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Lt. Col. Tim Ryan (Ret.):

Good afternoon, ladies and gentlemen. I'm Tim Ryan, the senior resident fellow for Space Power Studies at the Mitchell Institute Space Power Advantage Center of Excellence. And I'd like to welcome you to our panel today on the reality of space as a war fighting domain. Let me introduce our panelists to set the session. Today, I'd like to welcome Major General Doug Schiess, Dr. Derek Tournear, Mr. Rob Arkin, and Dr. Brad Tousley. General Schiess is the commander of Combined Forces Space Component Command, United States Space Command. He's responsible for planning, integrating, conducting and assessing global space operations to deliver combat relevant space capabilities. I would also be remiss if I didn't acknowledge the newest member of the AFA Thriving Forces and Family Committee member, Ms. Debbie Schiess. Congratulations and welcome to the team.

Dr. Tournear is the director of the Space Development Agency. He tasked to unify and integrate space capability development and deployment across the department to achieve the DOD space vision, while reducing overlap and inefficiency. Mr. Arkin is the vice president for Special Space Systems with GA-EMS Tiger Innovations. Prior to this, he was the president and CEO of Tiger Innovations Incorporated, which specialized in developing spacecraft and space related systems for a broad range of US government customers, and particularly, small, lightweight and low power innovative solutions. Dr. Tousley is the vice President for strategy and technology with Raytheon Intelligence & Space. Prior to this, he worked in various senior positions across the aerospace industry. He spent 13 years working for DARPA as the director, program manager and senior scientist in the tactical technology office. Welcome to you all.

Before we dive in, I have a couple few announcements on some upcoming Space Power events for those of you in the Space Power Nation. I'm really proud to announce that the Mitchell Institute will be sponsoring the first annual Space Power Security Forum on 25 October at the Army Navy Country Club. Now, what's so unique about this particular forum is the fact that it's happening in the DC AOR. This is the place where both strategy and resources are shaped, and we're going to provide that voice to be able to influence those. We'll have national security space leaders address Space Power strategy, operational concepts, policy and budget priorities to better understand the important vectors in this crucial war fighting domain. There's flyers that were left out on your seats. If you need additional flyers, there's some at our booth that's outside the escalator. Please feel free to frequent the Mitchell Institute's website. We've got plenty of information there as well and we hope to see you there.

Additionally, I'm really excited about the upcoming release of our latest paper on the critical role of space and command and control. CSO has clearly stated our ability to sense from space domain, transport that, make sense of that data and get that data in the hands of our joint war fighting partners, be it on land, sea or wherever, is what the Space Force delivers to JADC2. This paper takes that, will explore those critical attributes that are going to be needed for not only the transport, but the sensing piece from space, as well as how are we going to be able to defend that. So that's going to be a rollout that you'll see in the next couple weeks. And I'm really excited to be able to get feedback on that as it rolls.

So let's turn to the panel and why we're here. Earlier this week, we listened to Secretary Kendall. In the morning, he said that it's still all about China, China, China. The stark reality is China has carefully studied the core strategies, the operational concepts and technologies favored by the United States for over three decades. And this has drove their modernization efforts. To that point, make no doubt about it that our guardians today are continually challenged in the space domain. An example of this, last October, China launched a satellite named the SJ-21 into GEO. They moved that satellite into close proximity of other objects. Now here's the thing about the SJ-21, it's got a robotic arm on it and it will

certainly continue to practice Rendezvous Proximity Operations. So why should we be concerned about this? Well, as the former assistant commander, Major General Burt liked to say in many of these forums, she would say, "Who likes the show Space Force?" Hands would go up and she would say, "Well, in season one they had a satellite with a robotic arm and it severed the solar panels off of a satellite rendering it completely useless." That's why we need to be concerned about this.

We must continue to develop and field the weapons and capabilities needed to be able to maintain our advantage and space that we have today. So with that, I'd like to extend the opportunity for each of the panelists to provide some short opening comments. And we'll start with you, General Schiess.

Maj. Gen. Doug Schiess:

Hey, Tim. Thanks. First of all, thanks for inviting me to be a part of this panel. And then I just want to say thanks to the Air and Space Forces Association for putting on an incredible professional development conference this week. And thanks for what you do for our airmen, our guardians, and our families each and every day. And it's an honor for me to be able to participate in this forum. I think everybody in here probably knows how important space is to our national security. And I'd say probably a majority of the people in here also know how space is important to our way of life. I'm not sure that the average American knows how important space is to our way of life, but I know that the farmers in the bread belt know that they use space to be able to seed their farms, water their farms, do the things that they need to do to be able to feed all of us. And I like to eat, so that's good that they're doing that.

Obviously, our financial markets need our navigation and timing to be able to do the things that they need to do. And then I think probably everyone here, especially if you're like me and you traveled, you probably used a navigation app to get here. We were talking about the traffic on Monday, to be able to do that, and maybe even used an app that told you how to get around that. But that was brought to you by the Space Force and the Global Positioning System. And so obviously, space is important. And I have the privilege along with Chief Coffin of leading the women and men of the Combined Force Space Component Command, who every day come to work, thousands of people across the globe, to ensure that we can provide a safe and secure environment in the space domain. And that maybe as we work together with our allies and our commercial partners, that we can deter aggression, so that we can continue to keep space, the peaceful domain it needs to be, but also do the things that we need to do. Because our joint war fighters, they have become reliant on that combat war fighting effects that we bring to them. And we have to make sure that we can continue to do that on a daily basis. And just thanks again for allowing me to be a part of this. Thanks to my colleagues as well.

Lt. Col. Tim Ryan (Ret.):

Great. Thanks. Dr. Tournear.

Dr. Derek M. Tournear:

Well, that was a great overview of how we all use space. I really enjoyed that. Think about that. So at the Space Development Agency, that's kind of what we focus on from the start. We focus on the terrestrial war fighter. We talk a lot about space. Obviously it's in our name. But realistically, everything we do at SDA, Space Development Agency, focuses on speed, delivery and agility. And why do we do that? We don't do that just for space. Everybody uses space and space and loves it, but you really have to focus on why. And you did a great job of setting that out. And so from SDA's inception, we focused on saying that we want to make sure that we can give the capabilities to the terrestrial, airborne, and maritime war fighter so that they can rely on that.

So if you think about what do we really need to provide them? What are we saying we're going to provide? Two main capabilities. Number one, beyond line of site targeting for mobile targets. Think mobile missile launchers, think ships, detect them, track them, calculate a fire control solution and send it down directly to the war fighter so they can use that in their solution. And then capability number two is to do that exact same mission, there's no difference except the targets. Now, instead of looking for mobile missiles and ships, I want to actually do that same mission for advanced missiles in flight. We've heard a lot about hypersonic glide vehicles, detect them, track them, calculate a fire control solution, send it down to an interceptor to take out that thread immediately. And the purpose for that is exactly as the general said, it's to deter aggression. So once you can demonstrate that we have these capabilities, that's the whole goal. That will prevent war because everyone will see that and see how rapidly we can employ those capabilities and know that if they choose to actually engage in the United States, then we will be able to defeat them. And so that's where deterrence comes in.

So at SDA, we were established just shortly before the Space Force, so we're pretty excited to be where we are. We had some experimental demonstrations that we flew in 2021, six satellites. We did that all within a year of our first funding. And now by the end of this year, we'll fly our first tranche. We do everything with spiral development. We focused on proliferation, hundreds of satellites and spiral development, get new capabilities up there every two years. So our first tranche of satellites will begin launching later this year. And then that will be 28 satellites to show that we can actually do this missile warning and global network of communication satellites so that the war fighters can actually start to use that to develop their techniques. Because just around the corner in 2024, we'll launch another about 150 satellites to be able to actually do the mission and perform the mission, to be able to give us that global capability for those two capabilities, beyond line of site targeting and advanced missile detection that I laid out.

We're pretty excited to do this. It's a great time to be part of SDA and to be pushing this forward. And we're looking at moving into the space force here in the next couple of weeks, which I was apprehensive, to be honest. I was apprehensive about that at first. Because right now we're outside of the Space Force, independent, which is where we needed to be so that we could do this disruption. But now the Space Force is embracing this model of proliferation and spiral development. And so once we move into the Space Force, we'll be able to make that operational to get those capabilities to the war fighter where they need to be. So thank you for the opportunity to talk about that.

Robert Arkin:

This is a very interesting commentary. I like what you guys are saying. And the interesting part to me is that it's primarily focused on space as it assists earth-based [inaudible 00:10:42] things. So as commerce is starting to develop out more towards lunar and eventually martian uses, we have to protect our assets, we have to protect our civilian uses of those things, and then of course there's going to be military uses for those things. And we need to be able to observe and figure out what's going on and be able to deter things just like you suggest. And I think in order to do that, we are going to need to proliferate many, many more sensors. Cislunar volume is enormous and it's expensive to get there, it's hard to get there, it's hard to maintain things there, it's hard to communicate with things there.

So I think it's very incumbent upon us to try to develop new techniques, smaller SWAP, size, weight and power, smaller things that can get there more easily, be able to proliferate more, do more, in terms of measuring and seeing what's happening and getting that information back here is very difficult. So we need to have infrastructure that's surrounding in the cislunar volume that can enable, and I know Derek, you're in particular developing a lot of infrastructure for near earth things and we need to start expanding that into the cislunar volume. And that's a huge amount of information. And I know that the transport layer is meant to push huge volumes of data around, and there's important data and there's

less important data. And the problem is, the more sensors we get, most of that data, generally speaking is unimportant, some of it's really important. And so we need to start trying to develop edge processing techniques and small SWAP devices that can do some of that pre-processing in order to reduce the amount of information that we are needing to transmit so that we can have room for the important information.

And so I know that we as a group are really trying to push along in that direction, but I think our adversaries are investing a lot of money and they're trying to take away our military capabilities and eventually prevent us from doing commercial activities. And so we need to operate in an environment where we can develop these techniques very, very quickly, which means risk. And this is one of my government colleagues here, the risk has to be acceptable and I have to be able to build things and fail and repeatedly fail, much in the way that we previously developed aircraft or submarines or other things. And thankfully, with spacecraft there are very few people involved that are losing their lives. But we have to operate that way so that we can have disruptive change rather than the evolutionary change that we seem to get mired in because it's lower risk, but we'll never get to where we need to be. So that, I think, really for me frames a lot of this kind of conversation. And I appreciate being here to discuss it with these gentlemen.

Lt. Col. Tim Ryan (Ret.):

Great. Thanks, Rob.

Brad Tousley:

Thanks, Tim. Yeah, my name is Brad with Raytheon Intelligence & Space, and I work strategy and technology. And it's a pleasure to be up here on the panel, thanks to AFA and the Mitchell Institute, and it's great to be up here on stage. I'm a little bit of a different fish out of water here in that, yeah, I spend time at DARPA, I spent time at the NRO in the past, but long, long ago I was a 20 year Army officer. So to me, understanding space as a war fighting domain within the JADC2 infrastructure extends all the way to the ground and back up. And I think that's going to be one critical way to deal with pure adversaries like Mr. Kendall's talking about another, is that we can integrate all of our war fighting domains in real time, not hours and days, but minutes and seconds. That's where the transport layer comes in. We need to proliferate essentially the space layer, LEO and others to provide the blanket coverage on earth to provide the targeting information to those that need to get it into harm's way, are maybe Air Force, Marine Corps, special ops, all of them.

And the last thing I'll say is that the proliferation story is one way of dealing with our peer adversaries. Quantities at some level are inherently resilient, they're inherently affordable and they're inherently survivable. And that gives nested combat systems a lot more capability now and in the future. Within Raytheon, two specific ways that we're trying to address this. One is we've now been selected by the US government to be the lead for the Digital Infrastructure Consortium as part of JADC2. That's going to be a really important framework. We believe we're really positioned well to help the government addressing those critical problems to get that air, space, ground, maritime layer all nested together.

And the second thing is we're actually working on a program, competing on a program [inaudible 00:15:14] with the Army called Titan, which is about the long range targeting node. And if you consider where Derek and SDA are going of enabling long-range fires, there was an example of this, an exemplar was done back in the sixties, seventies and eighties called Assault Breaker 1.0. US Air Force and the Army involved, it was [inaudible 00:15:29] and JSTARS. And you can think that the same thing is going to happen now, but it's going to integrate the space layer nested deep within our national security

infrastructure to enable the same sets of targeting and kill webs that have happened in the past. Thanks, Tim.

Lt. Col. Tim Ryan (Ret.):

Great. Thanks, gentleman. I appreciate that. So to start with General Schiess, can you provide us, sitting from CFSCC, you've been out there now couple weeks to a month

Maj. Gen. Doug Schiess:

One month.

Lt. Col. Tim Ryan (Ret.):

There we go. So can you provide us an update on what space war fighters are doing today? And then can you talk to us a little bit about the importance of and how you see our partnerships not only with our allies, but with the commercial sector as we go?

Maj. Gen. Doug Schiess:

Yeah, thanks Tim. I'd be proud to talk about what the women and men of Combined Force Space Command do on a daily basis. But first of all, I think everyone knows this, but I just want to state it, and some of my colleagues talked about it, and I'd be happy to talk about SDA at Beyond Geo later if we get a question on that. So one of the things is obviously since the early 1990s when I was starting my career, our adversaries have seen that space is the underpin of how we fight with a joint war fighting system. And they know that that could become an Achilles' heel for us. And so we have to be able to protect and defend our assets, but we have to be able to also provide those capabilities in a contested environment. So we do that day in and day out, 24/7 from CFSCC with our tactical units that are presented to us from the services.

And one of the things that we do that is very, very important, and I know I'm looking forward to what Dr. Tournear is going to bring to the fight for that, but that is missile warning, and that is a critical thing that we do. It was great earlier today to sit... One, it's always great to see your boss on stage. So I got to see General Jim Dickinson, the commander of the United States Space Command up there. But he had his two other fellow combatant commanders, General VanHerck from NORAD NORTHCOM, and Admiral Richard from STRATCOM. Those three combatant commanders expect that CFSCC every day provides exquisite missile warning to be able to, one, protect our joint force and protect them from giving them the amount of time they need to be able to take action from an incoming missile, but also to provide our national leaders timely decision making. And they need to be able to do that. So a missile warning is a huge part of what we do each and every day.

We talked about GPS, so I'm not going to do that. We talked about you using applications here. Satellite communications, everybody that's in the military knows that it's very important that you have to be able to shoot, move and communicate. And you can't do that in some kind of environment if you don't have satellite communications. And so we can talk more about that later as we've consolidated all satellite communications within CFSCC, but we need to be able to do that in all different bands. So narrow band, protected, wide band. And that gets to some of the things that Dr. Tournear is doing too with that transport layer and be able to get that information out.

And then obviously in this, we have to be able to surveil our domain. We have to know what's going on in our domain. We have to know what our adversaries are doing, what our partners are doing, and we have to have exquisite space and ground based sensors. And we have some, and we're doing a great job with what we have right now, but we need more. We need to be able to do that in a much better

fashion so that we can provide that critical information to our war fighters and to our decision makers as well. And then obviously, we have classified capabilities that I can't talk about here. I'd love to, but I can't talk about, that the folks are doing on a daily basis to make sure that we can do our mission.

How do we do that? Well, at CFSCC we do that with four operations centers. A lot of people know about the Combined Space Operations Center at Vandenberg Space Force Base. And I don't know if there's anybody from Space Launch Delta 30, but I just want to say thanks for the support that you give us out there. Colonel Rob Long and his team, we can't do our mission without you. But that is the integrating ops center for all of CFSCC, and quite frankly, a lot of what US Space Command does.

Let me talk to you a little bit about a day in the life of the CFSCC crew. One, they could be watching a missile launch from a really important area of the world. Being able to, like I said, provide those decision makers the decision space and also protect our forces. At the same time, there could be a ground based radar that we need for surveillance going through an issue and they're working with a team to make sure that they can bring that up. Maybe they're working a GPS outage somewhere with some equipment, all that while watching a SpaceX commercial launch from Cape Canaveral to ensure that we are providing collision avoidance and conjunction information. And then at the same time, doing sensitive capabilities in AFRICOM or CENTCOM, all in period of time. And so making sure that all of those tactical units are being commanded and controlled.

Then we have the Joint Navigation Warfare Center down at Kirkland Air Force Base in New Mexico. Thanks to the Air Force for the support that they give them. These are a team of experts that know that GPS spectrum and that signal and know exactly what they need to do with it. One of the things they're doing really well right now is we have to bring on M-code. We have to bring on that new capability for GPS. And so they're helping us with the testing of that, making sure that we actually have the receivers that we need and that those capabilities are there. But they also provide exquisite analysis to the COCOMs. As a matter of fact, they could be providing information right now to UCOM in a very contested environment and spectrum.

And then we have two more centers in Colorado. We have the Joint Overhead Persistent Infrared center at Buckley Space Force Base. So thanks to Space Base Delta 2 for the support they do. And the Missile Warning Center at Cheyenne Mountain Space Force Station. So thanks to Space Base Delta 1 that provides us the support there. I can't talk a lot about what they do in this forum, but they do that critical role of providing that war fighting support.

And then to pivot onto what you just said, we can't do any of that without our coalition partners. And so it's really exciting for me to be a part of CFSCC because we have exchange officers that work on our floor. As a matter of fact, I can get a call in the middle of the night from CSpOC, and when I answer that phone, I don't know if that's going to be an American, a British, a Canadian or an Aussie that's on the other end of the line telling me what the situation is. And so they're working there right side by side with us. We have partnerships with the UK, their SpOC, the Australian SpOC, and then the Canadian SpOC as well to be able to do that mission.

What's really interesting is, so those are exchange officers, we put space force officers or other service officers in their formations and then they're in ours as well. But then we also have liaison officers. And it's really cool that we've brought on some new capabilities there in US Space Command's multinational support cell. And that is we have Germany, the UK, and we have France, and we have Japan that is right there in our floors working with us, and they can provide information back and forth. And so that coalition partnership is key to being able to provide the operations that we need to do.

And then lastly, I had a hard time saying this other day on Monday, but our commercial integration cell, I did it, they work with us on a daily basis. Started out from a Schriever war fighting game, putting together all those commercial company's operators together. We had six, we had [inaudible 00:22:41]

10 and we're growing. But that provides information back and forth very quickly so that we can share, they could provide us information if they're seeing something with their constellations, and we can provide they're clear to the right levels. And so we work together that, and that's going to continue to grow. As a matter of fact, last thing I'll say in that area is we just finished up what we call Global Sentinel. We brought a bunch of different folks in to be able to do multinational operations, collaborate together, and just an incredible effort that all of all the nations that came, we're very happy with that. And we'll continue work that, we're already working for our Global Sentinel for next year. So thanks for allowing me to talk about the women and men of CFSCC.

Lt. Col. Tim Ryan (Ret.):

Great, thanks. Appreciate the robust update on that. So Dr. Tournear, Tranche zero is scheduled launch, as you said in your opening comments, towards the end of the year. Tranche 1, that's going to fill out the rest of that in 2024. Can you tell us a little bit about the progress on, when we start talking about these tranches, how's it going to enable the ground based radios, the ships, the aircrafts connecting directly to satellites, Link 16 type, no data? How is all that going to work and what's that network doing?

Dr. Derek M. Tournear:

Sure. Let me unpack that a little bit, there's a lot of different things there. There's JADC2, which a lot of people here talk about. And one of the things I learned as an intel officer is, to confuse the enemy, you always try to obfuscate information. And sometimes we do that to ourselves. No one knows what JADC2 is. It's just completely confusing. I'll try to simplify that, because it really is a simple concept. The whole concept is how do we get any and all sensor data to any and all shooter at the right time? And in order to do that across the J in JADC2, for joint, across all the services is extraordinarily difficult. Everybody uses different comm systems and they use different networks, and it's just very difficult to cross all of those lines.

So historically, this is you go back into the Cold War days, the way this was originally done, there was a network called Link 16 that kind of tied all these things together. And Link 16 was designed so that we could have command and control and pass targeting data within a certain region, so roughly 200 to 300 nautical miles. So you could set that up and you could have that be all joint. So you could have a bunch of different sensors, a bunch of different shooters talking to one another on that Link 16 network with a roughly 200 nautical mile range. And then that's a managed network that's handled. So that was great, that worked. And it's what we use today and it really is the only thing that has tied all of our joint services and our allies together since the eighties.

And if you look at that and you say, "Okay, well is that the way we're going to be fighting wars in the future?" "Well, no." Why is that? Well, because it exists and allows us to prosecute targets on the order of a dozen or so targets a week, maybe a half dozen or so a day. If we get into a conflict where we need to prosecute hundreds of day, how are we going to do that? I can only have this communication within 200 nautical miles. How am I going to actually sense, calculate a fire control solution and send it to a weapon all within only sensors and radios available within that? Well, that's not going to happen. So that's what SDA looked at and said, "Look, we're not a commercial entity. We can't come out with the new service for iPhone and expect all of the services to buy that. It just doesn't work that way."

So we had to say, "We're going to use the existing radios." Link 16's already there, so that's where we said we're going to use Link 16. We're going to allow those radios to tie into our transport layer, system of hundreds of satellites in low earth orbit, so that now that they're used to operating on this local 200 nautical mile area, they can plug into us. And essentially that's like plugging into the internet. They can tie into targeting cells that are located anywhere on the globe and they can talk to any of these other

Link 16 networks that are located anywhere on the globe so that you can tie all of that processing and targeting capability and get that to pair with your weapon systems immediately. So what's that mean? That means that now if I have an F-35 coming in, receiving the Link 16 signal with targets, those targets could be coming from sensors that are either within my 200 nautical mile AOR, area of operations, or a fire control cell that's located back in continental US crunching all this data, calculating it, and sending it over my existing radio.

The whole idea is to tie all of that together seamlessly using already existing fielded radios. And so that's what that's going out with to be the backbone of JADC2. And then we're tying in with the Army's version of JADC2, which is called Titan, the Navy's version, which is a Maritime Targeting Cell. They have one that's ashore and one that's expeditionary. And then the Air force with their ABMS. We tie into those, we can link all those together. We go down to existing tactical data links, so the services don't have to worry about fielding new equipment, they can just tie into us and make sure that we can actually take a fight and make it a global connectivity and be able to prosecute those targets in real time. So that's the vision, that's the goal, and we'll get there. We'll start to demonstrate this in '23 and we'll be able to affect the fight starting in '24.

Lt. Col. Tim Ryan (Ret.):

Great. I appreciate that. So Dr. Tousley, when we talk about from a Raytheon perspective, how do you see JADC2 coming together in space? In other words, how do you see it being knitted together, particularly when it comes to the transport layer that Derek was talking about?

Brad Tousley:

Yeah, thanks. No, I think the next step beyond that, where Derek's going is you have to create the framework from a multilevel secure mesh network perspective that you can take a DOD centric model, from a standpoint of red black configuration, and tie it red black across the DOD, the IC and commercial, all three of those together. And Link 16, you have to be backwards compatible for it. But from the standpoint of propagating forward, the Air Force has done this with a particular schema called Stitches or Dynamo, which is a multilevel secure mesh network for the air domain. And we extended that between air and space together and that allowed that fabric to come together routinely. And the reason that the multi-level secure mesh network is important is because the network will be under attack from the threat. It'll be under threat from coverage reasons and things like that. And so the network is going to come up, it's going to go down in different periodic locations. And some of these advanced protocols that are coming online that can get nested into the transport layer will allow it to be inherently resilient from a network perspective, as opposed to purely directed energy or some other threat.

Within Raytheon, there's some ways we're working on this. There's a small entity, a subsidiary called BBN, that has been doing the multilevel secure mesh networking for the intelligence community for a long time, and others in the Air Force. That's one aspect. There's a particular set of algorithms, Stitches and Dynamo that allow those networks to get set up and torn down. And then from a command and control perspective, there's another set of tools, it's called a [inaudible 00:29:29] subscribe framework called Arachnid that's being developed on early versions of ABMS. And that's also something that we hope can be populated into the transport layer in the command and control infrastructure in the future. We think those two things together can really make the network and the command and control inherently survivable against a peer adversary that's going to attack it.

Dr. Derek M. Tournear:



And that multi-level security mesh network is critically important, not only for just making sure it's resilient, but commercial industry is fielding a bunch of sensors and a bunch of different comm networks up there. How are we going to plug those in to make sure that those are readily available for our war fighters? And the whole idea is if we have this multilevel security, we can have a trusted way to move data on and off the transport layer, which is essentially, we call that the secret outer net or the [inaudible 00:30:16] net if you will, of the outer net being in space, and then we're the secret version of that. That multi-level mesh network is how you pull data on and off to make sure you can get data from whatever source to whatever shooter at the right classification level.

Lt. Col. Tim Ryan (Ret.):

Great. Thanks. Rob, I know that you guys have made some significant progress in bringing laser comms to the table. How do you see fitting into the next generation of space architecture? What does it do to be able to enable in space? How does it ensure, when we talk about some of the security stuff that we talked about, how does all that fit together from your guys' perspective?

Robert Arkin:

Lasers are very important for a communication because, you can imagine, Derek was talking about all these different kinds of data that are being generated and sensors. And Brad is talking about ways to keep things secure. So lasers are very much point to point. They can transmit a lot of information, but historically they come at a large SWAP cost. So we've been making a lot of advances in trying to squeeze the most amount of optical power out of the smallest lasers that we can, so that we can increase the communication bandwidth and also decrease the swab to be able to have disadvantaged users, like individual soldiers out in the field, have comm up into the transport layer to be able to disseminate that information as much as possible. So I think it really goes back to my comments earlier about reducing SWAP for a whole variety of reasons. And we're doing that with the laser comm, with trying to shrink lasers and increase the communication bandwidth. But we also are trying to press forward and do more edge computing and eventually bring AI into it to so that the general doesn't get woken up in the middle of the night unnecessarily, because the data is only getting sent there if it's really actually something that's worth looking at.

Lt. Col. Tim Ryan (Ret.):

Great. Good. Thank you. So Brad, the CSO's discussed over time how since small satellites have become more operationally relevant, the cost of launches have dropped, there's actually a role for the Space Force in tactical level ISR, as he's put it. What do you see their role in tactical ISR?

Brad Tousley:

Yeah, I think the Space Force is going to be critical. You've pointed something out to him. I like to remind people of this, I know Derek knows this, but I want to be really explicit in how I state that over the last 10 to 12 years, the cost of launch per pound has dropped by a factor of 10 to 20, 25 and it's going to go down even further. And from a strategic trend standpoint, that's completely obliterated all the legacy assumptions of space based architecture. It just has. So coming back to why it matters for me as a former ground pounder and wanting to see the maximum support to the soldier and the fight on the ground or the Marine, the ability to proliferate more and more capabilities, and to low LEO, MEO, HEO, GEO and beyond makes it more difficult for the adversary to figure out what we're doing. It allows us to revolutionize our architectures faster, and allows the military to provide a variety of a set of capabilities very quickly to support the war fighter for deployment.

Because the cost of launches dropped, the ability to experiment with cheaper payloads, that cost has dropped, which means that Derek gets to run these tranches and get more capability every 18 to 24 months on orbit. That enables the support to the tactical war fighter because you can more rapidly get a set of capabilities up on orbit. Instead of waiting for something 10 or 20 years to get the capability. Maybe I can get something up in 24 months.

Robert Arkin:

But that also means that we have to be willing to accept risk and failure. Right?

Brad Tousley:

Absolutely.

Robert Arkin:

And historically, I think that's part of the problem is that people don't want to stick their neck out to do something if it's going to be a failure. So we kind of have to get over that.

Dr. Derek M. Tournear:

We're willing to accept risk and failure. But you're talking about it a lot, you're not planning for failure, are you? Just checking. All right. Just making sure.

Robert Arkin:

Definitely not.

Maj. Gen. Doug Schiess:

Yeah, Derek, you have a great point. The CSO has told us to be bold and so that does bring risk and we just got to do that smartly.

Lt. Col. Tim Ryan (Ret.):

Wonderful. Great. Thanks for the exchange. So General, you mentioned earlier, General Dickinson, commander of the US Space Command, he's identified SDA as "the command's top priority." And when we start to-

Dr. Derek M. Tournear:

Space domain awareness. No, you got space domain awareness, Space Development Agency, and then the real mission of SDA, speed, delivery agility. So obfuscation, remember that?

Lt. Col. Tim Ryan (Ret.):

Now we've let all the secrets out now. We talked about space domain awareness, and especially when we tie it into the things that Derek's talked about and Rob and Doug's talked about, that's not just mapping it, not just knowing the physical location of the objects, which traditionally has been as we've come up through that is kind of what we've looked at as traditional space domain awareness. But you have to know the intent of what those assets, both friendly, and be able to understand what our foes are doing at the same time. So can you talk a little bit about not only where we're at today, but what's that look like as we go forward?

Maj. Gen. Doug Schiess:

Yeah, thanks. And I think General Dickinson does think what you're doing is important, whether it's Space Development Agency or space domain awareness. And great, we'll have a couple more acronyms with SDA before we're done for today. But no, critically important. And what we do at CFSCC, I think we are probably the best in the world at space domain awareness right now. And we do really well in the orbital regimes that we're familiar with, low earth orbit, medium earth orbit, highly elliptical orbit, and even geosynchronous orbit. But as we've talked about, there's going to be different orbits and there's going to be different things that the commercial and even national security space are doing. And so we have to move out on that. But it's not just, as Tim said, cataloging. That's what we've done in the past and we've done that really well.

But the 18th Space Defense Squadron at Vandenberg, and then now the 19th Space Defense Squadron, they're charged with not just doing the catalog, but they're charged with making that continuous war fighting relevant information to the folks that need it, because we need to know what our adversaries are doing. You talked about a joke from Space Force, but we really need to know what our adversaries are doing. And to do that, we have to have the capabilities to do that. And right now, Guardians and other services are using just innovative ways to do that with systems that quite frankly are pretty darn old. But we'll continue to work with our partners and we'll get those upgraded and we'll continue to make strides and being better at that. But there's also things out there that make this more difficult for us.

Obviously, last November, Russia tested an anti-satellite system and created 15 more hundred parts of debris that we have to make sure that they don't run into very critical national security space stuff. But we also have to make sure that we're protecting not only our astronauts, but the Russian cosmonauts on the International Space Station. And we're making sure that they're safe from that debris that they created. But also the Chinese taikonauts and their system. And so that is a big mission. We have to be able to use some AI and some other capabilities to make that much faster so that we can do that. But then we have to look to the future, and as my colleague talked about here, that's beyond GEO. Our sensors and our systems right now are very capable for 23,000 nautical miles out. But anything beyond that, they're a little bit more. But that is something that both General Dickinson and the CSO are working.

And we know, I think the CSO has said, "Hey, in the next five to 10 years, we've got to get after that, maybe even faster." But the smart guardians and men and women of CFSCC, are getting after that to be able to do what we have with the capabilities we have now. But we have to look to the future to be able to get after that because obviously we are exploration humans, and so commercial is going to go out there, civil's going to go out there, and we have to be able to protect that domain as well. So thank you.

Lt. Col. Tim Ryan (Ret.):

Great. Thank you. Well, it looks like we've come to the end of our panel. I could talk for the rest of the afternoon if we had more time, but unfortunately we don't. I really appreciate you guys all coming here and being here. Thank you so much for everything that you guys do in your roles to help defend this nation. Thank you to the audience for coming out. Just as a quick plug, you might be interested in the space innovation to the tactical edge that's in Potomac D starting at 1350, and we've got another session that'll be here in Potomac C as well when this is done. So as we like to say in the Mitchell Institute, with that, have a great aerospace power kind of day.



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