Event Transcript:
Russia's ASAT Test: What Does it Mean? (Virtual)
April 24, 2020

Victoria Samson: Hello and good morning everyone. Welcome to Secure World's webinar, Russia's ASAT test -- What Does It Mean?

I'd like to thank everyone for coming on day whatever of quarantine. We're really glad that there's interest in the issue that we think is extremely important and thought-provoking. We look forward to having a fascinating discussion.

We've got a fantastic series of panelists up and looking forward to you hearing what they have to say. Then, of course, we'll be opening it up to questions from you, the audience.

I'd like to introduce myself. My name is Victoria Samson. I'm the Washington Office Director of the Secure World Foundation.

Next slide, please.

Just a little bit about Secure World. Since we have a fairly large contingent here, you may be unfamiliar with our organization. We're a private operating foundation that promotes cooperative solutions for space sustainability and peaceful uses of outer space.

Our foundation acts as a research body, convener, and facilitator to promote key space security and other space-related topics and to examine their influence on governance and international development.

Our mission is to work with governments, industry, international organizations, and civil society to develop and promote ideas and actions that achieve the secure, sustainable, and peaceful uses of outer space, benefiting Earth and all its peoples.

We translate this mission into actions aimed at raising resilience of space sustainability, building common understandings of complex issues, facilitating dialog, and promoting cooperative governance with space activities at the national and international level.

Just a little bit about our organization, we're still working on our 2019 report. Just to get a sense, in 2018, Secure World Foundation completed 120 projects and activities in over 20 countries on six continents on a programmatic budget about 1.5 million. We're small and pretty agile.

Next slide, please.

We'll be going into this more later on. Particularly, my colleague, Brian will be talking about this. We wanted to make sure everyone was aware of an annual report Secure World puts out on our "Global Counterspace Capabilities -- An Open Source Assessment."

What we do in this threat assessment is we look and see we can find in terms of unclassified open source information about five different types of counterspace capabilities.

We try to get a sense of what we know and what we just are conjecturing and really getting idea of increasing the transparency in the discussion about these different counterspace capabilities. We look at the United States, Russia, China, France, India, Iran, Japan, and North Korea.

It's available on our website for free. There's an executive summary if you rather not read all 140 plus pages. The long story short is that currently, only non-kinetic capabilities are actively being used in current military operations.

That doesn't mean that there aren't counterspace capabilities being developed and tested and thought about and that's what we'll be going into more with our panel today. With that, actually, let's go into our panelists.

Next slide, please.

You've already met me. Our first panelist is Dr. Brian Weeden. Brian Weeden is the Director of Program Planning for Secure World Foundation, has nearly two decades of professional experience in space operations and policy.

He is a member and former chair of the World Economic Forum's Global Future Council on Space Technologies, a member of the Advisory Committee on Commercial Remote Sensing to the National Oceanic and Atmospheric Administration, an executive director of the Consortium for Execution of Rendezvous and Servicing Operations.

Hello, Brian. Thank you for joining us.

Brian Weeden: Good morning, Victoria. Glad to be here.

Victoria: Great. Our next speaker is Michael Thompson. Michael Thompson is a satellite analyst and open source researcher who tracks military space programs. He is currently finishing his graduate degree in astrodynamics.

Michael, I think it's the first time we've had you at one of our events. Thank you so much for being willing to show your expertise.

Michael Thompson: Absolutely. Thank you for the introduction, Victoria.

Victoria: Our next speaker will be Pavel Podvig. Pavel Podvig is an independent analyst based in Geneva, where he runs his research project, Russian Nuclear Forces.

He is also a senior research fellow at the UN Institute for Disarmament Research and a researcher with the Program in Science and Global Security at Princeton University. Thank you for being here, Pavel, and good afternoon to you.

Pavel Podvig: Thank you. Thanks for coming.

Victoria: Thanks, and then our last speaker is Chris Newman. Professor Chris Newman, BA (Honors), PhD is a professor of space law and policy at Northumbria University in Newcastle. He has been active in teaching and researching space law for over two decades.

Chris has published extensively on the legal and ethical underpinnings of space governance and works closely with the space industry in the UK. Hi, Chris. Thank you for coming.

Chris Newman: Hello, Victoria. Thanks so much for having me.

Victoria: How it's going to work is we've done our intro, the panelists are each going to speak for about 10 minutes each, sticking to the time frame, guys. The one thing about not being in person is that I can't hand you guys notes when it's getting close to time being up, but I trust you. Then we'll open it to Q&A.

I will have some questions to kick off and then we'll try and get some questions from the audience.

Next slide, please.

Great. How this works if you're unfamiliar with Zoom. In order to ask Q&A, find the Q&A button, click on it, first step. Then you can look and see what questions have already been asked, you can upvote ones you think are interesting and you want to have answered.

If your question has not already been answered, please feel free to type it in as succinctly as possible and we'll try and see if we can get it answered for you. I will point out as well, this is pretty obvious since we're on an Internet recording, this event is on the record. It is being recorded, media are present, and we will be doing a transcript as well.

The recording will be up on our website at some point in the near future, as will the transcript. Just to let everyone know that this is happening. With that, let's go to our next slide. Brian, you're up.

Brian: Thanks, Victoria. I'm going to start off by giving a background overview of the Nudol program and Russian [inaudible 6:56] programs in general. Next slide, please. First to remind everybody that this is not really a new thing. The thing that Russia tested just recently was a missile for a direct-ascent ASAT weapon.

This is not a new capability. These capabilities have been around since the early days of the Cold War. During the Cold War, the Soviets built a missile defense system called the A-135 that was placed around Moscow.

[inaudible 7:29] that it likely had a DA-ASAT capability. The Soviet A-135 system had two interceptors, one that NATO called the Gorgon and one that was called the Gazelle. The Gazelle was a short-range, basically internal to the atmosphere, but the Gorgon was an interceptor that would go exo-atmospheric and was assessed to probably have been able to hit satellites.

Of course, it had a nuclear warhead on it, so you didn't want to have to hit it, you just had to get close. On the right here, you can see a drawing of the 51T6 missile, which was the Gorgon.

At the time it was silo-based. This system was first deployed in 1992 and this particular missile, the 51T6, was retired in 2007.

Next slide, please.

What's going on today is Russia is developing a new capability that is known as the PL-19 or Nudol, and this program began, as far as we can tell, in 2009.

There were contracts signed with the primary entity, which is Almaz-Antey, and then several subcontractors that are also working on the program. These are all the Russian equivalent of Northrop Grumman and Raytheon, defense contractors that have a long history of building space and ballistic missile programs within Russia.

On the right, you can see an artist's depiction of the Nudol system. This actually comes from an Almaz-Antey company calendar. As compared to the previous Gorgon, which was a silo-based missile, what's being developed now is a mobile system built around a transporter erector launcher.

Far as we can tell -- as we said, the contract started in 2009 -- the first ground testing of the rockets was in 2013, and then there have been several flight tests since then, which Michael's going to talk about in a little more detail. It is a tail-based system, it's got a solid rocket with a kinetic kill vehicle payload.

There seems to be three major components. There's a rocket, there's a separate command and control system, and then a separate radar system.

Next slide, please.

Just a brief comparison of the Nudol to some other systems that are out there. Russia is not the only country that has tested or is developing directors in ASAT capability. You have the Russians working on the PL-19 Nudol. Second from the left there is the Chinese DF-1 C, which is likely the basis for their SC-19 directors in ASAT weapon.

The third slot, you see an American Standard Missile 3. This was used in 2008 to destroy a US satellite. Then on the right, you have the Indian Prithvi Defense Vehicle Mark-II. This was used last March to destroy an Indian satellite.

These are the four programs we know of at the moment that are either under active development or have recently been used to destroy a satellite. They're considered to be potential directors in ASAT capabilities.

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Finally, I just want to talk briefly about where this fits into Russia's overall space portfolio. This is an assessment that came directly out of our counterspace report. Looking across the breadth of

counterspace capabilities, direct-ascent, co-orbital, direct energy, electronic warfare, space situational awareness, Nudol fits into that first line, which is LEO direct-ascent.

It's clear that Russia is currently doing active research and development and is flight-testing this capability. As far as we can tell, it's not operational. That is probably at least a few years away. It appears to be only going against low Earth orbiting satellites.

At this point, we don't have any evidence to suggest Russia is conducting flight testing or development of a direct-ascent against higher altitude orbits. At the same time, Russia is developing rendezvous and proximity capabilities that could be used for co-orbital anti-satellite technologies, including some recent tests in low Earth orbit that did produce debris.

That could be an indication that it actually was some sort of co-orbital ASAT test. Absolutely developing research and development for direct energy weapons. The big capability that Russia has been working on and actually using operationally is electronic warfare.

We've seen some very sophisticated systems deployed, Ukraine, Syria, elsewhere, that Russia is active. Finally, Russia has a pretty advanced space situational awareness capability, which is what we will need to be able to target other satellites. With that, I'll go ahead and stop, and turn it over to Michael.

Michael: All right. Thanks, Brian. I'm going to be talking a little bit about what we can get from this test in terms of in the open source world, and then also, how these have compared to previous tests.

Next slide, please.

One thing that I wanted to point out is that all of these tests come with navigation warnings. These are pretty standard airspace or maritime closures for any number of definite reasons. It could be scientific operations, it could be military activities, gunnery operations. Then particularly relevant to this case, rocket launches.

Rocket launches, warnings that we get from that, they allow us to identify these tests before they happen. In this case, we actually knew, or at least suspected, based on navigation warnings, that this test was coming around six days beforehand. That allowed us to do some preparation analysis for if there was, for example, a kinetic impact.

Next slide, please.

I wanted to point out here, and this is something that I actually went back and double-checked this week, because I wanted to be sure, every known Nudol test, this is the 10th one, has put out navigation warnings multiple days in advance.

Most of them have two portions. There's a first stage splashdown that you can see there in the lower left on this map. Then in the upper right, there's an eventual splashdown for the kill vehicle, upper stage, or whatever you really want to call it here. This constrains the direction of launch, the launch site.

Next slide, please.

Something that I wanted to point out is that there are likely little to no difference in navigation warnings for what I'm calling here just a flight test, which is what we saw, it's not impacting anything, and a potential kinetic test.

It's assumed that if there was going to be a kinetic test, an actual hit-to-kill test, the navigation warnings would look very similar. Something that I had looked into was analyzing the objects in orbit at the given time frames to attempt and spot, are there any targets that look particularly promising for a kinetic intercept?

I'm going to talk a little bit more about that specifically for this test next.

Next slide, please.

Now I'm talking specifically here about the April 15th test. The navigation warnings, it constrains the timing and the location of the test.

It was somewhere between 1500 and 2100 UTC in Plesetsk, which is where the Nudol program is based, or at least has performed test launches in the past. Based on this timing, and I have in parentheses here with a laugh to myself, we can relatively quickly constrain a list of possible targets.

I say relatively quickly because there's a lot up there, as you're going to see in a minute. An isolation of every Russian satellite that passed through that area that combines the first stage and the splashdown warnings yields this big corridor. We can go through and try and pick out specific things that look promising in terms of potential targets.

I will say here that the navigation warning this time, it's a six-hour window. Past tests have been more constraint. I think I've seen as low as two hours, an hour and a half for some of these navigation warnings. It's not all six hours, which makes it hard to narrow down exactly, are they trying a near miss of something.

That's the kind of thing that we can definitely get if we had a better constraining of the actual timing of the test. If you can go to the next slide, please. Here, a lot of potential targets. This is for the full six hours.

This is every Russian satellite that passed through that blue window that you see down there between the first stage splashdown and the eventual kill vehicle splashdown for that six-hour period.

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I wanted to say we can still narrow it down a lot further than that. We can talk about, what type of objects are likely to be ASAT test targets? The answer is, first of and foremost, low altitude targets. We are past the point of the 2007 Chinese test of blowing something out of space at 800 kilometers and essentially leaving debris there permanently.

I would hope that we are past tests like that. Really what we're looking for is we're looking for low altitude objects and specifically, dead or recently launched satellites with unknown functions. I put a few examples here. Microsat-R, that was the target for the Indian test in early 2019. It was most likely a dedicated target.

We didn't necessarily know much about it when it launched. We had some images, but it was very murky as to what its actual purpose was. We think at this point it was most likely essentially a dummy satellite that was just put up there to be shot down.

USA-193, the US test. It was a malfunctioning and very quickly decaying satellite. It was set to reenter within a matter of days or weeks, and it was shot down. Then the Chinese test back in 2007. That satellite had died years before.

Essentially, using common sense as to what might actually be a target, you can really vastly narrow the potential targets. Can you go to the next slide, please? This is a much more measurable scenario. Then all of these objects can be examined one-by-one, just based on what we know about them, things like that.

I'm not going to go through every single object here that I had kind of picked out as, well this is potentially interesting, but I will talk about a couple and the implications of that.

Next slide, please.

This is a couple of highlights from the target search. A couple of things that I found were really interesting. One of them was Kosmos-2535 through 2538. This was a quartet of satellites from late 2019 of relative unknown function. In terms of the Russian satellites, a lot of times, we can get at least some information out.

We know that they're part of a larger program. In this case, it was pretty unknown. The first two, 35 and 36, they performed RPO with each other, relative proximity operations. There was some speculation that 37 and 38 are radar calibration targets for air and space defense forces.

You can say that a large radar calibration target could be used for calibrating ground-based radar, things like that. Another interpretation, if you will, [laughs] is that it can be put up there to make sure that they can track something with the accuracy that they can hit it with an ASAT.

I will say that they were quite high for a potential ASAT test, so I don't think that they were trying to be hit or anything like that. These were over 600 kilometers. One thing that really, really stuck out to me was this SO4 rocket body. It was at very low altitude. It was at 230 kilometers on April 15th. It decayed five days later. It decayed on the 20th.

Also, if you can go to the next slide, the geometry of this, it went directly down the firing line. If you've looked at the navigation warnings and the geometry for the Indian test in 2019, it was in a slightly different orbit, but this looks very, very similar to that.

It travels directly down that firing line, it's very, very easy to hit that essentially head-on with the ASAT capability that we know that Russia and other Asians possess.

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This is, essentially, if you want to do this, or what we can get from the opensource, there are commercial SSA organizations, LEOLABS, other, that allow really near real-time monitoring of these potential targets as they're traveling through this, what I'm calling, the firing line.

With LEOLABS specifically, you need to have an account to actually get their predicted state vectors and things like that. Even without an account, you can monitor when new state vectors are generated just based on their own ground networks.

Essentially, as new state vectors are generated, you know that, OK well, that object is still in one piece. Throughout the day, sometimes you might get multiple updates as compared to waiting for Space-Track where you get an update every day, every two days, depending on the object.

Essentially, as new state vectors are generated within hours of overflying that test area, you can cross them off as, "OK, that's still alive, that's still alive." You can really understand, almost in real-time, what has actually happened in this kind of test.

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These are some just high-level takeaways on what we can understand from the orbital analysis, the navigation warnings, things like that. There were potential low-altitude targets that could have been used in this test, but they weren't, which is ultimately a good thing.

At the end of the day, speaking for myself at least, I don't want to make a huge deal about this test compared to past tests because ultimately, nothing was hit. They've done these type of tests before. It's not like there was nothing up there for them to hit. There clearly was, and they chose not to. That's ultimately a good thing.

A further narrowing of that time window could likely constrain the parameters of the test even further. It was nice, it was a surprise that the US military has announced this test when previous ones were unacknowledged. If they want to throw a launch time in there, that'd be great, but maybe that's wishful thinking on my part. [laughs]

This type of framework using essentially navigation warnings and really just basic orbital analysis. They allow us to monitor these tests in near real-time at the unclassified if you're government or opensource if you're NGO or think tank level. I wanted to point out here, US military acknowledged this test. Previous ones were left unacknowledged.

To understand these tests, we can't always rely on a statement from the US military that says, we're in the process of tracking a direct ASAT. Some opensource work is definitely needed. That is all that I have, I believe, on my end.

If you have any questions specifically about the analysis, you can either reach out to me or you can throw them in the chat and we can maybe get to those during the Q&A portion. To all, thanks.

Victoria: Great. Thank you, Michael. Next, we'll have Pavel Podvig talking about the geopolitical and Russian domestic context and his take on this test. Pavel?

Pavel: Thank you, and thanks everyone for joining. I'll try to be brief and read more questions, I guess. I guess I was a little bit puzzled when I saw that people are asking questions about what does it mean this test? Because as Michael just mentioned, and Brian also mentioned, that it's not the first test. By my count, it's about 10th test, but none of them were successful though.

When I saw that [inaudible 25:55] notice a few days before, I just thought, "OK, that's another day in the office for the Russian space forces." Of course, the fact that US [inaudible 26:11] command announced it almost like in real-time that, "Oh, we are tracking it," that certainly drew people's attention. They think it's not something particularly surprising.

In fact, the United States acknowledged at least one earlier test, in December of 2018. There was a bit of information about that, but that was two months after the fact, so this is definitely the first real-time announcement.

The question, of course, is that what does it mean? In the sense that, is there any kind of geopolitical plan and grand design behind this kind of development? It's possible I would say, but I would say it's still unlikely though, or at least not necessarily.

If you look at the kind of things that the Russian defense industry is doing, there are quite a few holdover programs from the Soviet days. ASAT, of course, has its very long history in the Soviet Union. It was a very big thing in the '80s when they thought that they have a mission, which was to shoot down the American Star Wars satellite.

There were quite a few problems there. One of them was, in fact, the program to convert the interceptors of the Moscow missile defense system, A-135, into a conventional ASAT. I think that program was called [inaudible 28:06] .

There were other projects there. There was this contact [inaudible 28:11] ASAT. [inaudible 28:16] director said it's never been tested like its American counterpart in '85. Then there were all these mines which also were appearing recently and they were often the kind of satellite that are tracking other satellites.

There was a project that actually looked at [inaudible 28:41] under ASAT all the way up to the geostationary orbit. This is the [inaudible 28:48] which we now are enjoying the [inaudible 28:54] one of the booster stage debris is actually what used to be [inaudible 29:00] .

Again, as I said, this is not necessarily some major geopolitical, geostrategic development. My take is that it's not necessarily a mission-driven development either, in the sense that it is impossible or, I would say, it's fairly unlikely that there is a request from the military or there is any particular strategy that would require that, "Oh, we need an ASAT capability."

It is the way things worked in the Soviet Union [inaudible 29:48] in the way they work in Russia. The industry has quite a bit of freedom in pursuing its projects. It's very interesting dynamics, but

basically, if they show that they could do something, they get resources and that's about how it works.

Apparently, since Russia had quite a bit of money back 10 years ago or so, and was investing in all kind of military [inaudible 30:27] , it's not surprising that this project actually was revived. I should say that I'm firmly in the ASAT skeptics camp because I do think that this is not a particularly useful military capability. We could talk about that.

In fact, the history of the Soviet and the US ASAT program actually show that yes, there was quite a bit of excitement early on. Then the Soviet Union actually deployed an ASAT system that was "operational" for almost two decades, the IS system, but in the end, it was clear that you cannot really do much in terms of military defense with ASAT capabilities.

As I said, there was quite a bit of excitement around the ADI, but that's because the ADI having been built was a very, as they say, target-rich environment. Once the ADI went away, there is nothing there really.

Again, if we look at this particular program, again, as Michael mentioned, there were early tests. As far as call tell, the tests actually began in 2014. The first successful test was in 2015.

Then there were a number of others. We don't know the exact number because not all of them were actually registered. My guess is that there were probably two tests in 2019. I know that the early tests involved just a rocket, just the interceptor, no attempt to do anything with a target.

In fact, I also was surprised that people were expecting that this test would involve an actual intercept. I would say that the last time the Soviet Union did the actual intercept was more than 40 years ago. I would say that the Russian designers, they have quite a bit of experience with missiles, rockets, space, operations in space, and things like that.

I saw there is a question there that it got quite a few what's up. Does Russia feel the need to keep up with others? I would say that no, not really. They don't have anything to prove here. They could perfectly work on various aspects of the system if they are working on that system by just conducting these [inaudible 33:57] tests, if you will.

As actually they do with the Moscow missile defense. Russia does conduct the tests of this missile defense interceptor in Sary Shagan. They not for a long time involve an actual target. Still, they feel confident that they get the results they need.

The only caveat here, I would say that if we look at the possible connection with the missile defense, as Brian suggested, although I'm a bit skeptical that there is a connection, my understanding is that Russia has never really demonstrated that it has a hit-to-kill technology in space. Certainly, you would expect this to be worked on.

On the other hand, my take on that is that a hit-to-kill for the purposes of missile defense, of course...That's what others in the United States in particular have been doing. My take is that if it's a missile defense test, then you...The most important part of missile defense is not the interceptor. The most important part is the radar and all the supporting stuff.

You don't do these kinds of tests in [inaudible 35:28] Plesetsk. They're in Sary Shagan, which has a very massive radar infrastructure. If there is an attempt to do the hit-to-kill experiment, I would expect them to be conducted from Sary Shagan and there are various capabilities there.

Let me stop here and again, I'll just go back and say that if the question is what does it mean, these ASAT tests, I would say, "Well, not really much." It's not something I would necessarily cheer in the sense that it's definitely there is some work there going on and there are implications of that, but it's not in any way a turn to some kind of dangerous...At least this is not the point where it is turning anywhere [inaudible 36:25] .

OK, let me stop here and let's give it to Christopher, I think.

Victoria: Thank You, Pavel. OK, next slide. We'll move on to our last speaker, Chris Newman. Chris, it's all yours.

Chris: OK. Thank you very much. I'm going to be relatively brief. I'm going to take us through the basics of the law and how the law relates to ASAT tests because actually, I don't think the law's the interesting thing here at this point.

I'm going to come on to it. My thesis actually is that in an area, space governance generally is crying out for certain norms of behavior and normative standards that we can look at. I think we've got normative behavior, but I don't necessarily think it's a normative behavior that we're after.

What I'm going to do is look at the way in which ASAT tests highlight the intersection between arms control and space governance. There's been a lot of discussion in the United Nations. A COUPOS was then at the Committee for Disarmament, but there seem fairly fruitless discussions on anti-satellite controls.

What I'm going to is look at predominantly the lex specialis of space law. By that, I'm going to predominantly concentrate on the Outer Space Treaty and look at to see what that can tell us, what that has in specifics about arms control, and then also think about the central principles of the Outer Space Treaty.

It's those principles that I think the international community needs to reconnect with because ultimately, in the last 13 years, there's been ASAT weapons testing and demonstrations from four major space powers.

We're seeing a normative behavior all right, but it's a norm of ASAT testing occurring. Michael in his discussion talked about we're not going to see the high level tests, so we're already seeing behavior accommodating and attenuating to ASAT tests.

We're now seeing good ASAT tests, so this is something I think that we need to think about and we need to address. Before I do that, I'm going to go and look at the law and show why international law is not going to perhaps provide us with any assistance at this point.

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[pause]

Chris: Yeah, if we could move on to the next slide. Thank you, that's great. As we said, the Outer Space Treaty is predominantly a security treaty. It was at the time of the Cold War. I won't go into too much detail about it.

There are numerous texts and numerous academics who can provide a lot better exposition than I can, but we note in the preamble to the treaty is that the use of outer space should be for peaceful purposes.

International law scholars recognize, however, the breadth of activity that this can encompass, where peaceful is read as non-aggressive. Of course, every ASAT test and every nation that is conducting ASAT test will be at pains to stress the defensive nature of their ASAT capability.

The operative articles that we're really going to look at his Article IV, which is the undertaking not to station nuclear weapons or weapons of mass destruction in orbit.

Article IV has those restrictions, but it also has permissive areas in there as well. It doesn't prohibit the station of conventional weapons and nor does it explicitly prohibit the testing of weapons in Earth orbit.

Interestingly enough, it does prohibit the testing of weapons on celestial bodies. We have to assume that that is a deliberate attempt by the drafters to delineate between testing on celestial bodies and testing in Earth orbit.

Moving to Article IX, because this is another area that scholars have tried to look at and examine to see if there's any way in which that can limit ASAT testing in Earth orbit.

The discussion that states shall conduct their activities in space with due regards for the interest of other parties, again, we've seen from the number of ASAT tests that have happened that the due regard principle isn't strong enough to provide an absolute prohibition on ASAT tests.

Indeed, with an interpretive view on it, one might say due regard for other state parties might be ensuring that we have defensive capabilities in respective of anti-satellite weapons. Again, there doesn't appear to be a lot within the Outer Space Treaty that is going to help those who wish to limit ASAT tests.

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With there being nothing in the treaties to prohibit ASAT weapons test, we look at other arms control treaties. Discussion move to the community disarmament, but other treaties have stalled and been consistently unsuccessful.

China, Russia have offered treaty solutions, but these have been treated with mistrust by the United States, with perhaps some justification, given the China and Russia have engaged in ASAT test themselves. Customary international law has been explored as a possibility to restrict the weaponization of space.

Opinio juris requires a general inconsistent state practice. As I've already said, we've seen general inconsistent state practice all right, but that consistent practice has been to conducting anti-satellite weapons testing.

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The Galatea aside, states are conducting these tests. What we're now seeing is instead of a discussion on the prohibition of these, perhaps a move towards an outcome-based discussion. Instead of prohibiting the ASAT test, do we instead want to predict the damage that this can possibly cause to the Earth's orbital environment?

With the normative behavior we're seeing, what we're actually seeing is ASAT test evolving. We're seeing lower tests, we're seeing tests using these software targets, we're seeing debris mitigation and notification requirements.

What we can see emerging is the states themselves are attenuating these tests.

Next slide, please.

What options exist? From a legal point of view, the international lawyer in me thinks, "What I'd really like is a treaty, an international treaty, a nice solid treaty that we can all latch on to, and it'll be just like the Outer Space Treaty."

However, treaty negotiations seem unlikely. The timeliness of them, we know how long international treaties take to actually construct. Is there a will to do this? Are we actually at risk of unpicking the existing treaty regimes?

For a number of reasons, whilst the new gold-plated treaty might seem attractive, actually, at the present time, probably, we're best off looking to other methods. Naturally, the next area we look to is the softer agreements. You'll notice on my slide there, I've got the EU Code of Conduct

Softer agreements don't necessarily guarantee any more consensus than the more formal treaties. Where does hope lie? As I said, we've identified that states themselves are limiting their behavior.

Possibly, the time has come for a state to unilaterally promulgate guidelines as to what ASAT tests should look like, or state what their ASAT tests will comprise of, and at least start the discussion. At the minute, the Paris and other treaty negotiations are in diplomatic limbo and show no sign of being resurrected.

If we're looking for an international law solution, we'll look in vain. To paraphrase Carl Sagan, there's no indication that help will come to save us from ourselves. With that, I shall pass you back to Victoria.

Victoria: Thank you, Chris. So much wonderful information. Really thought-provoking presentations by all our panelists. Thank you. We have a lot of questions from the audience. The

first question I'm going to ask is one that I share with our top voting one. Pavel answered it already, but I'd like to hear what the rest of the panel has to say.

I understood that Russia has a history in the Cold War, having tested globally ASATs. As Pavel said, it's been four decades since they've done an intercept.

Does the panel think that Russia will need to demonstrate a direct-ascent ASAT test, just to show, as perhaps a political gesture, if nothing else, that it can, given that the United States, China, and India have all done so relatively recently? Panelists. I see Brian. You want to take this one? We'll go from there.

Brian: Yeah, I'll start. I agree with Pavel that they probably, from a technical perspective, they probably don't. Russia has some very good engineers. They've studied this problem for a very long time. From a technical perspective, I agree with Pavel, they don't.

I'm a little bit worried that maybe from a geopolitical perspective, they might feel they have to. Unfortunately, this is what we saw with India, was they kept it very much in terms that this test proves we're now a global space power.

Again, that's what concerns me, is maybe there might be that current that says they might have to, or that leads them to more of a political calculation than a technological one. Again, I hope it doesn't, but that's what concerns me.

Victoria: Anyone else? Pavel, do you want to take this one again?

Pavel: If I may. My take is that the political calculation is also...I don't see why would Russia try to do something...It has nothing to prove, really, here. Then as there was another question there, how this works with the attempt to get the PPWT, the treaty, to prohibit use of weapons in space.

It's just politically, it's not a very...It's a questionable measure. Cooler heads would prevail and they would say that, "OK." Everybody knows that Russia has this capability. As you said, it may not be on par with a hit-to-kill American one.

If they want to prove something, they would move into the missile defense hit-to-kill rather than to ASAT, and then they would get much more out of that.

Victoria: Other panelists' thoughts, no? OK. One of the questions that I had is that what does the panel think, broadly speaking, about the development of the defensive counterspace programs, the emergence of Space Forces around the world?

Does that mean that we are leading towards a norm, perhaps, as Chris would say? That that capability is useful only in a political sense, if not a military sense? What do you guys think about that? Chris.

Chris: What we're seeing is almost a splash of cold water here that these things were existing. We knew that these capacities were existing anyway. Space Forces, in many cases, I don't want to

make too many generalizations, are more administrative exercises than anything else. The classification of a realignment of responsibilities.

What we're seeing here is much more of a reversion to type. Actually, when I was talking about treaty solutions, I was being as guilty as anybody is talking as much of this in an arms control context. Actually, this is a broader space management problem. We need to think about the space environment.

That's why I think outcomes-related solutions are the way forward, rather than looking at the actual test themselves. What are we looking to really prohibit here? We're looking to prohibit damage to the space environment, we're looking to dampen down security fears.

It needs to be looked at across the piece. That's what we're seeing. We're seeing norms and behavior being interpreted where guidance and softer agreements are not being taken up.

Victoria: Brian, did you want to add to that?

Brian: Yeah, I generally agree. I would add, what we see in our counterspace report over last three years is, yes, a growing number of countries. We're up to almost 10 that are exploring this space, no pun intended.

There's a difference between the breadth of things we're seeing explored from a technological standpoint, and then the things we're actually seeing that are moving to operational use. What that indicates is that there's probably at least interest in seeing what is this, how hard it would be to do, maybe let's do some of the technological development.

There's a gap between that and the stuff that countries are saying, "We actually should put the time and effort into making this operational." Those are two very different things. Requires a lot more money and a lot more resources to make something operationally useful from a military standpoint.

We're not quite seeing a full-fledged run towards that. We're seeing a lot of experimentation, some technological R&D development, and not quite full-fledged. At least I interpret that as a bit of a good sign.

Victoria: Hey, we'll take the good news where we can take it these days. Some question about the technological aspects of this test. Given that this was either the 9th or 10th version of this test, was this, from a technical standpoint, a complicated, sophisticated test, or was it just one in a line of series of tests that perhaps is trying to definitively improve Russia's capability in this matter?

Along those lines, if it was not a sophisticated test or something like that, why does the panel think that perhaps the United States was so quick this time to speak up and identify that it had actually happened, acknowledge it?

Then a third part of that, just to make this complicated. Let's say Russia was trying to actually intercept a satellite or an object. This is an interesting question from the audience.

Is there a sweet spot where you can do an intercept for an ASAT where it'll have the debris come down pretty quickly? What should they or should one aim for if they're trying to do that kind of low-impact counterspace attack?

Lots of questions there. Who wants to take the first one? Maybe, Michael. Do you want to talk about whether not this was a sophisticated test or go from there?

Michael: At least compare to the last test, I don't see anything of more or less sophistication here. I believe that Pavel said that some of the early tests, they were just testing out the, essentially, the booster. There wasn't actually a kill vehicle on top of it.

Certainly, from the opensource side, it's hard to know whether it was more or less sophisticated. If, for example, when the US announced the test, they had said, "Hey, it performed a very close to a hit to kill capability." Something along those lines.

You might make the argument, "Well, OK, this is maybe a little bit more sophisticated that we've seen in the past." Essentially, based on what we know, just to say, there's not necessary any reason to believe that it is more or less sophisticated than the previous tests.

Victoria: What about messaging? Why does the panel think that, perhaps, the US military was so quick to acknowledge it this time, if it was, as Michael said, not that much different from previous test?

Brian: My sense is that it's a function of a couple different things. One is the US government, and particularly the DoD, has been working the last several years to try and talk more publicly about these sorts of things.

We've had a lot of discussions from senior leadership about how they are concerned that there's too much classification and that's preventing them from discussing the threats they're seeing and the things they're concerned about. That's part of it. This could be the first of what we will see as a more open discussion of these sorts of tests going forward.

That would actually be a good thing, that the US government is acknowledging these and talking about them and, as Michael said in his briefing, hopefully providing more information about that. We'd love to know the exact launch time that this took place. That would really help the OSINT analysis.

There's also here in the US we have this big domestic discussion going on about the Space Force that's been happening for a couple of years. There is also a desire to use these sorts of threat discussions to reinforce the need for that.

Look, this is a perfect example. I could see the leadership saying, "This is why we need a Space Force, is to be able to deal with these sort of threats." Which, I think, is partly true. The growing contested nature of space over the last decade was certainly part of the discussion leading up to the Space Force.

Finally, if you're really being a domestic watcher, you're thinking of the budget and the discussions going on about the preparations for the fiscal year '21 budget. The Space Force certainly would like to see an increase, as would a lot of the parts of the military.

I would suspect that's probably part of it as well. Highlighting for Congress and others that yes, there are real threats out there and we could certainly use a little more money to go deal with them.

Victoria: Thanks. Just in terms from technical standpoint, if anyone wants to take a guess on this, is there a so-called safe spot to have for ASAT tests where you can do it and create debris that's going to be relatively short-lived, or is it just, generally speaking, you create debris, you're going to have to live with the consequences, and you never really know what the consequences are?

What do you guys think about that from a technical perspective? Any thoughts? Chris.

Pavel: Chris, you want to...? Let me try to take a stab at this. I guess, Victoria, you just answered the question. If there is a sweet spot like that, then I guess today it would be a test that would not create a lot of debris or would create debris that would quickly reenter. That's probably the only real requirement there.

Again, as I said, if Russia would really want to test the hit-to-kill capability, I'm not sure they would choose the trajectories or the launch from Plesetsk outside of the field of view of missile defense radars. That would be my take.

Brian: Just to add onto that, as Chris mentioned, we've seen some evolution of this over time. 2007, the Chinese ASAT test was up at 800-plus kilometers. That was bad because that debris is going to be up there for centuries.

The US intercept of USA-193 in 2008, that was down around 220 or so kilometers, I recall, a much lower altitude. The satellite itself was within days or a week of reentering. That was around the same altitude, 225, 250, we saw for the Indian ASAT test.

Much less debris and it was lower-lived, but I will point out that in both of those tests, there were some pieces that were thrown as high is 1,000 kilometers into LEO. Just because you're conducting the test down low does not mean all the debris is going to stay down there. It's certainly better than at 800.

Look, if you want to say what is the responsible, is you don't intercept an orbital object. You intercept a suborbital object. We saw that from China in 2010, '13, '14, '15. They conducted some tests of their SC-19 system against suborbital targets. In that case, none of the debris went into orbit. That was more of a responsible test from an orbital debris standpoint.

Victoria: Chris.

Chris: I was just going to echo both Brian and Pavel's comments and say that actually going higher would be counterproductive for the diplomatic efforts that we've seen over the past 20 years from Russia and China.

If they'd have gone to the higher orbits, if they'd have gone to the areas where we think are bad ASAT tests, then it would have completely undermined the PAROS and the other diplomatic efforts that they put forward as well.

When we do see continued tests like this, we're going to see them try and be portrayed as the safer option, the good option, for that very reason. Actually, they almost guard themselves. I wouldn't put too much thought by that, but I do think it's a cause for another glimmer of optimism.

Victoria. That's somewhat encouraging. We have a couple questions around technical for Michael specifically, talking about the navigation warning time frame. The two-hour notice, they want to know how common that it is. Maybe, can you give any thoughts about why it might have been such a large window?

Michael: I'm not really sure. Actually, because I saw the question over in the chat, I, over here in my other window, had pulled up a couple of the past notices. I've actually seen as low as about an hour and a half, which is nice, or I guess which is lower than I expected.

I'm not sure, necessarily, what to make of a six-hour window versus like a one-and-a-half-hour window. If you were going to do an actual hit-to-kill test, you essentially have an instantaneous window.

It's certainly up for debate whether they would say, "Hey, we are launching at this time," or they [laughs] might just say, "Hey, we're launching this afternoon." I'm not necessarily sure what to make of six hours. I will say that six hours, looking at previous tests, especially the more recent tests in 2019 and 2018, is a little large. I'm not necessarily sure what to make of that though.

I'm trying to remember. Was there a second question with that?

Victoria: I think that was pretty much it. Just thoughts on why that might have been the way it was. Another question that I had, it's been echoed a couple times, is discussions about the multilateral responses to space security threats.

Chris, you touched on this a little bit. Maybe you or the panel could expand on it. We've had discussions about the Russian and Chinese proposal of the PPWT. What has the US responded to that treaty's proposal? Does the US have its own versions of that?

Then maybe we could talk a little bit about the recent group of governmental experts' discussion on PAROS, and what actually happened there, if someone in the panel wants to talk about that. If not, I'm happy to jump in.

Just really explain where we are, because these shared space governance issues are really difficult to solve if we can't even bring them up in multilateral context. Can we go and talk about where we are for space security discussions at the international level? Thank you. Who wants to take that?

Chris: I'll start off, if I may. What we see is that each of the major space powers are opposed to ASAT tests except their own. They're not happy with others, but they're happy with their own, because they are for peaceful purposes, obviously, the defensive, as we've already covered off. They're at a safe altitude.

We've already got China having established what the bad ASAT test look like. In a multilateral world, we're seeing an amazing amount of geopolitics and realism reasserting itself, in that theirs is bad and ours is good. We need to move past that.

This is an area where the international community and individual states can actually move past that by making declarations of, "OK, either this is what we view as safe. If we're going to do this, this is what we view as safe. And these are the outcomes that we will regard as being prohibited. These are the outcomes that we think are bad. If you do this, you will be acting contrary to the international will."

Countries can do that. It doesn't take a space power to do that. We can all guess what they are. They're the protection of the orbital environment.

The problem is there is this balance between if we do stabilize the ASAT tests and have normative behaviors emerging in ASAT tests, we lose the balance on space security. It's a really delicate balance to manage this acceptance of ASAT tests and my realistic approach to that, but it's not a zero-sum thing. There will be a knock on effect, and it will be in the field of space security.

Nations have to decide, do they want guidelines on this? Do they want to start promulgating unilateral guidelines, which will say, "This is what we think and if you do this, you will be regarded as bad?" Or do they want to keep up the polite pretense that everybody else's ASAT test is bad.

Victoria: Thank you. Other thoughts? Brian.

Brian: I think that's right. I would expand that to say, we saw some of this in the nuclear testing world, which you started to see unilateral moratoriums on testing in the US and Soviet Union that, yeah, there was a couple of breaks where one would break a moratorium then it would test a couple, but they always go back to a moratorium.

Eventually, that led to a broader agreement that let's say nuclear testing is bad. Again, general acceptance, and then that was, "You're trying to [inaudible 64:54] ."

I could see something like that evolving through this, where it may start with a few countries that are willing to make a unilateral moratorium on testing or even call for a broader one, and then that might, as Chris pointed out, establish a norm that you see then evolving from there.

Again, look, if I had my hopeful hat on, that's what I hope to see. I saw it from Chris, trying to go straight for the multilateral treaty prohibiting and stuff is probably going to be tricky. The wildcard here is missile defense.

These capabilities we've talked about a couple of times in this show, that this ground launch missile hit to kill is very similar for anti-satellite capabilities and for midcourse missile defense. Really hard to prohibit one and allow the other.

We've seen over the last 10 years or so a growing number of countries that are interested in missile defense to protect themselves. Now, it doesn't have to be midcourse. There's a case to be made that terminal-level missile defense is probably an easier to do option than midcourse missile defense.

That is probably going to be what the difficult part of this is, is if there is a pushback saying, "No, we need to do hit to kill for midcourse missile defense." That might be the thing that pushes back against a moratorium on these ASAT tests.

Victoria: Thank you. It's almost a mentality of ASAT test for me, not for thee. One of the real issue that I've seen as securable co-sponsors at Space Security Conference every year in Geneva with UNIDIR is that there's a real disconnect between what the major space powers see as the biggest threat to space security and stability.

Russia, China, and the BRICS focus on space-based weapons, whereas the US and its allies tend to look at almost more as environmental discussion point. Space is cluttered spaces, space is congested, space is competitive.

It's really hard to come up with a common response when you can even identify what your biggest threat is. Is it destabilization? Is it weaponization? That's been a real problem for the multilateral fora. We've mentioned the PPWT several times. It was first proposed in 2008 and then revamped in 2014 by Russia and China. It's just been sitting there. There's been no forward movement.

Same with proposals by Russia and China for no first placement of weapons in outer space. Having said that, the United States particularly has not shown a tremendous amount of leadership in terms of providing counteroffers.

"OK, if you don't like the PPWT or no first placement, I would argue those are very problematic options, what can we do in return?" It's difficult. Relatively recently, 2018 through 2019, there's a group of governmental experts talking about PAROS, prevention of arms race in outer space. Couldn't even come to agreement as to what recommendations they wanted to make.

Again, these are tricky issues. Not to say that international diplomacy should be able to solve these problems easily, but there are sticking points that there definitely can be for this. With that, I want to have a broader discussion about candidate counterspace capabilities.

Does the panel think this thing is pre-determined? Will this capability be used? If someone has it eventually, is someone going to actually try and use it? Any thoughts? I can give my thought. [laughs]

Pavel: [laughs] You're only trying?

Victoria: Pavel, you want to take a crack at it? Thanks.

Pavel: As I mentioned, I'm in a skeptic's camp regarding the actual use of that capability. Basically, with this kind of ASAT, or even with more advanced ASAT, the mines or higher-altitude ASAT, it's hard to imagine a military mission in which this capability would be useful.

It works in a way that if a state that you want to target relies on its space capability to the extent that by taking out satellites, you could undermine the military capability, then that state would probably take steps to reduce that vulnerability.

There are clear ways of doing that. You go to distributed capability, you go to the smaller satellites, you go to redundancy. In the end, you can shoot down a satellite, but so what?

This is what I'm saying when I said that back in the day, both the Soviet Union and the United States, back in the late '60s or early 80s, they looked at it and they realized that it's not clear what the mission of this thing is.

In that sense, I'm an optimist. I do believe that these capabilities will not be used, because I do believe that they don't give you much in terms of military capability.

Brian: You're on mute, but I'm assuming that was me. [laughs] No, I generally agree with Pavel. I want to use an example here. There was a great article in "The Space Review" this week about a recap of a decision that was made at the 1975/1976 at the end of the Ford Administration, beginning of the Carter Administration, about exactly this problem.

You had a US national security process that started with essentially going, "Oh, my gosh, our satellites are vulnerable to all these Russian ASAT weapons. And what do we do about it?" Sounds very similar to a discussion we've been having here the last 10 years.

They convened a bunch of meetings. They had several studies. At the end of the day, their decision was, "We will harden our satellites, we will make them more resilient, and that's how we're going to increase the protection of our capabilities."

At the same time, they said, "We need to have a limited offensive capability of our own to go after Soviet satellites, particularly ROSAT, NEO ASAT satellites were being used to detect and target carrier battle groups for anti-ship missiles.

That began development program of this F-15 launched ASAT weapon that was actually tested in the 1980s. Destroyed the US satellite called Solway in '85, and had a couple of other tests. It was a big development program.

There was plans for wide deployment, but then the Reagan Administration said no, and they canceled it. It never became fully operational. When it came down to it, and they had to make some tough budget decisions, the decision was made that that capability didn't rise at the same level of priority as other things.

This is not a new debate about whether or not you have ASAT weapons, is space contested or not, it's been that way for a while. These things have happened in the past. So far, countries outside of this have explored it, they've done R&D.

The decision has always been, this does not rise to the level of something that's truly important like we've seen other military capabilities. I do want to add one caveat to that. Pavel is absolutely correct. There are ways to make systems more resilient, so that you are essentially deterring these kinetic ASAT tests by denying benefits.

At the same time, if somebody does choose to try and destroy a satellite, then you push through it, because your system is resilient. The caveat is the US has been trying to do that for a decade, and so far has not made any progress in making their system more resilient.

The caveat is there can be institutional and bureaucratic barriers to dealing or coming up with a way to counter these capabilities that can actually make it so they might be of some use. I generally agree with Pavel that so far, we've seen they have not been that useful.

Victoria: Chris, did you want to add to it?

Chris: Yeah. A consensus here on the fact that ASATs themselves, I very much sit in the skeptical camp.

While the law regarding testing is broadly supportive of testing, once we start getting into the actual use of the ASATs, and I know Brian's been working on "The Woomera Manual," the use of ASATs, the actual destruction of satellites in key orbits, and the creation of large debris fields may start intruding into areas where international law, not the law of outer space, but the law of armed conflict, starts getting involved.

What we might have is a situation where use of these anti-satellite weapons may well contravene the law of armed conflict. The electronic means, which [inaudible 75:17] much more efficient, much more predictable.

In the sense of worrying about ASATs, the legality becomes more apparent when they're used. They would almost be self-defeating to use them, because the testing of them isn't illegal. If you use them in the wrong orbit, in the wrong circumstances, and you have this indiscriminate debris field created, then it might well start offending against the law of armed conflict.

Victoria: Michael.

Michael: I'll also say that another deterrence to the possible usefulness of ASATS is in 2020, it certainly depends on what type of orbital platforms you're talking about. If you're talking about, for example, optical imagery, in terms of imagery analysis, getting something at 20 centimeters per pixel, that's nice. That's eye-watering.

We saw that with Trump's tweet from last year. It's nice to look at. Operationally, what is the difference between something at 20 centimeters per pixel and all the commercial platforms at 30, at 50? Things like that.

If you're talking about, US optical systems, you could take out the platforms that can do this very, very, very high-resolution imagery, but what is the NGA going to do? They're going to call up Planet and get things at closer to a meter per pixel. You can certainly do a lot with that.

When you talk about electronic intelligence and things like that, it's a little different. There's not a commercial market there. For optical systems, certainly, there's a lot of near-comparable replacements available in the commercial sector.

At some point, if you're trying to deny the ability to view or gather optical intelligence from space, you're going to start blowing up a lot of stuff. [laughs] You're going to run out of ASATS before you can deny that optical capability at least.

Victoria: Interesting points. In terms of looking to the future, where do we go from here? Do we continue on smartly with each country developing their own counterspace capabilities and hoping that we can have some international discussion on this?

Do we try and stop countries from developing these capabilities? Do we get in some NPT-type situation, where there's nuclear have and nuclear have-nots? Are we going to have space power have and have-nots, or ASATs haves and have-nots? Where does the panel think that we're going to be going in the future with this?

Pavel is going to take first crack, I think.

Pavel: [laughs] Let me try. There's a simple answer. The dynamic is there will be people in the military's old space that have this capability of pushing to get this done. However, in my view, there is a lesson we can learn from The ABM Treaty back in '72.

Which basically, the way I read what happened, and I looked into the record, and you could, too, what happened was that there was a clear understanding on both sides, the United States and the Soviet Union, that missile defense will not work anywhere close to what was advertised.

Based on that, it became easier for them to get an agreement, The ABM Treaty. That's how it came about. Something like that would probably happen eventually with space capabilities.

When people will start working on these things, trying to operationalize them, and trying to think of scenarios where these will be useful, they will come to the conclusion that these things don't work, and they don't give you any capability.

That would have to be internally understood by all the players, and then it would be possible to have an agreement to limit that and reach an understanding on the legal ban on these systems. Hopefully, that understanding of the utility of this enterprise would come earlier rather than later, but they will come. It's just a matter of time.

What we could do is to try to push that and to try to go and look closely into why these systems may not necessarily be as useful as people who have interest in deploying them and developing them lead us to believe. That's an important part of the work. Eventually, it will have to come through the internal bureaucracies, if you will. That will be my take.

Victoria: Thank you, Pavel. Anyone else in the panel want to opine on what the future looks from here? Brian?

Brian: I'll pick up on the thread we had earlier. I would hope that there's going to be a country or a group of countries out there that'll be willing to take some sort of a stand on this issue, at least at the level of no more deliberate intercepts that create orbital debris.

We've seen some indications after last year's Indian ASAT test that Germany made a statement that suggested they were thinking along those lines. Canada made a statement in front of the first committee last fall.

There may be some of that [inaudible 82:16] this, I would like to see that. That's our hopeful position would be that, a country or group of countries would take a stand on this before we do see an actual kinetic intercept next time. Then, that might lead to what Chris and I talked about earlier is, a couple of countries declaring moratoriums, and then we will have a norm building from there.

Victoria: Chris.

Chris: Again, just to agree and backup with what both Brian and Pavel have said that the way that this could emerge, and this is actually a really easy diplomatic win for a nation.

To state their own unilateral criteria for what an ASAT test is. I'd go a stage further than Brian. I would say, no intercepts that cause orbital debris period, deliberate or otherwise. That then imposes a duty on the ASAT tester to make sure that they don't contravene these international norms.

We need to see leadership from countries. Leadership from countries that don't necessarily have a horse in the game at the minute. Leadership from countries who can say, "We don't want to see tests that damage the orbital environment." This does go beyond simple arms control. This does go beyond that. It stretches into the environmental issue.

You're absolutely right, Victoria, when you said that it stretches across into environmental law, into space situational awareness, into the whole range of space activity. This is a good opportunity for a country to take leadership in this and say, "This is our red line."

Victoria: Thank you, Chris. Actually, that leads me for my last question that I have for the group. Obviously, nation states need to be involved in this conversation clearly for security issues.

One of the things that we tend not to recognize or forget as the space domain is changing, that the commercial sector plays a huge role in how we use space, and how we feel comfortable about others using space.

Should the commercial sector be worried about this? Should they be involved in the conversation? Do they have a role to play in terms of establishing norms for space phase security and stability in this issue? Thoughts?

Brian: Short answer is, yes. If you're planning a business model that's going to involve satellites operating in low Earth orbit, you should probably be wondering whether or not a country or a bunch of countries may be testing stuff that creates a bunch of debris.

If part of your business model is selling data and services to a country's militaries or intelligence agencies, you need to be thinking, "Am I going to be a target, should there be a conflict? Do I need to worry about that?"

I definitely think, commercial companies should be at least involved in the discussion and talking with their governments about these issues. If this continues and we see more widespread testing and deployment, that could have a negative repercussions for future investments and commercial development in low Earth orbit.

Victoria: Chris.

Chris: We've got this strange paradox. Logic and international politics aren't an easy companions. Actually, all of the major space powers who are engaged in these ASAT tests have a vested interest in a more ordered environment.

It's in their interest. It's in their collective interests to ensure that space is, as Brian said, a predictable environment so that this commercial activity can absolutely flourish. If that message can get through, and if that message by however it happens, by broad international support for limitations on ASAT tests, because that's where we could start a limitation on ASAT tests.

If that could be generated by both military, diplomatic, and commercial actors, then the message will get through that actually, it's in everybody's interest. Especially, it's in the major space best interest in space security and to retain that stability.

Victoria: Any last? Michael, you want to add something?

Michael: I'll say that building off of what Brian said. Really any company that their business model involves selling data to the government, developed or not developed, captured from orbital platforms. They should be wondering, "Is it safe for me to do this?"

Building off of that, one of the things that the US has looked into in recent years is to try and have a more distributed like MILSATCOM architecture by using a hosted payloads and things like that.

I know that there have been certain companies that have been uneasy with that because they're saying, "If I'm hosting a MILSATCOM payload, am I going to be one of the first targets if an ASAT war kicks off?"

There's this interacting factors at play, where If companies want to further their business model, and if countries want to have more distributed systems, companies really should be interested in this type of discussion.

Victoria: Thank you. Pavel, any last thoughts? You're good. That puts us right at time. I'd really like to thank the panel for some really fascinating insights and honest discussion. Also, I'd like to thank the audience, as well, for suggesting such interesting questions.

It was really interesting for me to hear from everyone, literally, all over the world. That shows that this issue is relevant, and of interest, and important to have a global discussion. We get to some

solution that we're all comfortable with, allows us continue to use space in a sustainable amount of the [inaudible 88:37] .

With that, I'd like to emphasize again, we will be putting the PowerPoint up on our website soon. We'll be putting the recording up on the website soon. Transcripts in a bit. If you have any questions, feel free to reach out to us.

We look forward to seeing you whether in person or most likely virtually at a later Secure World event. Thank you all. Have a great weekend.

Transcription by CastingWords