have been the first "space war." Space capabilities initially deployed at that time, such as the Global Positioning System, or GPS, have become vital links to how the United States military currently conducts operations.

So, what were the key lessons of Operation Desert Storm for national security space? And how have those lessons impacted the U.S. military's current approach to space operations?

Well, our guest today is well-positioned to help us answer these questions. Lieutenant General B. Chance Saltzman is the deputy chief of space operations for operations cyber and nuclear at the United States Space Force. General Saltzman joined the U.S. Air Force as a second lieutenant in 1992 and has had a long career with the United States Air Force. He initially joined the U.S. Space Force in 2020.

Let me say a few words about the plan for today's event. In a minute, I will turn over the floor to General Saltzman, who will make some opening remarks for about 10 or 15 minutes. Then General Saltzman and I will engage in a conversation and I'll ask him some questions. And finally, we'll take some questions from the audience.

If you would like to ask a question, you could either email that question to us at events@brookings.edu, again events@brookings.edu, or Tweet us at #SecurityStrategyTech.

So, on that note, let's begin. General Saltzman, thanks so much for joining us today and the floor is yours.

GENERAL SALTZMAN: Well, thanks a lot, Frank. I really appreciate the opportunity here and it's a real honor to be a part of the forum, have the opportunity to reflect back on Desert Storm. And like you said, that's the conflict that's been described by experts as the first space war.

But you also said that I joined the Air Force in 1992, which is correct, and I think our astute listeners will recognize that that is after Desert Storm, and so I was not a direct participant in Desert Storm, but I've been the benefactor of kind of the evolution of space operations at least in the U.S. Air Force since then. And so that's kind of what I want to spend a few minutes up front here talking about is why did we call that the first space war? What was going on there that made it different than maybe previous conflicts? And then talk a little bit about how we've progressed since then and why that might culminate in at least a U.S. Space Force being established in 2019.

So, I think it is accurate to say it was the first space war and there's probably a lot of different ways to characterize that. We certainly had satellite communications before 1991 and GPS was new and emerging. But what it did was it crystalized what we could do if we leveraged space capabilities differently in terms of conducting operations that was so powerful that it didn't go unnoticed. And I think that's the real theme that I'll kind of hit on here is we did so much, we did so well, that a lot of other countries around the world started to take notice.

But let me just take you back a little bit to 1991 and think about it if you're looking at it from a space operations perspective. You know, the ability of our U.S. commanders to keep track of a maneuvering Iraqi army through a sandstorm and then when the sandstorm cleared we started hitting it with precision munitions, this had a devastating effect on the army, both physically because we were hitting the army, but also mentally. They had no idea how we were able to track them through the weather through the night. And a lot of that, of course, was enabled by our space-based ISR capabilities and as well as, you know, the munitions that we employ with GPS precision.

And then on our side, our ability to maneuver in a featureless desert terrain in very tight coordination across a vast number of assets that the U.S. Army and Air Force and Navy brought to bear, again that's all made possible in terms of navigation by the GPS, in terms of our communication which relies on that GPS timing signal, in terms of the satellite communications that provides beyond the line of sight communications for forces. Again, it was something that certainly the Iraqi military had never faced before from an adversary and gave us a tremendous advantage.

Our ability, in fact, to just build up a massive force in Saudi Arabia and across Middle

Eastern locations was really about our ability to leverage reach-back capacity in terms of planning, in terms of flow. It's a real problem for a military if everybody shows up at the port on the same day. It gets cluttered, it gets -- it's a mess when you try to build that out into a force that's ready to fight. And so the timing and the sequencing, this was a precision operations and the ability to lean on that planning, that was all the naval by satellite communications primarily as we moved the force forward into the Middle East for Desert Storm.

And then finally, you'll recall a lot of angst I guess is the best way to describe it when it came to the Scud missiles and what kind of damage could be wreaked, what kind of havoc could be wreaked by those Scud missiles. However, during the war I'd say, you know, my recollection and there's probably others that either have similar or something close to this, is that largely that threat was mitigated, both by incredible work of our air defenders with the Patriot batteries, but, you know, enabled by missile warning that was coming from space-based capabilities.

And while we're not directly engaging the missiles with those space-based capabilities, the warning, the early warning that it provided when the launch occurred and the point-outs, the cueing, that says, hey, it's coming from this direction, gave our air defenders a critical advantage in a very tight timeline.

And so, again, I think that doesn't mean that there weren't some missiles that impacted and, of course, it still caused problems. But by and large what we thought was going to be a huge threat to our operations, turns out we were able to take mitigating efforts in some part at least due to the space capabilities that were provided.

So, I guess, you know, when I think back to why is it the first space war, it was our defense, it was our offense that was greatly enhanced by those space capabilities that we had in place. And I think what I want to switch to is a recognition that this was a very immature, kind of nascent space capability. In fact, we only had about half of the GPS constellation in operation when Desert Storm kicked off, which meant that the availability of that signal that we've all come to rely on in our cars and everywhere else was not as accurate and it wasn't as available 24 hours a day. So, there were times of the day where we had less satellites available and, therefore, less availability of that signal. And so we

had to plan for that and account for it.

Today, of course, you can't go anywhere on the planet without having access to a GPS signal 24 hours a day, 7 days a week. And again, that's something that the U.S. Space Force now does not just for the military, but really for anybody that needs to leverage that GPS navigation capability and the timing signal, of course, which is so important.

During Desert Storm, I understand about 50% of the communications networks that were in place to enable the war in the command and control came from satellite communications. And then what we really talk about when we say "satellite communications" is not how many satellites, but it's how much bandwidth is available. And that's bandwidth and channels and signals and transponders. There was a lot of ways to account for that. But in short, there was a limited amount of bandwidth that was available, so this was just basic messaging and phones that we were using to have that reach-back capability and over-the-horizon communications with the forces.

Today, I can tell you from firsthand experience, I just came back from a year deployed to the Middle East where I was the deputy for Air Force's Central Command, and there's always going to be capacity limitations. We're never going to have as much communications as we want, but the bandwidth challenges that I faced were very small relative to what we faced back in Desert Storm. And so we've made tremendous strides there.

And then let me just hit on the missile warning capabilities, too. During Desert Storm we were basically using sensors that were designed for what we call strategic missile warning, and that's the ability to see ICBMs that were primarily, you know, were threatened to us by the Soviet Union at the time. And ICBMs, you can imagine, are very hot when they launch and they stay burning for quite a long time relatively speaking. And so the sensors that we had in orbit were designed to see those characteristics. And so when we tried to use those capabilities and look at the threats that we were going to face in the Middle East, they were going to be much shorter-burning, less intense events. And we were concerned that maybe the strategic missile warning assets wouldn't be as good for the tactical warning that was going to be necessary. But some really sharp engineers were able to put together the algorithms and the data fusion so that it turns out we were able to provide sufficient warning.

But what I'll tell you is we've learned from that and we have dramatically improved those capabilities. And to some degree now it's an unblinking eye, that if there's a missile launched on the surface of the Earth, we know about it and we make sure that the people that need to know that that missile was launched are aware in time.

And so, you know, we've definitely grown in our capacity and learned from that first space war. And I know we'll get into that in a little bit, Frank, and talk about it in more detail, but we've grown so much, in fact, that our space capabilities really are shaping other forces.

We've kind of transitioned from a nice to have additive capability that enhances to really a critical dependency. If we can't rely on the space capabilities now, the force that we've built around that is not going to be as effective. And quite frankly, we've become so lean and dependent on it that I'm worried that if we don't have space capabilities, we're really not going to have the power projection necessary to accomplish our missions.

And so that's what, you know, I think our adversaries learned when they watched, is they watched us go from enhancement to dependency and reliance on these critical capabilities. And they know that if they can deny us those capabilities, that it might upset the table in terms of strategic advantage. And so certainly our strategic competitors, I'll just call them that, have invested heavily -- heavily -- in capabilities whose sole purpose is to deny us space-based capabilities. And that's really what the biggest concern is, I would say, over the last 10, 15 years.

The biggest change since Desert Storm is that the space domain is no longer a benign environment. It is not a sanctuary where we can provide capabilities to the forces on the surface of the Earth. We're going to have to fight for those capabilities. We're going to have to protect and defend them because we know we critically depend on those assets and we know that our adversaries want to take those away from us.

And that's what kind of brings me to the Space Force. You know, the Department of Defense organizes its service, and this will be a little bit of an oversimplification and generalization, but it organizes its force around domains. You know, you have the Air Force that's responsible for air superiority, you have the Navy responsible for maritime and sea control, and, of course, the Army in its

land-dominance roles. And now you have a Space Force that's focused every day on making sure that we can protect and defend and use the space domain the way we need to, both militarily, commercially, and civilly, to meet our national interests. And so that's what we've been dedicated to do, is build the kind of force that is attendant to those.

And let me just kind of conclude with a quick story. I was a little nervous about this event because, like I said, I didn't participate in Desert Storm and so, you know, what's my credibility? And I was talking to a mentor of mine and he suggested that I go down and talk to General Horner, Chuck Horner, who actually was, of course, most of know, the 9th Air Force commander and the lieutenant general responsible for the air campaign. He was the air component commander for Desert Storm.

And I said, well, that's great, but I don't have General Horner's phone number. And he said no problem, I've got it. And one thing leads to another and I find myself on a Sunday afternoon down in Florida having an adult beverage with General Horner and talking about Desert Storm. And it was a remarkable afternoon, one that I'll certainly remember forever. But here's the key takeaway.

You know, as I was sitting there I was thinking, you know, when he was a three star responsible for the air component, he was at the same point in his career that I now find myself in, a relatively new three star responsible for figuring out operations and wielding these components. And I started thinking how did General Horner feel in 1990, '91? You know, did he feel up to the task of leading and conducting airpower in pursuit of these objectives?

And then, you know, after about two or three hours of talking to him I realized, of course he was ready because he had spent 30 years preparing for that moment. You know, every exercise, every bit of training, all the advance training, thousands of hours in his weapons systems to figure out what they could and couldn't do; the red flags that had just been invented in the 1970s and training against those weapons systems so you could determine what the best tactics are to provide capabilities, and employing weapons to see what they could and couldn't do; and how to link up with tankers and work with coalition forces over time and how do you see to those and pick the right targets. Basically, he'd spent an entire career planning and preparing for that moment.

And that's when it dawned on me that that's now what the Space Force can provide. You

know, 30 years from now, there's going to be some young three star general who's going to be able to say I spent the last 30 years preparing for what -- bringing space power to bear when the country calls on it. And so it'd my job between now and then to give them that infrastructure, to give them the training requirements, to give them all of that. And I think that's what's most exciting about what we're doing at the Space Force is just that focused dedication, so when the nation needs us, we're going to be able to answer the call.

MR. ROSE: Great. Well, General Saltzman, thanks for that awesome overview. And I am so glad you brought up General Horner because in addition to being the air component commander during Desert Storm, he eventually, and correct me if I'm wrong, went on to be the commander of the United States Space Command in the 1990s.

So, that brings me to my first question. From your perspective, and you talked a little bit about this in your opening remarks, but from kind of your perspective, and I'd be interested in General Horner's perspective, what were the key lessons you take away from Desert Storm with regard to space?

And secondly, how over the last 30 years have we effectively integrated those lessons into our military space policies, doctrine, and force structures?

So, over to you, General.

GENERAL SALTZMAN: Yeah, there's a lot there, Frank. And so let me just hit the highlights that I think answer that broadly and then we can dive in as far as you want to.

But clearly, we learned that space is a force multiplier. I mean, that's a simple lesson that I think everybody can understand. You know, and we've worn out the analogy or the discussion about, you know, a thousand bombers in World War II to maybe put a few bombs inside a mile of a target, and now with one B2 you can hit multiple independent targets, etc. Those are great examples that are space-enabled and force multipliers.

The other thing that's a little more nuanced that I was starting to, again, glean from General Horner was decision superiority. And we don't think about it that way a lot, but our ability to see what's going on in the battlespace, pull it together, make sense of it, make decisions, and direct forces that are far flung across the theater at a tempo that the adversary cannot respond to, that's the art of war.

That's the science of war. And a lot of that is enabled by space. You're collecting the data, fusing it together, and then being able to direct forces that are widely distributed.

It's a powerful -- I said force multiplier, but that decision superiority, you're always one step ahead of the adversary. And we saw that in Desert Storm. The Iraqi army had just never seen anything like that and we were able to always be one step ahead of them.

And then I guess one of the most powerful lessons I learned from General Horner in talking to him was the idea that there's a new readiness standard. As soon as you say, hey, you have to fight and compete for control of the domain, with that comes a series of responsibilities to be ready for that contested domain. And now you train differently, you build different systems, you build joint exercises, large employment exercises. You manage data differently. You do C2 structures differently because the game has changed. And so that's a new readiness standard that you now have to apply and I saw that with the way General Horner talked about getting ready over the decade that preceded Desert Storm.

MR. ROSE: Great. Well, General, let me turn my next question on the head of the previous question. In your opening remarks, you made it clear that our potential adversaries, and I'll say Russia, China, but I'd also include North Korea and Iran in that mix because they're developing counter space systems, as well, what were their key lessons from Desert Storm? And how do you think they have done in learning those lessons?

From my perspective, I'll tell you, I think they've done a pretty good job. But I'd be interested in your thoughts.

GENERAL SALTZMAN: Yeah. Amen, Frank. I think there's two overarching lessons that I take away when I think about it through that lens. And the first is that the United States has one of the greatest fighting forces that's ever been put together. And if you face them head on in the battlefield, you lose. And I think we forget sometimes how powerful the Iraqi army was in 1990. And the idea that you face America and you lose in a symmetrical fight. And I think our adversaries saw that and realized they couldn't spend enough money to build a fighting force that could challenge us head on.

And so when you're faced with that dilemma, you look for asymmetric advantages. You

look for where you can spend a little less money, but start to dissolve the power of that fighting force. And I think it didn't take them long to figure out that space might be one of those areas where they could do it.

And so at the same time that they're looking to create capabilities to deny us that advantage in space, we're, of course, learning that the more you can enhance your forces with space, the smaller your forces can be and then that drives that reliance that I talked about. And so we're so inextricably linked through our space capabilities now that it's starting to be a strategic vulnerability. Now we have to figure out how it is that we can protect and defend those assets because they're so critical to us.

And so I think that's probably the big one. Don't fight America head on and find the ways, and in this case space as a way for them to try to balance the tables a little bit.

MR. ROSE: Great. Well, on that note, let's move on to some contemporary topics. General, as you know better than most, there's been a lot of debate over the past several years about whether the United States should establish a Space Force or should not establish a Space Force. However, I think that debate is over. The U.S. is going to have a Space Force.

But, you know, from my perspective, whether the Space Force is ultimately successful or not is an open question at this point. And, you know, from my perspective, I think the Space Force's ultimate success will depend on the answers to two questions.

First, will the establishment of the Space Force improve the integration of space across the joint force?

And secondly, will it improve deterrents and the resiliency of U.S. space architecture? Something which you've just touched upon.

So, as you guys stand up the Space Force and as the director of operations you're going to be key to this, how are you ensuring that we have good integration across the joint force, we're enhancing deterrents and we're enhancing resiliency? Over to you.

GENERAL SALTZMAN: Well, that's a great question, Frank, and let me just start by saying it's at the top of General Raymond, the chief of space operations, list is to integrate the force that

we've built over the first year, spend his second year really integrating that capability. And so you've asked precisely the question that we're focused on for our second year as an independent armed force.

And for me, I kind of sum it up in one simple phrase: There's going to service-level focus on the space domain. But for those that don't show up every day at the Pentagon and fight the traditional bureaucratic wars that go on there, service-level may not really resonate. And so let me just explain kind of what I mean by it when I say a "service-level focus."

You can imagine that if a service is responsible for more than one domain, it has to make routine trades, whether it's in resourcing or priority of personnel. Even policy sometimes has to -- we have to make these trades between one domain or another. And I think if you went back to the '40s, the Army would say, hey, we had to make trades between the Army forces and the Air Force forces. And I think, you know, since the establishment of the Air Force as an independent service and the rise of space capabilities in the Air Force, you had a service responsible for multiple domains and there were, you know, tradeoffs that had to be made.

But now you have a single service that's focused on that domain. And so the ability to focus resources, advocacy, prioritize where you want to put your limited manpower, what you want to focus on and not have it filtered is an important service-level responsibility. And it gives it an attention at the joint level that we may have not had beforehand.

We write our own doctrine. We build our own tactics, techniques, and procedures for how the systems work. We're building our own budget now and sending that budget to the secretary and advocating for what we feel like we need to contest the space domain and be effective.

Ranges, tests, advance training, all of these things now we think about them and we are focused on that. We develop our people. Like General Horner, 30 years he spent dedicated to airpower. We are building the infrastructure so that our guardians are going to spend their entire career focused on how best to take care of our assets in space and accomplish the missions that are assigned from that domain.

A couple of more things that maybe people don't always know. The chief of space operations is a full member of the Joint Chiefs of Staff. He is in the tank every day. I know because I'm

right with him as the operations deputy. And those tank-level discussions are not always about service things. It's not services fighting with each other. It's actually joint solutions, best military advice to the chairman of the Joint Chiefs on a broad range of topics.

What I can tell you now is that there is no topic that doesn't include a space perspective. Now, I wasn't in the tank beforehand, but my guess is without somebody thinking every day about space that there were probably topics that went through the tank and didn't get that level of attention. So, this is service-level attention and advocacy for the space domain. That's a powerful integrating force, I think.

Your question about resiliency and deterrence is really important, too. And so I think about initially, from a service-level perspective, what is it the Space Force is doing? And there's kind of two broad categories. And it's our concept of operations, how we do our jobs, and then, secondly, is the resourcing. You know, how do we prioritize the limited dollars that we had or the dollars that we have to accomplish a mission in a very resilient way? Because, like I said, we can't afford for it to go away.

And I think when you think about how we do our business, leveraging and working closely with industry and partners, our allies, because we know they can bring capabilities to bear to help us and be more resilient. Prioritizing funding so that we're not wasting resources in an area that might be less important than some of our prime considerations. How you spend your money and the way you design your force creates its own kind of resiliency. More capacity, more capability is its own kind of resiliency.

And if we're strong enough and if we're resilient enough, we're not a very good target for our adversaries. If they take a couple of systems out, there's more to backfill it or we have different ways of pursuing the same kinds of objectives. And if you can deny the benefits of an attack, it has a deterrent effect.

And so by being resilient, by being strong, by having allies and partners, those operational concepts, I think that creates a deterrent effect for an adversary going after us in space.

MR. ROSE: Great. And let me build on that point with regards to allies and partners. You know, traditionally, the U.S. security space enterprise didn't do allied cooperation particularly well. They get with the Five Eyes and they'd go in their SKIF, but other allies really weren't integrating.

However, that's been changing and a lot of that I attribute to the leadership of General Raymond. We've seen the combined Space Operations Center established at Vandenburg Air Force Base. We are increasingly including our allies into space wargames.

That said, you know, as you stand up the Space Force, what's your vision for better integrating our allies and partners into U.S. national security space operations?

GENERAL SALTZMAN: Yeah. You know, it's a great question and I think I'll just kind of lean on what I started with in the last question and that's that we recognize that we are far more powerful from protecting and defending and actually accomplishing space operations and space capabilities if we do it as an allied partner force. You know, there's just more to be brought to bear if you include your allies and partners. And so my experience has been that we recognize and have for a while that this is a team sport. And the players in that team sport are international players and that we are much stronger together than the sum of our components.

The Schriever Wargame I think is a great example where we have gone from what you rightly acknowledged is maybe a more confined group or maybe just broaden it to the Five Eyes, we have gone beyond that now. And we are expanding the participation in that wargame, which is really central to how we frame our force design and the way ahead, and we've broadened that out beyond the Five Eyes to much broader audiences.

We are actively working to build relationships where we exchange officers. We have a plan to engage over a dozen countries in terms of space and space capabilities. That includes everything from data-sharing agreements to literally personnel exchange. I had an opportunity to sit down with the air attaché from the United Kingdom that came and talked to me. And he's excited about taking some British officers and putting them on our space staff. And he said, you know, how could you use one of these officers and how many could you use? And I said every one you send me will have tremendous challenges and opportunities, I promise.

And I see that with our exchanges in Canada to the Canadian Space Operations Center. There's just a lot of different opportunities, like you mentioned NATO, and we're just growing and growing and growing because we know that that alliance, that partnership team is going to be much stronger and

help us be more resilient.

MR. ROSE: Yeah, that's great, General. Now, in addition to our allies, I think one of the biggest developments we've seen in the space arena over the last decade or two has been the tremendous growth of the commercial space sector. Indeed, space companies like SpaceX, Virgin Galactic, and Blue Origin are fundamentally reshaping how we think about outer space.

So, as the Space Force stands up, how do you plan to partner with these companies in the commercial space sector? Are there benefits to you by partnering with these groups?

GENERAL SALTZMAN: Absolutely. Yeah, I mean, in short, we're going to partner as tightly as we can because they are doing so much to expand our options. You mentioned some like SpaceX and Virgin Galactic, that launch, commercial launch, those ventures are paying huge dividends because they're dropping the price point of what it takes to put a pound on orbit. And the less it costs, the more options we have at our disposal.

You know, if you can launch hundreds of satellites in low Earth orbit that accomplish the same thing as one giant satellite at geo can do, it gives you options and, quite frankly, it gives you more resiliency. So, the ability for the commercial sector to make it more cost-effective for us to put options in space and share payloads, etc., it's vital to our interests because, like I said, it gives us so many different pathways to meet our mission and that's going to be incredibly important.

Let me tell you, you know, I'm just the dumb operator. Right? I'm the chief of operations and so I don't get too much into the acquisitions side of the business. However, what General Raymond has challenged me to do is to engage as the chief operator with industry, with the commercial sector, and make sure they understand what our challenges are. And so I try to get out there as much as I can and explain the conditions that I'm facing, where I'm short, what my opportunities are, what I see as the big hurdles that I have to overcome to do my job. And the more they understand about what those operational challenges are, the better they'll be able to kind of provide capability back to us that the acquires and the capabilities guys can go out and test and buy, etc.

And so we see this as like a cycle of life, you know. As I come up with what the operational challenges are, I discuss with the commercial sector and then they can provide capabilities

back that we buy. And then I get them and test them and train them, and the cycle continues.

And so it's going to be a very tight partnership because we know how important pushing the technological envelope is in space operations.

MR. ROSE: Great. Well, General, let's shift to another set of issues. Your boss, Chief of Space Operations General Raymond, has frequently described the outer space environment as "the wild, wild West," where there are very few rules of the road to ensure responsible behavior in the domain. And the general has been very vocal recently in calling out the Russians for some close maneuvers between Russian satellites near some U.S. satellites.

From the Space Force's perspective, what types of rules of the road would you like to see established in outer space to help maintain the safety, security, and stability of the space environment?

GENERAL SALTZMAN: Great question. And let's not jump too fast away from your question.

First, there needs to be international norms of responsible behavior. I mean, just saying that, that we say, listen, we're all now participating in this space domain. We're all operating in proximity of one another. What does it mean to operate safely so that everybody can take advantage of this and continue to do what they need to do in pursuit of their interests, but in a safe way?

And so once we agree that, yes, we do need these norms of behavior, now we can start talking about, okay, what are some of the norms of behavior? And it won't surprise you, these are things that we've been doing for hundreds and probably thousands of years in the maritime environment and certainly for, you know, decades and decades in the air environment. The closer we get to one another, the less safe it is. And so we need to start talking about how do we behave together in close interaction so that we don't accidentally or purposefully interfere with the operations of another satellite?

There are also things like debris mitigation. That's a problem. You know, debris is hard to track because it can be small and kind of escape our radars and our optics that are looking for them. And I know you understand this, Frank, but, you know, a very small object moving at five miles a second is a tremendous amount of energy that can cause problems. And so as we do our launch operations or as we do separations on orbit, we need to make sure we're using procedures and sound practices that

limit debris, so that we don't all have to deal with it.

And so those are just a couple, but, you know, we need to collectively start describing this and learn the lessons and be as responsible as we can using this tremendous asset in space.

MR. ROSE: Great. Well, let me ask you another question. And I was going back looking at your title. You are deputy chief of space operations for operations cyber and nuclear. That's quite a title, you know. But what that title tells me is this: You really can't think of space as separated from other strategic domains, like nuclear and cyber.

General, as I was mentioning to you before we began the program, I teach a course at Georgetown called "Outer Space Strategic Technologies and the Future of International Security." And my argument is, as we the United States think through these issues, we need to do it in a more wholistic manner. China is doing this with the establishment of their PLA Strategic Support Force, which brings together space, cyber, and electronic warfare.

So, I'd be interested in understanding how you view that relationship between nuclear, and the cyber domains, and what you think the United States can do to ensure better coordination across those domains.

GENERAL SALTZMAN: Well, I appreciate the question because this is an important maybe difference in the way we conduct operations than maybe some of the other services.

You noticed in my title that cyber is a part of operations. And, you know, as the chief operations officer, I think about the intelligence functions, the space operations functions, the cyber operations function as all one integrated whole; that I can't think about them separately because they are critically linked in accomplishment of the mission.

And so just to focus on cyber for a minute, satellites in space are useless unless you can connect with them via RF and via a network that then returns the data or allows you to command and control. So, we have to literally be connected to our hardware on orbit, our systems, via a network. And so our cyber operators are responsible for maintaining that network and then defending that network because it's so critical. Whether it's an antenna structure, whether it's the literal network on the ground that connects our servers, etc., it's just vital. It's inseparable from us conducting space operations.

The nuclear side of that title is really about deterrence, quite frankly. We are responsible for nuclear command and control and communications. A part of that NC3 structure includes our assets and SATCOM. And so we recognize that we are an important part of the U.S.'s deterrent posture and we take that very seriously. And that's why we have it integrated into my official responsibilities. But the ability to command and control forces for that nuclear mission and, don't forget, the ability to watch and have that unblinking eye looking for missile launches against the United States and that homeland defense mission, those are tremendous deterrents. Because if we see the launch, they know we're going to respond to the launch. So, therefore, it's best just to leave everything in the silos.

MR. ROSE: Great. Well, General, one of the issues that's been on the background of our entire discussion today has been China and how we manage the rise of China in outer space. I actually wrote a report on this about a year ago. And what I would say is during the Obama administration there was quite a bit of contact with China on space sustainability issues.

For example, at the time when I was at the State Department, I worked very closely with General Raymond, who at the time was commander of the 14th Air Force and the JSPOC, to establish a direct link between the JSPOC and the Chinese, so we could provide them conjunction notifications in a timely manner. It's not out of the goodness of our hearts, but to prevent a collision.

Going forward, do you see a role for some type of mil-to-mil engagement with China to try to find ways to reduce the risk of miscalculation in outer space?

GENERAL SALTZMAN: Yeah, another great question. You know, we've described this as kind of an era of great power competition. I like the way Secretary Mattis kind of laid that out for us. And I think the lesson there is, in competition what's important is that you have that continuous engagement. You're always on the playing field, if you will, and you're always trying to work with one another, so nothing gets too far out of scope.

And I agree with you, I think sharing data, I think that sharing information, sharing operations even sometimes, like here's what we're planning on doing, don't be spooked by it, this is just a test, all those discussions are value added. I don't know that it stops there, but it certainly should start there. And we should expand that discussion as long as possible.

I'm certainly not opposed to any mil-to-mil engagements because I think there's good value in us exchanging that kind of information. All the other services do it in all the other domains and I think it makes perfect sense to keep after it.

MR. ROSE: Great. You know, General, that reminds me of my experience with the Chinese. One of the things I always did when before I met with the Chinese on space-related issues at the State Department, I'd call the JSPOC up. And I would say could you provide me the number of close approaches between Chinese satellites and pieces of debris from China's 2007 ASAT test? And by the time I left government in early 2017, it was up to like 1,500 close approaches and it's probably even more now.

So, like I try to say to people, we don't do this out of the goodness of our heart. It's about maintaining the long-term sustainability for the space environment for all nations because debris does not discriminate.

Well, I've spoken enough. We've got about 15 minutes left, so why don't we go to some of the questions that we've received from the audience? And the first question is what role should the Space Force play in helping address the challenge of orbital debris?

GENERAL SALTZMAN: Well, that's just the topic we were talking about, great question. Right?

So, I think we should play a central role, primarily because we're experts at it. Like you said we've been watching and we pay close attention to it. We have operators devoted to it and it also harkens me back to our discussion on responsible behavior. I think we need to be a leader in both helping devise those rules and tenets of responsible behavior and then adhering to them, and debris is one of those things. I like the way you said that, it doesn't discriminate.

And debris-producing events, this is not like something on Earth that kind of falls back to the ground and is no longer a problem. When you create those debris events, they stay around for a long, long time. And we have to devote resources to making sure that we're tracking all those debris, to make sure that nothing surprises us.

And so, you know, I would say to answer the question it's about advocacy. It's about

negotiation. It's about working with partners to come up with what the right rules of the road are with regards to debris-generating events. And again, remember, some of this is accidental. It's not all about intentional. Launches create debris, but there's ways to mitigate that and have good solid procedures that I think we can get our arms around.

And then it's about training our folks and providing expertise, both to mitigate the effects of debris that is on orbit and then also to train and educate on how we can go about creating less debris on orbit and taking care of it.

MR. ROSE: Great. The next question deals with NATO. About a little bit more than a year ago, NATO declared space as an operational warfighting domain, which is a big change. Because, quite frankly, prior to that NATO never really spent much attention addressing space issues.

The question is, one, how do U.S. space capabilities benefit NATO? And how can the United States work more effectively with NATO on these space issues?

GENERAL SALTZMAN: You know, we've talked about this a little bit, so I'll go back to the power of partnerships, the power of alliances, the power of multiple nations coming together and saying this is what we should do as an international community in this domain. That in and of itself has a tremendous power; tremendous power and tremendous benefit. I've talked about force multipliers for NATO forces. What's good for one force is good for another because we use common standards, like GPS, that people understand.

The other one I like is indications and warning and the data-sharing and attribution that can be created from space capabilities. And the things that are concerning on the European continent to NATO are concerns across the entire Department of Defense. And so we have capabilities that can monitor, treaty monitoring, or providing data about activities in surrounding countries.

All of this knowledge enhances our situation awareness, though there are no surprises. Surprises create problems when forces come in close proximity to one another. The more you know, the more you can take that into account and be a little more conventional with your responses.

And so I just see the power of information that can be provided from space-based capabilities as being an important aspect to NATO operations.

MR. ROSE: Great. Well, on that point let's drill in a little bit more on kind of the operations side, the command and control side of the house.

The next question is as follows. How do you see the Space Force contributing to the implementation of Joint All-Domain Command and Control? I know this one is really in the weeds, but if there's anyone in the Space Force who can answer the question, it's you, General.

GENERAL SALTZMAN: Yeah. I love being in these weeds, Frank. This is my weed farm right here.

So, first, we are a member of the joint team. You know, the Space Force as a service is going to be in every joint fight from here on out. So, when you say "joint" and "all-domain", it universally, if I can use that metaphor, includes the Space Force.

And second is the basic tenets and construct associated with Joint All-Domain are the kinds of things that we're pursuing independently and as a part of that effort. Think about cloud-based data structures. Think about common standards and interfaces. Think about how we practice fighting in a joint all-domain, our exercises and our training events. We are going to command and control our Space Forces using the same models and methods for decision superiority that every service is using when they describe their Joint All-Domain Command and Control.

And as we practice this together and use common terminology and discover common operational problems, we will advance that concept as a joint team, not individually from service to service, but collectively as we move forward. And we're going to be partners tied at the hip on this because it's so important that space information, space capabilities, and space decision makers are wrapped up into the all-domain solutions.

MR. ROSE: All right. And let me ask you another question really on the technical side. And the question is, how can the U.S. better ensure the resiliency of both its space-based communications and the GPS signal?

The member of the audience said one of the lessons that the Iraqis took away from the Gulf War was GPS jammers. So, you know, what are we doing to make sure that our space-based communications and GPS can operate in these contested environments?

GENERAL SALTZMAN: The short answer is capacity. The longer answer, of course, is how do you effectively create capacity? The idea that we expand bandwidth, that we expand satellite opportunities, that we use commercial satellite communications as well as military satellite communications. We use allies. We use any partner that brings this capacity to bear. And the idea would be to stitch all this together in a seamless network where I don't know what cellphone tower my phone is connected to, likewise I don't know exactly what the pathways are through my satellite communications because there are so many and it's a self-healing network. And it's a resilient network that uses multiple elements to stitch together the COM hats. That to me is resiliency by definition. You know, if one path is down, the network seamlessly transitions you to another path and you don't even know it.

GPS is a little tougher, but not an unsolvable problem set. You know, the idea is that you've got to remember that GPS jamming occurs terrestrially or in the air, quite frankly. It's the receivers on the ground. It's not necessarily the satellites on orbit, it's the receivers on the ground trying to receive the signal that are interfered with. So, that just means about testing and developing and looking at different kinds of receivers to make sure that we can always have that signal available to the people that need it best; capacity, options, etc.

MR. ROSE: And, General, on that point I would note a number of our allies have PNT systems. For example, the European Union has Galileo with their publicly regulated system, or PRS, which is their security code. Our allies in the Asia Pacific, Japan has the QZSS system. So, you know, from my perspective, I think when I look at ways to improve the resiliency of U.S. military forces, it really lends me to this idea to the point you've been making: our allies are our asymmetric advantage. Whereas our adversaries see space as an asymmetric vulnerability, I see our allies as one of our, again, our asymmetric advantages in this competition with Russia and China.

So, General, we've got time for about one or two more questions. And I want to -- and I think this is a really good question because it really sums up both the history that we've talked about and kind of the path going forward.

And the question is this: to what extent is the success of Operation Desert Storm limiting

our imagination in terms of what we can do in the space domain today and in the future? That's an open-ended question. You can go wherever you want with it.

GENERAL SALTZMAN: You know, I deal in space terms, so I don't like limits. I like limitless. And so, honestly, I don't think it limits our imagination too much. You know, there's a longstanding military tradition that we're always ready to fight the last war. But you know what? Space Force as a service wasn't around in Desert Storm, and so we have this opportunity to kind of take a look at the past and see it for what it is, but not be too wed to the ways in which we were doing operations back then.

I think it's the best part of my job is that to some degree I have a blank sheet of paper. It's not completely true. You know, there's always a little bit of growth from coming out of the Air Force and Air Force Space Command at the time. But really, the sky is the limit in terms of what we can think about and how we can use imaginative, innovative terms and new concepts. And we're really pushing that. We're testing assumptions to make sure that we're not locked into old think, if you will, and not learning the right lessons -- or not learning the wrong lessons from the past.

So, you know, I'll tell you one thing that maybe was a lesson that we might have learned that was wrong in terms of Desert Storm. We had this tremendous advantage of being able to build up the force and then launch operations at a time and place of our choosing. I'm not sure we're going to have that in the future. And so I can't build a force structure and I can't build a resilient architecture that relies on a tremendous build-up time. Hey, you're going to go to war six months from now, get ready. That is not going to be a luxury I face. And so we've got to start building now and the resiliency and the operational capabilities have to be ready to defend themselves, to protect the capabilities that we provide back to the Earth right out of the gate.

And so, you know, if there is something we learned from the past about, hey, just flow the forces out and get ready and just build up, we want to get past that and not thing about it in those terms. But I'm real excited about the way we have embraced innovation, the way we've kind of tested assumptions that maybe locked up into a particular way of thinking. So, I don't see Desert Storm as limiting our imagination when it comes to space operations.

MR. ROSE: Great. Well, let's go to the last question and it's going to go back to where we began, and that's with General Horner. Thirty years from now, when you're retired and sitting on a beach in Florida or wherever, what do you want your legacy to be as the first deputy chief of space operations? What do you want people to be able to say about you and your tenure in this position? Because you are the first.

GENERAL SALTZMAN: I appreciate the question. It's a scary proposition. You know, I'm certainly humbled by the opportunity and so every day I think how is it that we're adding value? We've been given this tremendous responsibility to lay the foundations of this new service, so I focus as much as I can on key priorities and building an infrastructure that we can use over and over and over again for the years to come to build up a better capability.

So, I think about our guardians. I think about what kind of training do they need? What kind of education do they need? That's just this gift that keeps on giving. Because, quite frankly, I don't know what problems they're going to face 30 years from now. But I know that if I can build a training infrastructure and an educational system that continues to make our people the best and brightest space warriors on the planet, that they'll be ready for the challenges that they face 30 years from now.

And so prioritizing our efforts about giving those skills and the infrastructure to develop those skills as one of the top priorities on my list, that to me is operational readiness. The problem is I don't know what I'm getting ready for. And so I'm trying to be as broad as I can be, as innovative as I can to help with their critical thinking skills, to help with their technical understanding of the networks, of the satellite systems, of the domain itself, so that whatever problems are thrown at them, they're going to be ready to go.

And so I'm all about building those guardians, not necessarily the satellites. Those are going to fade away, but the people and the structures that develop our people, that's going to be lasting.

MR. ROSE: You know, General, I couldn't agree more. You know, having held senior positions in the U.S. Government throughout my career, the more senior I became, I learned that people are policy. And if you get the people right, the other pieces tend to fall into place.

And on that note, we are at the end of our time. General, I want to thank you for a great

discussion. We have, I think, addressed the history, the current status of space, but, more importantly, the future and the challenges we face. And I think you have outlined a really pragmatic way ahead, but it's also not going to be easy to make it happen. So, I wish you the best of luck as you, General Raymond, and your colleagues in the Space Force build up over the years to come.

So, on that note, let me thank the audience for joining us today. I hope you have a great weekend. Thanks so much and stay safe. Bye.

GENERAL SALTZMAN: Thanks, Frank.

MR. ROSE: Thank you, General.

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