

Future Force Design for Counterspace Campaigning

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Gen. Kevin P. Chilton, USAF (Ret.):

Thank you. Thank you everybody. Well, we're going to move on and build on the morning panel on Space Order of Battle this afternoon for our first panel. And we're going to talk about how the United States can deter adversary aggression and if need be deny our adversaries the use of the space domain. In my view, at least I haven't found a time in history where an adversary has been fully deterred by a purely defensive posture. There's never been a castle with high enough walls or thick enough walls that someone didn't figure out a way to attack it and remained undeterred in their objective to destroy the adversary. And in the same sense, a military needs to have the ability to hit back and hold an adversary's interests and capabilities at risk. I believe space is no different, and that's why I'm so pleased to feature such a great panel this afternoon to explore this topic today and I'll begin by introducing the panel.

So sitting next to me is our war fighter that's working for U.S. Space Command, Brigadier General Devin Pepper, the Deputy Commanding General for Operations and Vice Commander at Space Operations Command. And next I'm very pleased to welcome to the stage, Mr. Scott Forney, President of General Atomic Electromagnetic Systems. There's a great team in San Diego that does tremendous work supporting our Space Force with great capabilities, as well as our Air Force. So Scott welcome to the stage good to have you here. Next I'd like to introduce Lieutenant General, Shawn Bratton. General Bratton is the Deputy Chief of Space Operations, Strategy, Plans, Programs, and Requirements. Is there anything you don't do? That's quite a line up there General Bratton. Welcome, it's good to see you again. And certainly last but not least, I'd like to welcome our Mitchell Institute's Space Center of Excellence very own senior resident fellow, Mr. Charles Galbreath. Retired Colonel, Galbreath. Prior to joining Mitchell, Charles served as the Deputy Chief of Technology and Innovation for our Space Force.

Charles, good to have you on stage. General Bratton and General Pepper and Charles, I guess I want to direct this first question to you. Our adversaries' militaries rely more and more heavily on space. Back when I was on active duty we relied on space and our adversaries didn't. We still do and suddenly it would appear they rely as much as we do to conduct their terrestrial operations. Do you see counterspace campaigning serving to eliminate or at least severely degrade our adversaries' abilities to use space to enhance their terrestrial war fighting capabilities? General Bratton?

Lt. Gen. Shawn N. Bratton:

Thanks Devin, I'll go. Hey first off, thanks everybody for being here. The after lunch crowd, if you're sleepy we'll be sure and wake you up and thanks to AFA for holding the conference and bringing us all together. General Saltzman talks about competitive endurance, and counter space campaigning is one of the tenets of that. I think that involves a lot of activity that comes before conflict, right? So we talk about deterrence, we talk about competition and how does campaigning our investments and our activities contribute in those spaces. But certainly when you transition to conflict I think there is a responsibility to protect and defend, to have offensive capabilities and the Space Force is certainly interested in being able to protect what we have on orbit so we can provide the joint force what they need to compete and win in conflict. I think we talk about things like the objective force and the capabilities we need, that certainly involves the full range of kind of response options that we owe the joint commander as they think about that.

We have to deny the adversary the space advantage while we maintain advantage for ourselves. And so in the lane I'm in and where we work to do that requires budgets and so certainly things like continuing

resolution hurt us a lot. And so we're looking forward to getting a budget passed so we can deliver the capabilities that Devin needs to be able to operate in this space.

Gen. Kevin P. Chilton, USAF (Ret.):

Just push it out.

Brig. Gen. Devin R. Pepper:

Well General Chilton, thanks for having me sit on this panel. I know most folks thought it was going to be Lieutenant General Miller sitting on this panel. But he is on much needed leave right now, so he asked me to represent space operations.

Gen. Kevin P. Chilton, USAF (Ret.):

Good to have you.

Brig. Gen. Devin R. Pepper:

When I saw you were moderating, I had a flashback to my J-31 days in STRATCOM. I thought we were going to have a discussion on strategic deterrence, but this kind of lays into that discussion about deterrence and the fact that... And I think this past Super Bowl showed it, that you can't win a fight playing defense you have to go on the offense. So this is something that we need and I think as Shawn Bratton said, we need to be able to provide to the joint force because certainly we saw what Russia did to the run-up to Ukraine. The first thing the adversary is going to do, the PRC is going to do is try to take out our eyes and ears and our space layer. Because they have been watching us, so they know the asymmetric advantage that space gives us. So we have to be able to take the fight to them to hold their assets at risk, to hold their capabilities at risk. So this is why we... Certainly, classification doesn't help us, right?

But certainly we have to be able to defend our own assets but also punch back if we have to.

Gen. Kevin P. Chilton, USAF (Ret.):

Very good. Charles?

Col. Charles Galbreath, USSF (Ret.):

When we look at what China might be doing from a employing space to enable the closure of their kill chain or to enable an anti-accessory denial strategy, we need to be able to disrupt that. Because if we can't if they can hold us at arm's length they may be able to achieve a more near-term objective such as recapturing Taiwan. And if we have the ability to disrupt their kill chain, to disrupt their ATOD strategy. Maybe that causes them pause and they don't move down that path of achieving that near-term objective. So I think it's absolutely critical and if we ever do get into a fight past deterrence. The ability to protect our Soldiers, Sailors, Airmen, Marines, Guardians from an adversary space-enabled attack is absolutely essential. We're not talking about machines in space that don't have a mother, we're talking about human beings that we're protecting by denying the adversary use of that space capability.

Gen. Kevin P. Chilton, USAF (Ret.):

That's great, and you mentioned disrupt and how it could give an adversary pause. I recall early on years ago when I was still on active duty, we talked about well we could maybe jam as long as we had reversible effects. We were afraid of talking about the classic disrupt, degrade, deny and destroy mission

sets that exist in every other domain. Is what I'm hearing today is we're willing to execute all four of those approaches, disrupt, degrade, deny and if we have to destroy an adversary's capability to ensure we win the space fight and protect our terrestrial forces?

Lt. Gen. Shawn N. Bratton:

Yeah, I think we owe the joint commander all the options. We got to be respectful of the domain and the consequences of some activities in the domain, but at the same time we can't shy away from capabilities. We need to protect the joint force, and so I think we got to look at everything that's out there and deliver capabilities across all five of the Ds.

Gen. Kevin P. Chilton, USAF (Ret.):

Okay, thanks. Scott, let me turn to you. I mean these are all new capabilities that not many years ago we weren't even allowed to talk about, let alone alone field. I wonder if you could address some of the challenges that industry might face to effectively develop these and field these new designs.

Scott Forney:

Chilli, thanks for inviting us. This is really an important panel if you think about the five Ds and what industry has to do, as you look at new space today things have completely changed. General Thomas got into space initially in 1958, things were quite different then. We were worried about Polaris and how we're going to provide communication or whatever the predecessor was called for GPS. Today it's all quite different and instead of trying to build one of two of something, we're looking at proliferated whatever. I think it's false to call it proliferated LEO, I think there's proliferated GEO or MEO or XGEO. Whatever it's going to be we need to have those resources and as industry all those five Ds we have to be prepared to deliver what the customer wants. I counted before this panel that GA has 21 different space customers right now and everybody has a different role and I think it's our job to spend as much internal funding as we can so that when the mission requests which changes every year now, because of what our adversaries are doing.

That we're ready for that and we as a company are investing very handsomely. I think in the last five years, maybe four years we've invested 300 million for our size company. That's a lot of money, we've unfortunately had to take losses too on some of these fixed price contracts. So not everything has to be fixed price, I see Frank Cavalli in the audience. I know he's a proponent of fixed price and for the right reason we agree with that. But sometimes we've got to do something a little bit differently and so we're in a position. At least this industry, there's so many terrestrial-based airborne technologies that we can offer the war fighter in space that we've never been able to think about before and that's why we're excited.

Gen. Kevin P. Chilton, USAF (Ret.):

Right, the ability to maneuver without regret is General Shawn said, "We never thought about that and that's important." I would agree. You mentioned LEO, MEO and GEO are becoming proliferated. I get the sense we're kind of looking at the China issue right here but if you look a little longer range and it includes a China threat too. You expand that domain to Cis-Lunar and how you're going to maneuver there and how you're going to get to and from lunar orbit, how are you going to protect our equities at the Lagrange points, etc. This is going to require some new capabilities, I would suspect. Your thoughts?

Scott Forney:

Yeah, it is. And I'd like to go back to General Shaw's maneuver without regret. There are many ways to do that and at least for our company we're working on three different types of power and energy that allow us to do that. We have sort of a DeltaV system that uses an unconventional six degree-of-freedom propulsion, but we also have different nuclear options. I don't mean big nuclear reactors, I'm talking about radioisotope based thermovoltic systems or very, very small thermionics I think has a future that gives you that. I read every day about well, we can attach a propulsion system to a almost depleted satellite. That's a good answer I would agree, but in the future I think we've got to think more on that which goes to Cis-Lunar. I mean GA is under contract for Cis-Lunar applications. So we're spending a lot of time thinking about how do you do space situational awareness? How do you communicate? And today let's face it laser communication, doing it optically is the long-term best answer and I don't mean just for proliferated LEO, from ex-GEO, wherever you're going to be located.

And if you look at Lagrange 0.1 and two, wouldn't that be great if we had technology at both points so that we could really get a good view of what's going on? From a company standpoint we're on Draper's team to go on the backside of the moon with a NASA program in 2026. It would be great if we were able to get more technology to be able to see what's going on in the backside.

Gen. Kevin P. Chilton, USAF (Ret.):

General Bratton.

Lt. Gen. Shawn N. Bratton:

I think we owe, from the government side especially DoD and Space Force clarity on those futures kind of aspects and where we're looking. What do we think of still demo and S&T and what do we want to move into an objective force? And this is in this great power competition. The stand-up of Space Force Futures is really to get after this and work with Honorable Cavalli's team on hey, here's what we're thinking and here's where we need to partner with industry on. Things like space refueling and Cis-Lunar where we're still trying to tease out the military utility and to be able to develop those concepts and technologies to war gaming them and then team up with the SpOC team on the operational concepts and the DOTMLPF-P. We're transitioning something from an idea to part of the objective force that the Space Force needs to field to compete and win, that is exactly what the Space Force Futures is trying to get after.

But we got to communicate and we got to be really open with industry one to partner with them, but also to make it clear on these are capabilities we need and these are capabilities that still we're not sure about.

Gen. Kevin P. Chilton, USAF (Ret.):

So on top of better communications... I'm sorry, Charles. You had something you wanted to add? Please.

Col. Charles Galbreath, USSF (Ret.):

Just pile on a bit. So I'm very excited about Space Futures Command. I think having an organization focusing on those activities is really important, but I want to make sure that it doesn't always stay future. At some point those capabilities have to transition to operations and overcoming that transition period is classically difficult. So how can the Space Force work to overcome those valleys of death to ensure that there is not only technical maturity, but also operational pull for those capabilities so that we can actually deliver those and field them? When we do demonstrations like Oracle with AFRL soon, we need to be able to transition that to an operational capability as quickly as possible. And so making the right decisions about what capabilities we need, what for structure we need them to be in and then

demonstrating that technology and fielding it as rapidly as possible to overcome that valley of death is absolutely critical.

Gen. Kevin P. Chilton, USAF (Ret.):

So these are challenges that DoD presents to the industry as well, right? I mean the need to partner is certainly important. Let me throw another challenge out there that I continue to hear and that's over classification. Scott, do you want to comment on that? And then-

Scott Forney:

Sure.

Gen. Kevin P. Chilton, USAF (Ret.):

I mean, is it a problem or not?

Scott Forney:

No, no, it is not a problem.

Gen. Kevin P. Chilton, USAF (Ret.):

Okay.

Scott Forney:

There's SAP reform going on right now, so it'd be premature to talk about what that's going to result in. But frankly a lot of the things that we're doing today I do believe has to be in a caveat, it's really too critical to let that get out and I will give huge compliments to Space Force and all the support development organizations for the good communication that goes on from these different organizations. When you're in the club you get to hear the right things so you're working on the right things, if you're not in a club it's a very difficult place to be. But I would say that from my perspective, all of our customers do very well at making sure that we can communicate very well. But the downside is that you got to get the systems installed and ever since COVID, the pandemic it's been really quite slow at getting the necessary communication and network systems in. It's been quite slow to get the certifications on SCIFs or SAP facilities and that we need some help on.

If there's anything we could do to do better and then I have a recent example where we do need a different way to contract. If you're in a lull that you're going to be supporting the war fighter three months later. We want to carry people through if they have billets, like SCI billets. I had an example that a customer assured me that we would not gap on a program, our contract expired on December 31st we're waiting for the new contract. 22 people lost their billets, which doesn't seem like a big number but it is a big number based on what we're trying to accomplish. So it would be great if we could find out the equivalent of a CRADA, whatever it takes to make sure that we can gap even if it's a no-cost contract. That I would ask for help from the US government on.

Gen. Kevin P. Chilton, USAF (Ret.):

Yeah. Sometimes we forget those people have to be laid off because there's no revenue coming in for them. Yeah. But you brought up being in the club and General Pepper, I'm going to switch to deterrence here too but a little bit on innovation. If you're a small innovative company and you're not in the club how do you get your ideas bubbled up if you don't have the clearances? I mean this, I would assume has

got to be a challenge for you all as you try to bring in innovation across not just the major companies like General Atomic, Lockheed's, Boeing and stuff. But some of these other smaller companies that have something important they want to bring to play but they don't know how it fits.

Brig. Gen. Devin R. Pepper:

So space has been overclassified for years and again I want to applaud what Dr. Plumb and the OSD staff just recently produced as far as being able to de-sap a lot of our space capability. Bringing it at an SCI level, that's a work that's going to take place over the next couple of years. There may be some things in acquisitions that we still need to maintain in SAP channels. But from an operator's perspective the lower the classification level the better I can integrate into a fight. We talked about that at the classified session yesterday. You don't want to be that person going to a combatant commander at the 11th hour with a briefcase and going, "Hey sir or ma'am, I got something that's going to help you with your fight." We have got to integrate these capabilities early on into the campaign and certainly de-sapping, a lot of the ops capability is going to allow us to do that. For example, we did that with our space EW capability. When DEFSEC [inaudible 00:18:18] declassified or de-sapped space EW, that allowed us to integrate it into the five more rapidly and we can see they're deployed supporting co-comms all over the globe right now. So certainly we've got some work to do but I think the path that we're on with OSD, de-sapping a lot of the operational capability will help us integrate into the joint force a lot faster.

Gen. Kevin P. Chilton, USAF (Ret.):

So it seemed to me it's essential to deterrence too. If everybody's so classified the adversary doesn't know what you have how can they be deterred?

Brig. Gen. Devin R. Pepper:

How can they be deterred? Exactly.

Gen. Kevin P. Chilton, USAF (Ret.):

Right.

Brig. Gen. Devin R. Pepper:

Deterrence is if you have a big gun, I have to be able to tell you I got a big gun and by the way it's pointing at your cranium right now in order to deter you. So if you can't say that, then how can you deter an adversary?

Gen. Kevin P. Chilton, USAF (Ret.):

It's a classic ending to Dr. Strange, love the movie. Right?

Brig. Gen. Devin R. Pepper:

That's right.

Gen. Kevin P. Chilton, USAF (Ret.):

There's a classic reminder there. Let's move on to not only protecting our DoD assets in space, but commercial assets. So for a long time we've had the civilian reserve air fleet, which is contracts between the Air Force and United Airlines, Delta Air Lines, different commercial airlines. Kind of holds them on retainer and then if we need to move people overseas in time of conflict or for deployment. We don't

put them on C-17s, we put them on those airplanes. So there's a relationship between the civilian airline industry and air mobility command. Same thing I would assume would be something we're interested in doing in space, there's tremendous commercial capability that's in existence today and it's growing and I've heard that we were talking about... We joked about this earlier, we didn't want to call it... It's called CRAF for the air group, so we didn't call it CRAS for space. It just wasn't going to float, so it's called the Commercial Augmentation Space Reserve. Now the CRAF, the airliners we can keep them out of the threat environment.

But our commercial space partners that we're going to contract with and use, they're going to be in harm's way the minute the balloon goes up. How are we thinking about defending them?

Brig. Gen. Devin R. Pepper:

I'll jump in first. So I think it goes back to what General Burt said on the last panel. We will look to leverage commercial and again Space Force, we have a commercial strategy that's going to be produced along with OSD. But certainly when it comes to being able to reconstitute many of our constellations we're going to be looking for the civilian companies to do that and then as General Burt mentioned, they may become a defended asset. So certainly they may become the most important satellite that we're using at that moment. So how do we get them into the critical asset list and then onto a defended asset list to be defended. But certainly we're going to be looking for commercial to augment us in times of conflict and crisis as we've seen some of the commercial vendors being used and leveraged in Ukraine right now.

Lt. Gen. Shawn N. Bratton:

Yeah, I think that there's a great contribution there. It goes right back to the deterrence discussion the capacity that commercial brings, especially just today in communications, in earth observation. Really increases the resiliency and our ability to deliver that to the joint force. So it becomes almost a deterrent effect of how would an adversary try and shut that down when there's so much there? And attacking civilian targets is a very different thing than attacking a military target. So I think all these things work in our advantage thinking through, and this really is in Devin and SpOC and U.S. Space Command's lane of how do we defend those capabilities to ensure that we can deliver to the joint force what we need? How do we think about risk to mission, risk to force when you include not only commercial but also allied capabilities? I think that the pros at U.S. Space Command, at SpOC are thinking about that every day. I think on the force design side, how we think about our commercial strategy which we have a really good document I think that will come out here soon.

But we're nesting that underneath the OSD-level document and so the synchronization of this not just as a space capability, but across the broader department is where we're at on how does all this contribute back to enduring competition and competitive endurance.

Gen. Kevin P. Chilton, USAF (Ret.):

Right. Well, I mean to develop these capabilities that we need we certainly need this partnership we've talked about between DoD and industry. One of the challenges or reasons we hear all the time is it takes 10 years, 15 years to develop a system. Whether it's an aircraft or a space capability because of changing requirements, evolving requirements and of course the longer the program lasts the more requirements change. So it becomes a self-licking ice cream cone sometimes. But there's this talk now that we don't need 100%, 85% is going to be good enough. But also the risk is assumed by the operator when you don't deliver 100% of the requirement. So it seems to me there's got to be a close relationship discussion between when you're going to give up on a requirement to make sure you get a capability on

time, it may not be 100% and how you're going to accept and analyze that risk. Can you talk a little bit about Scott, are those discussions happening in your company with the customer?

To say, we can give you 100% in this amount of time or 85% here and are you willing to take this risk?

Scott Forney:

It's a great question and candidly it is going on right now. There's great examples actually where this is happening, if you look at what Derek Tournear's done with the Space Development Agency. He puts out a spec, you bid it, he makes down selects very quickly and you're on contract and that's what the contract is. So I had a recent example that we bid in a contract in September to a prime, the prime was already down selected and we expect our contract in the next week and I don't expect those requirements to change. And if they did, I think we'll work very well with the Space Development Agency in the prime on those things. In addition to that, I think an 85% solution has to be understood because if we don't have speed to the war fighter it's already changed. If we wait in 15 years or 10 years, that's just too long and so a lot of that is also helped by industry spending some of their IRAD wisely on making sure that we have the latest technology to offer. So yeah, it's a give and take.

Gen. Kevin P. Chilton, USAF (Ret.):

Yeah. So you got to hold requirements fixed as best you can, but if you can't meet them you got to be able to have this dialogue with the customer about you want to wait another five years or do you want us to get it out at 85%? Are those dialogues happening and that are those relationships being formalized between the government and the developers?

Brig. Gen. Devin R. Pepper:

So I'll look to General Bratton to really answer this, but I would say any capability the faster we go the better for the operator. I think if you listen to General Miller and what he's saying now, any capability that's being delivered has to be delivered by December 25 in order us to be able to train exercise with that capability to be ready for a potential fight with the PRC at 27. So the faster industry can go the better. Again, if it meets 85% of my requirements I'm okay with that because again I have to be able to train operators on it and exercise with that capability.

Gen. Kevin P. Chilton, USAF (Ret.):

General Bratton, you're in the requirements-

Lt. Gen. Shawn N. Bratton:

Yeah. I think Honorable Calvelli is sitting right there and he would knock it out of the park with this. The transparency to industry is key here and I think from the five-eight, from plans and requirements seat understanding what capabilities we need to deliver, that the Space Force needs to deliver. Where we're at in the programming and fielding of those, what are our priorities in funding and then what things we're still interested in but maybe haven't crossed that line into the objective force. I think that's one thing certainly we can do. I think that the tenets that Honorable Calvelli published really getting after consistent practices within the DoD side and so industry is not guessing and we don't want that at all. We have to be side-by-side in this and we have to have sort of a mutually beneficial relationship, not adversarial in any way and I don't think it is that and I think we've made tremendous strides. We beat ourselves up a lot, but then again on how slow we are and how long things take.

But we've completely changed things in the past five years, which is tremendously fast for the Department of Defense. And so in some ways as we struggle with the valley of death in those things, we're also making tremendous strides in this area in acquisition reform really led by SQ and the acquisition community in SDA, and SUPARCO and SSC. So I'm filled with hope in this area.

Gen. Kevin P. Chilton, USAF (Ret.):

Great, thanks. I want to talk a little bit about norms of behavior. This is something that I think the US has been trying to push for a long time. This administration has pushed forward at least one norm into the UN resolution that would ban destructive direct ascent ASAT testing. But notably, neither China or Russia would sign this. It doesn't surprise me because of their irresponsible behavior in creating debris in the last decade and their continuing pursuit of those capabilities. How can the United States promote responsible norms of behavior in space without losing the tactical edge to adversaries? Charles?

Col. Charles Galbreath, USSF (Ret.):

So I'll jump on that one. Even in normal warfare, whatever normal warfare is right? We have certain types of weapons that we say we're not going to use those chemical, biological, we've established those norms that we're not going to use those. That doesn't mean we can't effectively conduct military operations, it just means we do it in a different manner. The same way we don't want to have indiscriminate damage to civilian territories, right? We want to have precision strikes. So I think in a similar way we're going to develop capabilities in space where we have very discrete effects on the adversary asset or capability that we intend to and we can promote the norms of not following those other potential more harmful paths. Now, as we've talked before maybe we don't want to limit ourselves and self constrain and self deter. But I think there is a way that we can achieve the effects that we are trying to achieve without going down those paths.

Gen. Kevin P. Chilton, USAF (Ret.):

There's some simple things we could have as norms of behavior like how close can I maneuver my satellite next to yours in a peaceful manner? And we have these norms at sea on how ships cross or how ships behave vis-a-vis one another in peace time. So I think it's a worthy cause and back to the deterrence calculus, it can help prevent miscalculation and someone thinking that you're doing something aggressive and then striking you when in fact you were just observing for example.

Lt. Gen. Shawn N. Bratton:

Yeah. No, I think that's Tim Schaber there through the lights maybe. He is the operational test authority for the Space Force and delivering new capabilities. And so a lot of this really comes down to how do we work through developmental test, operational test of systems to ensure the capability is ready when Devin gets it on the warfighter side. And I think technology, the modeling and sim that we have now where we're going with model-based systems engineering. That adds a lot in our confidence in systems that maybe previously we would've needed to actually do a complete fly-out in the testing agency. So it's a tough dilemma for the STARCOM team for sure, but I think they're really working through it mainly through modeling and sim of those kind of capabilities.

Gen. Kevin P. Chilton, USAF (Ret.):

I mean, we can field a capability and sustain a capability without testing. In our country we did an F-15 ASAT test in the '80s, we did Burnt Frost in this century. We know how to do this, but we don't need to be doing it in testing and that's I think the point of this effort. We have an effective nuclear triad today

and we don't do nuclear testing and I think that's a great point. But continuing on how the different ways of holding adversary satellites at risk, there's non-kinetic ways to do this as well and General Pepper and Charles maybe you could talk a little bit about other vulnerabilities we would want to go after to deny them the ability to support their terrestrial forces or attack our space capabilities.

Brig. Gen. Devin R. Pepper:

Again, I'll talk a little bit about my time as a DJ5 at U.S. Space Command and one of the things we did at U.S. Space Command and again when we presented our O plan to SecDef. In fact, even when we presented it to OSDP one of the compliments we got on that O plan was the fact that it was the most integrated O plan of any of the other... And again, I'm not knocking any the other co-comms. But again, we can't do what we do without... And we heard general Saltzman say today without our cyber. So certainly there's a partnership between us and U.S. Cyber Command, there's a partnership between us and SOF Special Ops Command. So certainly there are ways in which we can deny our potential adversary with using their space capability and other ways besides destructive means there's non-kinetic, there's cyber, there's directed energy. So certainly there is a whole host of tools we can use, or even from a terrestrial perspective right?

Certainly the PRC operates a lot of SOCI sites in Latin America and around the globe and certainly we have an ability to get after some of those sites from a special ops perspective. So again, there's other ways in which we can prevent the PRC from using their capability against us that doesn't lead to destructive on-orbit capability.

Gen. Kevin P. Chilton, USAF (Ret.):

Right, alternative approaches. Charles.

Col. Charles Galbreath, USSF (Ret.):

I love the idea of having a lot of tools in our toolbox as long as we can afford to have all of the tools that we need to develop and certainly there's a right tool for a right job, and the preference would of course be to do a non-destructive non-debris generating activity. But I do have to wonder on these more exquisite capabilities, I would suggest that the intelligence that's required to know exactly how to achieve that effect beforehand and the assuredness and the intelligence you need for battle damage assessment after to make sure that you actually had the effect that you intended requires a little more effort and it may be worth that effort. But I think that's a limitation or a facet of these non-destructive means, these non-kinetic means that we need to make sure that we factor into our calculus and the overall architecture that we have to create in order to make these weapons effective.

Gen. Kevin P. Chilton, USAF (Ret.):

Thanks. I'm going to ask a tough question now. Well maybe it's not tough, I hope not. So I was at STRATCOM, we paid attention to nuclear weapons and effects and I'm reminded in 1962, in the early days of nuclear deterrence. We did a test called Starfish where we shot and launched a single nuclear warhead into low earth orbit and detonated it. Now there weren't a lot of satellites up in those days, Telstar had just gone up. But those that were up there within short order and they weren't near the blast died and they all went away, stopped operating because of the electron pulse that went into the Van Allen belt destroyed their electronics. Are we thinking about that kind of threat today when we're putting so many of our eggs in the LEO basket? And as we go forward as part of a resilience strategy are we considering the risk of a North Korea who may not have very sophisticated capability, but certainly has a rocket that goes straight up and a nuclear warhead?

Are we thinking about how we harden our new LEO constellations about this threat that still exists today?

Lt. Gen. Shawn N. Bratton:

Yeah. I'd say we are certainly thinking about resiliency and how to ensure that we can continue to deliver the space capabilities across the spectrum of conflict. And so having all your eggs in one basket is absolutely not what we want to do from a resiliency lens of... And I think SWAC gets after that pretty well in some of their force design, their capability design work as they think about threats to the systems and how to mitigate that. So I think this is where the power of both the government and industry, but also our allied capabilities and how do you look at the full suite of what's available to the joint force against those threats that you're mentioning and this particularly devastating threat. If that were to happen how do we continue to deliver the space capabilities the joint force needs? Protect ourselves on orbit? And that is the mission of the Space Force to do that. And so there's the hardware piece of that, there's the non-material solution, there's the Guardians out there working the tactics of how to overcome those challenges.

And I think we do think about each and every one of those sort of through that lens.

Gen. Kevin P. Chilton, USAF (Ret.):

Okay, thank you.

Brig. Gen. Devin R. Pepper:

So again, what General Bratton said. So we do have Guardians who are developing TTPs for a high altitude nuclear detonation. I mean, that's one of the threats that we have to be able to defend against and be able to fight through. But when it comes to the actual satellite itself, that's where we look for our force design to be able to give us an answer. Right? To be able to ensure we have the right proliferate LEO architecture, proliferate MEO architectures. To make sure that we still have nuclear hardened capability on orbit to be able to fight that mission assurance to national command authorities and also to STRATCOM. So that is still one of the threats that we actively develop TTPs against, but certainly we're looking for our future architecture to be able to-

Gen. Kevin P. Chilton, USAF (Ret.):

So hardware solutions as well hardening some of the electronics?

Brig. Gen. Devin R. Pepper:

Yes, sir.

Gen. Kevin P. Chilton, USAF (Ret.):

Great, thanks. Hey, there's a classic push-pull of technology that goes on and oftentimes industries waiting for a pull signal from the Department of Defense like, "We need this. Okay, we'll do it." But there's also a push side where innovation occurs out in industry Scott. Are there any things that come to mind that are ideas that are percolating out at GA, where thinking the Space force might really benefit from these technologies? Maybe not in the timeframe we're talking about 2027, but down the road?

Scott Forney:

It's a fair question and industry has to have something in the barn ready to go and we need to get paid to put something in the barn. But to the point before we have a fortunate test capability, we have two irradiation facilities that we can use to go test our own hardening which obviously is a big concern and the requirements are not always specified for the worst-case scenario. So you have to think ahead of what those requirements are. Because of our long history of being very transformational, we spent a lot of time thinking about what is the next thing that the customer needs? What will a laser do? Just communicate or is there a better use on that? So we're trying to take a strong advantage of making sure that our engineers and scientists are working on the next generation and then we freely talk about them. It's not about proprietary anymore it's about what does the warfighter need.

Because if joint forces doesn't have knowledge we're not going to go down that path and so we spend hundreds of millions of dollars trying to make sure that we're thinking about five years to 10 years from now. If we were to be fair of ourselves, we're probably looking out 50 years in some case on what is the technology and what is the manufacturing capability needed to go fast. Because let's face it with additive manufacturer going to be all kinds of new opportunities.

Gen. Kevin P. Chilton, USAF (Ret.):

Thank you. Dual use capabilities it would seem propose or present a challenge to offensive operations in space. So an adversary field is a satellite that says it's just for disposing to graveyard orbits a dead satellite. But because it can grapple and maneuver a satellite can also be used as an offensive weapon. How are you all thinking about this to discriminate or decide what you're going to hold at risk?

Brig. Gen. Devin R. Pepper:

And I know we have my Dell-A team commander out in the audience here, but really that's come from an SDA perspective. All the investments that we've put into our intelligence community to be able to discern what exactly and characterize that on orbit asset. Right? To determine its purpose and that's what our folks at INSC do and Dell-A team. They provide that characterization for potential orbit threats or if it's being used in a benign way. But certainly we've seen a PRC as we heard General Gagnon mention earlier today, they're using a lot of their dual use capabilities. So we have to be able to characterize that, and that's something our intelligence professionals at INSC do for us every day.

Gen. Kevin P. Chilton, USAF (Ret.):

Right.

Lt. Gen. Shawn N. Bratton:

No, I think Devin nailed it. I think understanding what's going on in the domain, land, air, sea, they all deal with this same sort of dilemma on dual use and we just need to think it through in the space domain. How do we respond? How do we ensure we can continue to deliver capabilities, deny that advantage to the adversary, however they're attaining it? We got smart folks who know how to do this, they live in SpOC and out in the deltas and the squadrons and they're killing it every day. So I think we know how to deal with these problems, we just need to identify them and awareness is the key.

Gen. Kevin P. Chilton, USAF (Ret.):

Great. Thank you. Well we started this panel talking about deterrence, the need to go beyond just defense but to include offense. I think we've touched on some important areas in that regard and how industry can help and what the requirements are and how quickly we can field these things to make a difference to actually deter China from doing something rash in the Western Pacific that would be

against our national interests. So I want to thank you all for this wonderful panel and great discussion. How about a round applause for our panel members?

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