



## Event Transcript: Summit for Sustainability

### Summit Panel: The Relationship Between Commercial Space and Counterspace

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foundation that promotes cooperative solutions for space sustainability and the peaceful uses of outer space.

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**Krystal:** It is my pleasure to introduce the final panel for today. I am excited because I like to thank that you are all still here, because you're finding the content interesting and valuable. If that's not the case, feel free to pull me aside later, not just because Bryan Steyn is our last speaker.

This panel I think is going to be particularly interesting for the group. As I said earlier, we don't want to shy away from the hard topics. We're not going to be able to make progress if we don't really look at the issues in depth. We wanted to have a panel specifically on the relationship between commercial space and counter space.

I'll turn the mic over to my colleague, Brian Weeden.

**Brian Weeden:** Thank you, Krystal. Thank you everyone. [inaudible 1:05] is Brian Weeden. I am the Director of Program Planning here at Secure World Foundation. Thank you for sticking around to the last panel of today's discussions. We're going to go out with the bank, hopefully figuratively and not literally.

[laughter]

**Brian:** What we wanted to do with this panel is try and breach these two different topics. As we heard at the very beginning of the day today, one of the big things going on in the space world is this burgeoning commercial space sector, all these new companies and startups, and capital flowing into the space world, and hundreds and thousands of commercial constellations, and all the great benefits they may offer.

As we also heard this morning, there is a whole other discussion going on about the growing chances of conflict in space. As we documented in our report, and so was CSIS in their report, the proliferation of counter space technologies to a growing number of countries, that could be used to threaten satellites or in a future conflict could actually be used against satellites.

These two discussions, at least from our stance, are going on independent of each other. We think that there need to be a little more bridging of those two groups, those two communities, and those discussions, because there's probably interactions between them. That's what we want to get to on this panel discussion, to discuss those interactions between those two topics.

Joining me on this discussion is a panel of very distinguished speakers. To my left is Mr. Jeffrey Trauberman. He's the VP of Government Affairs for VOX Space, which is the portion of the Virgin Group that works for the national security space community.

Jeff is a longtime executive at Boeing focusing on program management and business development across the space sector before now moving over to VOX and Virgin.

Next to him is Pam Melroy. Pam is currently the CEO at Melroy & Hollett Technology Partners. She's a retired Air Force test pilot, a former astronaut, and a Space Shuttle commander. Makes me feel like, "What have I done in my life?"

[laughter]

**Brian:** Served as a civil servant both with the FAA and DARPA. Next to her is -- it's out of order in my notes -- is Mr. Joshua Huminski. Josh is the Director of the Mike Rogers Center for Intelligence and Global Affairs, which is part of a NGO known as the Center for the Study of the Presidency & Congress.

Josh has a background in public affairs, communications, security, risk consultancy, strategic business development. As we'll hear about in a few minutes, the Center for the Study of the Presidency & Congress has been working on some of these issues of how does the commercial space world, how can it help on the national security side.

Next down is we have Dr. Bhavya Lal. She's the Research Staff Member at the IDA Science and Technology Policy Institute. They provide research and policy analysis to support multiple government agencies, including the White House Office of Science and Technology Policy and the National Space Council.

Bhavya serves on multiple scientific advisory panels and committees and plays a key role in helping inform the US government on various public policy challenges and problems.

Last and certainly not least I guess...

[laughter]

**Brian:** Doug Loverro.

[crosstalk]

[laughter]

**Brian:** Retired Air Force colonel who's worked on several military space programs, including GPS and a bunch NRO things we can't talk about. He served as the top civilian in the Pentagon for national security space policy and is currently involved in a number of consulting and advisory roles.

I want to open up with a question to Bhavya. There's been a lot of hype about what might happen in the commercial space world over the next decade. We've heard very big numbers of what that might be. Can you talk about how real that hype is? What's going on in the commercial space world? More importantly, is it only in the US, or are we talking about global here?

**Bhavya Lal:** Thanks, Brian. Thanks for the invitation to join this amazing summit today. Before I get into the hype, I just wanted to make a quick point on this term "commercial space." It's one of those blind man and the elephant issue. We all use the term "commercial space," but we mean different things.

We don't have to agree on a definition, but we at least need to recognize that there are different definitions. I was just looking at one of the bills in Congress, and it said something like, "Any activity outside the government is commercial." That dots everything. [laughs]

The more mainstream definition of commercial has two dimensions. There has to be some private skin in the game, some risk and risk capital, and then there have to be customers that aren't just the government.

I think if you take a very strict definition, where you have to have both fully private capital and the customer base, that makes no distinction between government, and household, and businesses, we don't really have "a commercial space" sector really. Having said that, I think we should say it, and we dispense with that because there's other sectors where you see this thing as well.

With that said, the commercial space sector...the hype is real, as it would be for any mainstream such sector. SmallSats are a good example. We went through this Gartner cycle, the peak of inflated expectations, and that was followed with the trough of disillusionment. Now we're at the slope of enlightenment. [laughs]

I think that's when companies have realized that the action is with government. The SmallSat Alliance was set up to essentially lobby government for funds, both at the front end and also as a customer end. I think that's something. It's an important realization for us as a community, that we may have overestimated how much non-government business there is, at least in the present times.

Maybe in the next 10, 15, 20, 30, 50 years, it would be a different business. Today, it is essentially a government sector, hopefully changing. In terms of other countries, the hype is similarly high. We are finishing up a study looking at commercial space in China. Again, there the definition of commercial space is somewhat different.

A company like X Space, which is wholly entirely owned by the government is considered commercial because they are selling for profit. That's different. The intentions are really what you see in the United States. It's about making money. It's about being the next Elon Musk.

We heard from the CEO of this satellite builder called [inaudible 7:47] , Yang Fang. He said, "We all wanted to be the Chinese SpaceX, the Chinese Elon Musk. At the time, it was based on dreams. I want to thank Elon Musk and Jeff Bezos." There's this excitement of this new thing that everybody wants to be part of.

Part of the hype is data really driven by investment. We see a lot of VC and we think we've arrived, but investment really is a sign of optimism, then success. I think that's something we just need to keep in the back of our heads. I can go some more, but maybe others have some points to make.

**Brian:** I want to ask, Pam, you look a lot at innovation policy, and what's going on there. Can you talk about that piece of this, and what's going on in the commercial release is a little bit different than traditional in the space world?

**Pam Melroy:** I think Bobby's point, that commercial space is something that is actually pretty diverse. There's two kinds of people in this world. The people who divide everything into two things, and those who don't.

[laughter]

**Pam:** I'm one of the former. I do look at it actually as a spectrum, and it has more to do with market maturity. Actually, by your definition, the commercial telecoms, which is traditional, commercial space is very mature. They don't sell just to the government. They have their own market base, and so forth.

I think about it in terms of market maturity. If you have a very mature market, you know exactly who your customer is, and there's a strong demand...and that could be the government, and that's OK too. There's also this other dimension, which really is very specific to startups, and that is the barrier to entry.

If you are building a launch company, that is a very capital-intensive proposition, to build an engine, and run it enough thousands of seconds that you actually feel safe trying to shoot that thing into space. If you're going orbital, then it's all or nothing. You light the rocket and you hope that it makes it all the way to orbital velocity.

In commercial space, now, we've got all these other things, CubeSats. There's a barrier to entry because you've got to pay for launch. Not so much building the satellite itself but figuring out how to put it together and how to get a launch.

The lowest barrier to entry is people who are just interested in the data. They want to make an entire market around the data. They don't want it to be about the satellite. It's as cheap as it could possibly be, or they're happy to use somebody else's data -- maybe even existing commercially available data.

You can see that those barriers to entry change how difficult it is to initiate a startup. All of those dimensions matter. Here in the United States, I think, because we have so many traditional space operations, but more importantly, government investment, that technology has flowed out to the startup community very successfully.

We have the world's only really widely acknowledged space unicorn, startup space unicorn, in SpaceX. There's probably a couple of others, but SpaceX is the one that everybody knows is definitely a unicorn.

That barrier to entry is the lens that I look at internationally. Say, "Yeah. The stuff that's the lower barrier to entry is popping up everywhere." The more capital-intensive it is, the more billionaires you need behind you. It begins to tail off depending on the country. I think that's my view on what's happening.

**Brian:** Thank you. Doug, I want to turn to you. Just like I asked Bhavya to unpack the hype about commercial space, same thing for you about this issue of space becoming a battleground, a warfighter in space. Can you unpack that a little bit for us and talk about what is the hype and what is the reality of what that might happen in the next few years and what that space looks like?

**Doug Loverro:** Sure. Thanks, Brian. Thanks for Secure World for hosting this forum. It's been a great conversation today. Brian, in his email to us, said "Be provocative," so I will try to be provocative...

[laughter]

**Doug:** ...and meet his expectations for today. I made a statement in a smaller forum we had yesterday that I don't think a war in space is going to happen in 50 years, and I was yelled and screamed at and told to sit down and shut up. Which I did not.

[laughter]

**Doug:** The fact of the matter is that we have known for decades most of the ways or all of the ways that we could affect on-orbit operations in space in a deleterious manner.

We understand those. They're dictated by physics and by clear physical principles that we understand, whether that's jamming or blinding or kinetic activity or robotic approaches or simply blocking a satellite, putting a RF shield in front of a satellite and just blocking it.

There's many, many different ways, and since I was in charge of that effort for the US government for many years, I kind of know all the ways that you can do that. There is a lot of hype around it today. There is a lot of folks that are thinking this is something new, but it's really not something new. It's something that we participated in.

The US did its first anti-satellite test in 1958. I think '58 by your estimation, Brian, right?

**Brian:** Mm-hmm.

**Doug:** We have been doing this kind of work for a long time. I would remark that 1958 is over 60 years ago, and we have not had war in space. That doesn't mean we won't. It just means that the threat of war in space, the likelihood of war in space, especially kinetic action in space, in my mind, is overrated.

Because really, kinetic action in space is attendant to peer-to-peer conflict. Gauge the likelihood of peer-to-peer conflict and you can gauge the likelihood of kinetic action in space.

That's not to say that we won't participate in activities that are classed as anti-satellite activities, but of a different flavor. RF jamming is done today. It is done by many nations. The US declassified its intent to do RF jamming in 2000. Many nations participate that. It's a very low bound of anti-satellite activities. Quite effective in many military operations. I think we can expect to see that kind of work done in the future.

We can expect to see GPS jamming done. We see that done today. We understand the effectivity of it or the lack of effectivity of it, depending on your view of the world. We can expect that in lower-level conflicts, those kind of things will happen.

That doesn't mean that we should ignore the possibility of those higher-level conflicts happening. We should absolutely be attendant to the notion that they can happen and we don't want them to happen.

We should not be overly concerned, in my mind, that this is imminent -- that because one or two or three countries have demonstrated the capability that suddenly their use is imminent in the next low-level regional conflict, because it's probably not.

That said, we need to go ahead and make sure that if and when it does happen, it does not ruin the environment that we're operating in. People sometimes say, "My God, you'll ruin the entire space environment if we use kinetic weapons."

By the way, I'm one of those who will say that's not a good thing to do. Land mines have a similar effect on the land, as do defoliants and chemical agents that could be used in land warfare. We've seen fit as nations to go ahead and outlaw those kind of weapons, or to make them certainly not something that people would want to use because we've said those are unacceptable ways to prosecute war.

To me, that is the key conversation, and many of you have heard me say this before -- the conversation we have to have about space conflict isn't, "Will it happen or won't it happen?" It's going to happen. It's

happening now. It's happening at these non-kinetic levels and it might happen at kinetic levels in the future.

What we need to talk about is which ways of conflict in war are unacceptable and that the international community is ready to stand up and say, "This is an unacceptable method of carrying out warfare in this domain."

We do that in air. We do that in land. We do that on the sea. We should do that in space, because it's unrealistic, to be provocative, to suggest that war in space will not occur, that conflict in space will not occur. It will. What we have to decide is, what is the rule set that will define how that operates? I'll leave it at that.

**Brian:** Thank you. Jeff, you work for a company that's trying to make a business in space. You used to work for a big company. You worked at a defense contractor. How do you guys see this? Are you concerned about space being a war zone? Do you see it as an opportunity to help? How do you see yourself fitting into this discussion?

**Jeffrey Trauberman:** Probably all of the above, Brian. Maybe before I even talk about that, I just want to thank you and the Secure World Foundation again.

We're happy to be a sponsor as part of the Virgin Space team. We have a couple lines of business. Part of it's the satellite business. Part of it's the people-launching business. You'll hear from Dan Hart, our CEO, tomorrow, and he'll elaborate on a lot of these topics, but just thank you again and we're glad to be here.

It's been said before, just because I work at a commercial company, space is just another domain. We have a lot to learn from the domain. We have a lot to learn from other sectors, not just what happens in the space domain, but also how do other sectors approach standards and norms of behavior?

I think we're thinking a lot about that in our company. I don't think there's any argument that if there's really serious conflict or a hot war in space that that would diminish commercial activities, commercial investment, or really have a substantial chilling effect on the market.

On the other hand, I think prior to that and I would say hopefully the lead-up to that, but I think commercial companies can contribute to the overall resilience of the space environment. Why is that important?

If the space environment becomes so resilient because there's a mixture of government and commercial capabilities, adversaries might say to themselves, "What is the point? What's the point of launching any kind of hostile action in space? The systems are resilient. There really isn't a lot that can be gained by that."

I think maybe counterintuitively, you could see how these kinds of commercial capabilities could contribute to stability in the space environment. In addition, company-to-company and commercial agreements among companies in other countries I think can forge relationships that can also contribute to the stability of the space environment, which I think is beneficial.

My sum on this is there are a couple of foundational things we think about in the commercial sector -- best practices, norms of behavior. It could evolve some point to standards, and really, "foundational" being space situational awareness so we have a shared understanding of what's going

on. I'm reminded of that cinematic, cerebral masterpiece, "Animal House" who said, "Knowledge is good."

[laughter]

**Brian:** Very deep.

**Jeffrey:** I'm just a deep thinker, Brian.

**Brian:** Doug and Pam, unpack that a little bit, either one of you, about this issue of commercial playing a role in helping...it creates resilience [inaudible 19:53] . I think I'll start with you, Doug, because you maybe were the father of that policy, at least, in the US, or strategy. Can you unpack that a little bit and talk about why that is the case?

**Doug:** Sure. I think Jeff said it, and I'm a big believer in it. This really goes to a question of deterrence. How do you deter hostile action in space? In land warfare, in terrestrial warfare, we typically talk about deterring hostile action through threat of retaliation.

My strategic outlook on space is that is not effective in space. Retaliation is not an effective way to go ahead and deal with the threat of conflict in space. Nor, quite frankly, is it useful, because you've still lost your space stuff if all you do is retaliate. You've just made sure that now both of you are operating at a bad level.

Resilience, on the other hand, deters hostile action in space because the enemy realizes that that hostile action will be ineffective. There's no reason to take hostile action that isn't effective.

There's many layers to this discussion. One of the things that I've testified before in front of Congress on is what you're really trying to do is raise the level of action that an adversary must undertake in order to deny your space capabilities to a level that is unacceptable to him and unacceptable to you.

If you can get away with jamming my communications, well, then you're going to go do that. If you can't jam my communications because I've created anti-jam communications either through a constellation of LEO satellites or through some specifically honed geosynchronous anti-jam satellites, then he's going to have to take physical action against you, which is a much higher boundary of entry and therefore deters conflict.

Resilience, by its nature, deters conflict. The commercial world provides a lot of mechanisms to create resilience in space missions. By the way, the same can be true for allied capabilities as well. In fact, normally, when I talk about this, I like to talk about them both in tandem.

Allied cooperation in space and cooperation with our commercial partners in space both add to inherent resilience, which inherently raises the level for deterrence, and that's good, because despite the fact that I've said war in space is inevitable, I'd still like to keep it as less evitable as possible. Is that a word?

[laughter]

**Brian:** It is now.

[laughter]

**Doug:** The higher we can make the barrier to entry to conflict in space, the better it is for the space environment and, quite frankly, for our national security, and you get there through resilience, not through threats of retaliation.

**Bhavya:** Brian, you said to be provocative. Can I respond to Doug?

**Brian:** Go right ahead.

**Bhavya:** I completely buy that commercial space provides a deterrence effect which will maybe push back conflict, but let's take two analogies. For the sake of being a contrarian I'll say this -- one from history and one from the maritime domain.

From history, I come from India -- I was born in India -- the East India Company came to I guess India and I guess maybe the rest of the Southeast Asian subcontinent, and after a while, the British empire became so dependent on the goods that the East India Company was providing, and this is the 1600s, that they actually had to provide the military to support. The commercial sector, in essence, drew in imperialism.

Again, I'm not necessarily saying this is a highly relevant example, but we need to think about it. The second analogy is from the maritime sector. We have however many trillions of dollars of...90 percent of the global trade happens over the oceans. 21 percent of -- this was the CSIS report I was reading a few weeks ago -- 21 percent of the global trade, or three-ish trillion dollars, goes through the South China Sea.

We are extremely concerned about any activity the Chinese do in South China Sea. My point is that while there may be a deterrence effect, but my as commercial gets to be more important, gets to be a bigger part of the economy, it also starts to make other issues more important. We should just remember that.

**Brian:** Pam, you looked at this issue when you were at DARPA and some of these issues. If you can unpack it similarly.

**Pam:** Yeah, right. I think it's really interesting. I hear what Doug is talking about as tactical.

That makes a lot of sense to me -- the idea that easy access to launch and small sats sitting on the shelf, you can set up a regional constellation that provides GPS and com services. It doesn't matter -- if things got shot down, you can replace them very quickly.

That is a tactical problem. Bhavya, what you're talking about is a strategic problem. It's where space commerce has gotten to be such a significant part of the economy that it then becomes actually a reason to go to war. I don't think we're actually there yet...

**Bhavya:** Yes.

**Pam:** ...but I think you're not wrong to project out to a point where there's a strategic impact.

**Brian:** Josh, I want to turn to you because you guys have done a study, or a series of workshops, looking at how industry may be able to help address some of these challenges and some of the obstacles in doing so. I wonder if you could talk about that a little bit.

**Joshua Huminski:** Yeah, absolutely. On behalf of Chairman Mike Rogers, the former Intelligence Committee chairman, and Representative Glenn Nye, SUSSPC, we launched the National Security Space Program.

The genesis for this was actually another event in DC where a representative from ORS, Officer Response to Space, made a presentation and very boldly claimed that they had a great success -- that a battlefield commander -- I presume it was Horn of Africa at the time -- said that they needed imagery, and the ORS delivered it in four years, and that was "responsive" and "rapid."

[laughter]

**Joshua:** If your measure by historical analogy is 10 years, then sure, that is rapid. The chairman and I sort of sat there scratching our heads being like, "This must be an acquisitions challenge, not an engineering or technology challenge." I can go call a [inaudible 26:19] or call up another imaging company and get the data that I needed.

We started from that position saying, "Where are the obstacles to integration? Where are the conversations happening or not happening? What needs to be done to accelerate the integration of these commercial capabilities?"

It really comes down to a cultural challenge, a cultural change, that I think we've all touched on on the panel so far -- that hitherto, space has certainly been contested. We can all agree since 1958 and the first ASAT test and subsequent actions thereafter.

We've treated it as a benign sanctuary environment, and when I say we, I'm treating it very much from the United States perspective. We were able to do whatever we wanted whenever we wanted without challenge. The problem is, that's not really the case anymore. It really hasn't been the case for some time. We just chose not to acknowledge it as that.

The reality is, we've structured our acquisitions process, we've structured our entire approach to national security space, on the assumption and presumption that we can have uncontested access to space. We can do whatever we want, and whenever we want.

Now you have commercial space is doing incredible things. Jeff's sitting up here with Launcher One, which is going to be doing some incredible stuff coming up. We just saw the Falcon Heavy launch and land last night. It's outpacing what government can do.

At the same time, China, Russia, and other adversaries -- India, the recent ASAT test. Not an adversary, but...is launching new capabilities. We're seeing these two trends, and while at the policy level -- I would assume Doug could speak to it better than I can -- there's been an acknowledgment of this.

In the actual reality of structure and acquisitions, that hasn't happened yet. There hasn't been a recognition of this. That's a very blanket and bold statement, when there are pockets, certainly down at Special Operations Command -- DIU, DARPA, doing some very interesting, innovative things. If you look at the main Air Force, the main SMC, the big, large acquisitions bodies -- NRO -- put them aside for the moment. They're treating space as they have for the last 20 years.

They still want your standard heavy lift capacity. They're not looking at new, novel, small-launch. They're not looking at MED constellations. What we've found is that the fundamental question of what we're trying to do hasn't really been answered yet.

I think if we break it down to three very simple things...We want to increase resiliency of the architecture, be that SBIRS, be that GPS, be that whatever it is. We want to increase deterrence, because as Doug was talking about, and as was mentioned before, we want to deter action through other means, not necessarily overwhelming retaliation.

The third leg that I think is missed in a lot of conversation is delivering effects for the warfighter on the ground. Too often in the space community, it stops by us looking up. It's like, "Great. We have satellites that can do some really nifty things."

It's about that soldier, sailor, airman, or Marine on the ground, that special operations force, that needs that capability delivered. It's about, how can we deliver that most effectively? I think as we found in the report was that what we need to have a multilateral, multi-layer approach to it, with existing legacy systems as well as new systems coming online.

That fundamentally necessitates a change in culture and a change in attitude that some of the Space Force debate, I think, has encouraged, some of the space development agency debate has encouraged. We're not quite there yet. It remains to be seen how we can move more swiftly and more agile in terms of commercial integration.

**Doug:** Brian, I'd like to...

[crosstalk]

**Doug:** ...jump onto what Joshua said. I absolutely agree. DoD space is the only DoD activity where we only have one way to do something. Everyplace else within the entire military-industrial complex, we have a thousand ways.

I always tell people, we have 500 ways to put metal on the beach. I can do it through a long-range artillery, through an ICBM, through a bomb on B-2, through a bomb on an F-22.

There's a thousand ways, 500 ways, to put metal on a beach. We have one way to navigate around the world. That makes no military sense and that reflects what Joshua was talking about, which is we've had this unitary somewhat sanctuary. I don't like to actually use that term, because we knew during the Cold War it wasn't a sanctuary. We actually knew that it was hostile.

We still believed that it was only associated with nuclear war, so short of nuclear war, we believed it was a sanctuary, and therefore we only needed one way to do it. We approached space from not a military perspective but from an engineering perspective. What's the best, cheapest way to get the most capability?

You could do that on an Excel spreadsheet. We didn't even have Excel at the time, but we still did that same kind of thing. We still did that calculation and we said, "This is the way to do it."

No place else in any military endeavor you've ever participated in is that the calculus that arrives at the one way to do something, which is why we have F-35s, F-22s, F-16s, F-15s, and F-15EXs still in the inventory, because you want multiple ways to do things.

This is standard military approach to everything we do, and yet, it is absent in space. When we see arguments between the Air Force and the SGA about "my way is right, or your way is right," there's no...No, both ways are right. [laughs]

You want both ways to do it so that if the adversary figures out a way to deny one, it won't necessarily deny the other.

**Brian:** Jeff, coming back to you, how do you approach this issue of the culture in the military that currently exists in acquisitions as somebody who's trying to advocate for a different approach to some of these things?

**Jeffrey:** It could be a challenge, as Doug mentioned. As Doug mentioned, there are established roles and missions, and breaking into that sector, you just can't show up at the door and say, "Here I am. Please give me a contract." I'll use one more movie analogy, and then I'll let it go. "It's complicated."

[laughter]

**Jeffrey:** I think there is real and genuine interest on the part of, at least, all the military leaders I speak with, about really embracing it.

I think that a light bulb has gone off, and so most of the people I talk with are really welcoming this, but they, too, are puzzling about, "How do we do this? How do we take advantage of it? How do we follow the rules that we're obligated to follow, yet still take advantage of these capabilities?"

I think it's going to take a little bit more time, but I think we and other parts of the sector are getting traction. I'm really an optimist about this, but it's not going to just happen overnight, and it's not going to be a next year thing.

Over the long term, I can't imagine that, say, the Department of Defense would not avail itself more of the enormous investments being made in the commercial sector. I think they know that. They're just struggling with the how and when. I think that's a conversation we're happy to have.

**Joshua:** Let me just jump in real quick right now. I think if you see the senior leadership engagement, certainly previously Secretary Wilson, General Goldfein, Al Raymond, there is some top level -- and I completely agree with that, absolutely.

The problem that we found within our report and project was the penetration of the so-called clay layer, that you have great leaders that, unfortunately, turn over. Then it's like, "Great, yes. Yes, sir, yes, ma'am, we understand that that's the command intent," and then they just wait it out.

What we've tried to do in this report -- I have a few copies, and I'll have you circulate it around -- was that you need to have some sort of driver to get that change to go forward. Either change or upset the way you do business to really get something to penetrate that clay layer.

We've had great engagement across the board, and everyone saying, "We need to do this," whether it's Starlink or whether it's project HYPER, "take advantage of these capabilities." It's the how. It's not whether we should or not. It's how can we do it with those existing authorities, and how can we make the engagement sustainable beyond leadership change?

**Doug:** Josh, I agree with you, and I think there's also, coupled with that, beneath the senior leadership, there is an understandable concern. "What if this doesn't go well? What if this project that I've now said I'm going to endorse, embrace, and contract, it doesn't work out?"

I do think it's a matter of time and a matter of penetrating throughout the institution more broadly. I totally agree.

**Brian:** Picking up on that, I've heard, not directly, but kind of rumblings to the effect of, "Now that we're back in a great power conflict, we can't afford to rely on commercial, because they might not be there when we need them, that we have to go back to more of a tighter government industrial base," kind of the old way of doing things.

How do you guys react to that thought?

**Pam:** I'll make a comment, which is that our current military...For example, I think about the Air Force as heavily reliant on having dominance over the air space. If you're going to go to Iraq or Afghanistan, you launch a UAV, it provides you the data that you need. It's beamed to command and control, and that goes straight to the tip of the spear.

That's all very well and good, but in denied air space, which is these great peer environments, we don't enjoy that kind of air dominance. In fact, it will be much harder. Space is the only solution to that problem.

At the pace at which we are moving and developing capability, and the number of assets that we have in space that provide us that kind of strategic and tactical intelligence, we've got a real problem, because there's commercial companies out there who will sell real-time data to our potential adversaries.

There's a real concern in my mind that we have to take advantage of commercial, because they're sometimes offering capabilities that are the fastest, and our potential adversaries are taking advantage of it. It would be really foolish to ignore it.

**Doug:** Brian, can I take another crack at that in a general perspective?

Those of you who have any experience in the Army, you know the Army talks about three different kinds of things they use. They have combat arms, combat support, and combat services.

Combat arms means you're actually in uniform shooting and fighting with one another, and that's inherently a government occupation. It is a uniformed occupation. You can own your M-16. You're going to go ahead and fire your own rifles. You're going to own your own artillery. It's not a commercial capability.

On the other hand of the scale is commercial services, which tend to be in the Army logistics services, but in space, that could be normal scheduled launch.

Scheduled launch is a commercial service. That's different from responsive launch, and I want to distinguish the two really quickly, but launch is a commercial service. There's no reason that the DoD needs to own that. It's a combat service.

In the middle of that is combat support, which are those things that are not directly in combat, but those things that support conflict. In the rest of the DoD, again, we understand the differences between these three things, and we say, "Look, combat arms, I need to own. I can't rely on a commercial entity to do combat arms."

Combat support, I can go ahead and have shared government ownership and commercial ownership. You see that in aircraft transport. We have C-17s and United Airlines Flight 255 bringing troops to the front. Both of those are present when we bring troops to the front.

Then you have combat services, which tend to be rear echelon services, which can almost be purely commercialized. For the US military and the US national security, almost all of our undersea communication is commercial architecture. It's commercial undersea communication. We rely on it every day.

We don't rely on it to string wire across the battlefield. I don't actually think we string wire across the battlefield anymore, but you get my drift.

[laughter]

**Doug:** We don't rely on it for that, but we rely on it for the undersea communications, and we're satisfied that that combat service can be commercialized.

Those fundamental concepts apply equally well to space. We've forgotten to do that.

**Brian:** Jeff, you wanted to go?

**Jeffrey:** I'm going to elaborate. I think Doug has said it very well. There are just some capability...I'm very sympathetic. Military customers have some needs that are, I'll call it, inherently governmental. They have to absolutely be there when they need to be there in the form they need to be there. I'm very sympathetic to that.

Combat arms is [inaudible 38:49], air transport, secure terminals and secure communications. I think that's an important thing, and I think there's no reason that the military shouldn't be acquiring systems that it really needs.

I think the discussion is more interesting when you get to, is there really a commercial market out there? How robust is the commercial market? What are the kinds of capabilities that the military needs? Is it a peacetime capability, or is it a wartime?

There's no black or white single answer. There really is a spectrum of capabilities, but yet in the totality, I'm optimistic there's enough commercial out there that's going to be attractive and available, and also suitable for the Department of Defense and the national security to avail themselves of.

**Brian:** I want to start bringing in some of the questions of the audience. Actually, there's one I want to tie together. It's something I was going to ask already.

That is, does this burgeoning commercial world make it more or less likely there's going to be a conflict in space? In other words, can we see the expanding commercial as a one factor that might make it less likely there's going to be conflict in space?

**Doug:** It depends upon your viewpoint. If we agree with the policy prescription that I've laid out that the more resilient you are in space, the less likely you're going to have conflict.

That adds to less likelihood if you agree with what we talked about before with the merchant companies and the need to protect merchant activity.

You might consider that it's more likely, but really, the number of times that mercantile activity has led to full-scale conflict are not that large.

Larger international economic concerns like access to oil during World War II, the run up to World War II, or those kind of things, were certainly commercial interests, but not in the same way we're talking about here.

I don't want to suggest that just because you've commercialized space, suddenly it's going to be an active war-fighting zone. I like to go back in history.

The first contract for an aircraft in the world was let by the US Army to Orville and Wilbur Wright. That was the first contract for an aircraft. At the same time, the entire commercial aviation industry was developing.

The fact that the commercial aviation industry developed did not make it more likely or less likely that we were going to have World War I or World War II, or the Korean War or the Vietnamese War.

I think that we shouldn't overextend these analogies to suggest that just because it's a commercial activity in a domain, that leads to conflict in the domain or vice versa, that the presence of commercial activity necessarily inhibits conflict.

**Doug:** As to your question of whether it is more likely or less likely that we'll see a conflict in space, I'm going to answer a resounding yes.

[laughter]

**Doug:** The private sector can play a role in space in multiple ways. If the commercial sector improves resiliency, on the one hand, it diminishes the value of attacking. What's the point of attacking it where more resilient?

Conversely, you could also see, though, if the military becomes so dependent on commercial systems, it may decide that it has an actual military interest in protecting those systems. We saw some of that in World War II in the Navy protecting maritime shipping there.

You could get the military drawn into a conflict potentially in its role, if they're really dependent upon these capabilities. I think you can also see, potentially, commercial capabilities becoming a target, maybe an easier target.

You can take on a commercial system, maybe an unmanned or uninhabited system, and create effects that don't necessarily injure anybody. What's the military response going to be to that?

I don't have an answer to that, but there are a lot of dimensions to this, so I don't know that I can tell you that it's more likely or it's less likely. It kind of depends upon the circumstance and the situation.

**Brian:** Josh?

**Joshua:** I think, going back real quick, one thing I wanted to highlight is that I am critical of the Air Force, but they are making progress. I think that needs to be highlighted there, because I don't want to get lambasted by Air Force service members saying, "What about all these things we're doing?"

[laughter]

**Joshua:** Just want to put that to the side.

The other one, just to touch on something that Jeff had mentioned, we need to look at everything as having almost a nuclear triad for space, where we're not just putting all of our eggs in one basket, not purely governmental, and not purely commercial.

There is a sliding scale from inherently governmental capabilities to things that can be provided by commercial.

In terms of the economic vitality and importance of commercial space to national security is, I think the thing that we're hitting on is that commercial space and space at large is fundamentally not just a national security asset. It's an economic security asset.

That's where we're starting to start shifting our perspective in how we treat commercial integration with the military, within intelligence, within everything at large.

I wrote an example that -- and this is going to sound a little bit weird -- the United States Air Force has a direct hand in Tinder. All those location-based dating applications and everything else are enabled by GPS. Who runs GPS? It's the Air Force.

It's not just the GPS. It's also SCADA systems and ATM systems and all these other pieces and components that are operating right now, so when you start talking about commercial integration, you need to start really looking at that in terms of a conflict environment.

That's not something that's necessarily happening at either a low enough or high enough level. I think on the one hand, you have very high classification, Schriever War Game-style activities which are great. We absolutely need to have that.

There's other conversations that are happening that need to happen at that lower level. What happens if one of these... We start contracting this capability, and China does something or Russia does something?

How do we respond? What does that look like? What's my responsibility as the United States government to retaliate or defend if I'm using this as a service? If it's an allied partner, what do we do?

These conversations aren't necessarily happening openly, and I think maybe in terms of the sustainability conversation that Secure World's trying to have, maybe it needs to happen publicly. Maybe we need to have those dialogues where we start to talk about, what does this actually mean? What does commercial implication mean for us?

**Brian:** I'm going to tie together a couple of the questions that are up here. Doug, I think I'll start with you.

One of them is, doesn't the lack of norms or attribute means low-level counter-space activities could be misinterpreted and lead to escalation?

Tied to that, how does SSA play a role in increasing transparency and attribution in the domain?

**Doug:** That's a great question. It's a little bit complex, because you put together norms and attribution, which really are two separate things, so if I can separate those.

For the longest time, the DoD wasn't sure what norms it wanted in space, so it would not endorse any. That's the condition we find today within the US government. We don't know what norms are in our interest from a DoD national security perspective, so we're fearful of endorsing any norms.

I think that's a consequence of not having a mature military-minded leadership set for space, which I'm hoping will change in the next 20 years as we create a space force.

**Brian:** There it is.

[laughter]

**Doug:** You already all know that from me.

Norms are important. Norms are important in every field of warfare. The norms of how ships pass each other, the norms of how you signal, the norms of how you deviate from lanes of traffic, those norms are important, because they signal certain kinds of behavior that we then infer hostile or non-hostile action from. Norms are important for that sake.

Norms, by the way, again, as I said a little bit differently, that's different than guidelines. Norms are the normal way of doing things. They're not necessarily specified. They're just norms.

To go over to attribution, one of the reasons why I concentrate so much on resilience and making the level of conflict high enough that you can actually inhibit action is because if you make the level of conflict high enough, attribution is no longer an issue.

If it's easy to do a cyber attack, or it's easy to jam, or it's easy to blind, then it's very hard to attribute in space. SSA, in this case, reflects more than just where spots are in space. It reflects all of the things that effect the domain.

It's understanding the full domain and all the things that effect the domain electromagnetically, photonically -- not really a good word -- and physically and positionally.

SSA is more than just tracking objects in space. It's understanding what's happening in the domain. The lower the level of conflict necessary to effect that domain, the harder it is to attribute. The harder it is to attribute, the more likely it is that it will happen, because you can't hold anybody responsible.

These are all part of the whole theory that we promulgated on increasing resilience, because that helps the attribution question get easier. Not simple, just easier.

I think attribution is important. We have to be able to do it, but we can't be so naïve as to think that tracking two dots in the sky is all that I will need to do to attribute what's happening in space because it's far beyond that.

**Brian:** Anyone else on that?

**Pam:** I'd just like to make a point that there are different views on commercial around the world. Here in the United States, we have very bright lines between national security space, civil space, and commercial.

I'm a commercial company, you're a commercial entity. You may have a government customer. It's not always obvious, maybe, and completely transparent when you have a government customer, but it usually is.

Like a launch of an Air Force satellite, you may not know what the satellite is, but you know it's being launched by this company for the Air Force.

Other countries have much more malleable boundaries, and I think to this attribution point, that's very interesting. From my perspective, an obviously commercial company doing x should not be seen as a threat, because they're obviously a commercial company. That is our view of the world.

In other countries, where a commercial enterprise is actually just one layer deep, the government is right behind it, or deeply involved in the activities. These are just different commercial systems, different systems of regulation, government, oversight, and so forth.

That's OK. All those things are OK, but it does make it more difficult from an attribution standpoint. The way I look at this commercial thing is, Doug, I think you said it perfectly. It's like, is it United? Is it the United flight that's bringing troops to Afghanistan, or is it a C-17 landing in Afghanistan?

You personally, if you were flying those airplanes, you would have a different perspective on risk for all of those. If you're going to go into a bad neighborhood or a risky situation, you know exactly what you're getting into.

That perception is on both sides of the fence, right? Right? Not only the pilot, but also the bad guy who wants to do something. Not going to mess with the United flying from Washington to Atlanta, but for sure, would probably try to mess with the C-17.

I think when you can't tell the difference, that attribution thing is a big deal, so that's why what we're talking about is extremely important, especially a lot of the norms, because they're about transparency, and they're about creating expectations and beliefs.

Where there's more ambiguity in whether it is a truly commercial enterprise, those kinds of norms can make an enormous difference for the rest of the world.

**Bhavya:** Brian, if I can add something to what Pam said. Doing this study on commercial space in China, we went. We interviewed. We talked to a lot of companies, as well as some government officials. One of the things we learned, which just blew my mind. We might think that we have these bright lines between government, commercial, and civil.

From the Chinese perspective -- it's all about perceptions -- they don't see that. They think that it is just as intermingled in the United States as we claim it is in China. Again, whether it's incorrect or correct, it is a perception that they have.

**Pam:** It is an extremely interesting point that we have commercial satellites doing rendezvous proximity operations and cooperative robotics with government satellites today. It's called the International Space Station.

**Brian:** [laughs] Yeah, exactly.

**Pam:** How threatening is that?

**Brian:** Bhavya, I want you to expand a little bit more. We've been talking quite a bit in the context of the US military thinking about commercial sector. Are there other countries also thinking about how they would engage with commercial for national security reasons?

**Bhavya:** One of the things we looked in our China study was what are the drivers. Obviously, the private sector drivers are actually fairly similar to private sector drivers in this country.

From the government's perspective, the drivers really are the government thinks that their state-owned enterprises are old and slow and bureaucratic. They think that private sector is going to bring the innovation and the new burst of energy and support the national security mission.

They want to develop the private sector in parallel without bringing it too close to the SOEs for that reason, but then ultimately it will help with winning their wars. I'm sure there's others on the panel who can speak to how it is in Europe, but China is quite interesting.

**Brian:** One of the questions that's pretty highly rated up here, I'm going to throw it out there because it's complicated. [inaudible 53:26] says, "Don't we need new international rules and legal prohibitions because these non-binding norms, rules of the road, don't really have any deterrence effect? They don't really have anything that says you must follow them. Is that why we have to have more firm things?"

**Jeffrey:** What non-binding rules and norms have global traction to date? I think there's great promise in non-binding norms and practices.

Of course, if we discover that they're not really gaining acceptance in the international community, I certainly think we can revisit that, but I don't know that we have any globally established norms and practices by which we can judge the answer to this question yet.

**Joshua:** I disagree with Jeff on this one. We do have some well-established norms. They're established in the Outer Space Treaty, and we know what those are. All of the prohibitions against harmful interference, all of the other things about no military bases on celestial bodies or the moon, no placement of weapons of mass destruction in space.

We have fairly well established, I don't even want to call them norms, because they're not norms. They're treaty provisions that prohibit certain activities and in fact in other cases require certain activities like rescue of astronauts. These rules are agreed to internationally. They've stood us well, and I believe there's always a place for those.

I believe what happens also, though, is that because we're afraid to establish new rules, we get into this circular argument where if it's not legally binding, it's not effective. That's not true. We talked about the Orbital Debris Mitigation Guidelines earlier in the day today, and I think...

**Jeffrey:** I want to [inaudible 55:28] . I'm totally aware of the Outer Space Treaty, and the provisions.

[laughter]

**Jeffrey:** I studied them recently again, but I thought we were talking about norms and practices beyond the rules.

**Joshua:** We are. Let me continue. ODMSP, we saw the compliance is only 40 percent. I actually think that intended compliance is probably higher, but actual compliance is lower. That's pretty good because we have a norm that is not a legally binding norm, but it still leads to compliance.

The US violated that norm for many years. We finally decided to clean up our act, and we're getting better on that ourselves.

In between are other things. There were some things that should be law. I mentioned already, we have prohibitions against certain forms of warfare. I believe there should be prohibitions against intentionally creating massive amounts of debris in space.

I absolutely believe there's a need for an international moratorium on kinetic ASAT activities, and that we should outlaw those kinds of weapons. I think that the balance of the nations of the world could agree to that.

On the other hand, probably people are not going to agree on exactly what closure distance is, or what kind of space traffic management system you need. There can still be behavioral suggestions and guidelines that I think are useful because the most of the space-faring nations will go ahead and agree to follow things that are in their interest to follow.

In fact, all treaties are based upon what nations believe are in their interest to follow. Some of them, we write down, and sign, and approve by Congress. Some of them, we do informally.

I think that you do need some things, but we shouldn't be over-prescriptive. The things that have been introduced in the UN, such as Parallels or PBWT, will never happen because they're not in anybody's interest to follow, and you're not going to go ahead and get them to be part of any international agreement.

**Brian:** A couple of broad questions just to close up the panel here. I asked whether the expanding commercial sector makes it more or less likely to see conflict in space. Let me ask the inverse of that. There's all of this rhetoric about warfare in space, and the spread of space weapons, and all this other stuff.

Is that having a negative impact on the commercial sector, do you think, Jeff, or could it in the future?

**Jeffrey:** I think in the aggregate, it will hurt the space economy over time. What happens between now and some period of time, I think there clearly will be an upturn in the commercial sector that is attempting to apply its capabilities to helping the Department of Defense and communities in this.

I know in our particular case, we're finding some traction in tactically responsive space, which is a capability that I think the military is beginning to find some value in.

Just in general, I don't think conflict is good for the overall investment environment. As a great thinker, General Hyten, said, and I'm paraphrasing, if you have a conflict in space, something really bad is going on on the ground.

I just think that the military people that I deal with, their objective, and I think it's valuable, is to keep peace and stability so that commercial activities such as ours and those around the room here can flourish.

**Bhavya:** If I can add to that, while conflict itself may be less than ideal for the robustness of commercial space, the specter of conflict may in fact be good. [laughs] There is more DOD government funding that increases the size of the space sector, more activities, there's more new kinds of activities.

Commercial SIGINT, for example, we wouldn't really have at the level, or commercial Soar, that sort of thing. Also, because the government would like to be better prepared for the conflict with commercial space, maybe we will address the externalities of space.

We have now, because there may be conflict, where we want our commercial assets to operate as planned, we want to make sure that debris is cleaned. [laughs] I think preparing for conflict may be good for the robustness of commercial space.

**Doug:** Brian, I'm going to make a completely unsupported statement and hope that it's true.

[laughter]

**Pam:** Please go ahead.

**Doug:** At least I prefaced it that way.

[laughter]

**Doug:** In my opinion, where commerce flourishes, conflict decreases, and I think that's true in most of the domains that I can think of. Maritime shipping, as has already been said, is a multitrillion-dollar industry.

The threat of large scale naval encounter, we have not worried about large scale naval encounter in a true sense since the end of World War Two. There was some minor problem with that in the Cold War, but again, associated with peer-to-peer nuclear conflict.

It's too valuable to nations to maintain the economic flow than it is to disrupt that economic flow, and when we disrupt that economic flow, we're really having large security impacts, large economic security impacts.

The more valuable space is as an economic engine, the less likely, in my mind, it leads to that conflict occurs there or at least conflict that affects the economic activity, absent the intention to engage in peer-to-peer conflict.

**Joshua:** One question, real quick.

**Brian:** Go ahead.

**Joshua:** I think a lot of the conversation that we've been having thus far quite rightly focuses on space in sort of a vacuum, pardon the pun.

**Brian:** [laughs]

**Joshua:** The reality is that, right now, all of the space-based capabilities are all focused on delivery of an effect on the ground, so that treating space in a vacuum again is a poor construct strategically because it's all about synthetic aperture radars. It's about communications.

It's about the delivery of movement and precision targeting of things on the ground. We need to look at it in that context.

Right now, I think there is very much a split or a dichotomy where it's, everything is up there, it's great, we've put an asset up there. That's where the conversation stops, when in reality, it's about having that marine fire team that's outside coast or wherever to have that capability to know that, "I am here, and this target ammunition is going to go there."

We can't separate that. I think it's important that we go always back to the delivery of facts or something on the ground.

**Brian:** One final question to the panel, and that's whether the commercial world should be more involved in some of these national security debates that we're having, discussions over policies and strategy. Do you think that should be the case?

**Pam:** Absolutely.

**Brian:** [laughs]

**Pam:** I think the interesting thing about industry is, they talk to everyone. They talk to all their potential customers, so I think they also are watching their own assets very closely in space.

I think it can be very easy to get wrapped around a specific perspective about what's going on without really being connected to the way the world is really working in that operational domain.

**Joshua:** Absolutely. We wrote a 50-page report.

[laughter]

**Joshua:** The conversations that happen on the sidelines of our program, of which Brian, and Victoria, and Secure World have been absolutely fantastically involved in, were so positive independently and unintentionally because we had individuals sitting next to one another who, I'm a creature of social media, so I know what's going on in SpaceX, and Virgin, and everything.

You had an individual from the Air Force sitting next to a New Space representative and like, "Oh, you're doing what? You can do that?" That's really interesting.

Having these dialogues back and forth are absolutely critical to creating awareness not only of capabilities and requirements, but to raise critical questions of saying, "What happens if we get into a conflict and something happens, or there's a debris-creating event and my payload is hosted on somebody else's payload?"

Absolutely, it's vital that these conversations happen, and they need to happen at multiple levels, both classified and unclassified.

**Jeffrey:** I, of course, agree. I do think that we shouldn't kid ourselves. It's not just one conversation or one setting. This, getting a large institution or institutions to change requires some effort, and persistent, and showing them the capabilities you have.

I have every confidence that over time, commercial will play a growing and growing part of our military and national security portfolio.

**Doug:** I would say that I view there's different conversations. I think there's a purely commercial civil conversation that needs to occur, and in fact most of what we've done today has been a purely commercial civil conversation about, how do we deal with normal activities in space, short of conflict?

Space traffic management, debris control, those kind of things, that's a conversation that doesn't really need to be had with the national security sector. There's a national security conversation that has to happen about, how do we plan defenses and how do we go ahead and establish strategies and doctrine for combat in space?

It doesn't necessarily have to include the commercial world, but could. In the middle is a very robust conversation about, how do we relate with one another? That's the conversation that I think is probably most important is, how do we relate to one another?

How do we make sure that you can engage in your commercial activity and be successful, that I can engage in my national security activity and be successful, and that together we can be jointly more successful by coordinating our activities?

I think that happens in our financial sectors, it happens in our cyber and computing sectors, it happens in all of our different sectors. In space, it should happen as well.

**Brian:** Kindly join me in thanking my panel for a great discussion.

[applause]