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P R O C E E D I N G S

MR. O'HANLON: Hi, everybody, and welcome to Brookings. I'm Mike O'Hanlon with the Foreign Policy program as is Frank Rose and Madelyn Creedon. And we would like to welcome you along with co-panelists, whom I'll introduce in just a second, to a discussion on space, the military uses of space, the way in which the United States and the Department of Defense organize to deal with issues concerning space, any potential first-base cooperation or arms control, the way in which space fits into the broader return to great power competition as underscored in the National Defense Strategy, and anything else under the sun that pertains to security and space. And we look forward in the second half of this conversation to where you'll want to go with that topic.

A couple of broad words of framing and then we're going to have a conversation up here for about half the time before we go to you. And I'll also introduce our distinguished panelists.

I think that many of you who have not necessarily followed Brookings as long as I have may not remember this book, but 32 years ago Paul Stares, my good friend and a distinguished scholar now at the Council on Foreign Relations, wrote a book called "Space and National Security." And at that time, which was still the Cold War, 1987, the concern was should we have anti-satellite weapons? Was there a way to prevent the United States and Soviet Union from taking their competition to space? Could space somehow remain a sanctuary from at least lethal or offensive military pursuits? These were a lot of the questions that were in the air back at that point.

And this was a debate that was underway even before glasnost and perestroika and the fall of the Berlin Wall. So there was a question as to whether we could actually do these things and constrain competition in space even in a hostile superpower relationship. That was then.

Much less importantly, but it sort of fits in because it was about 16 years ago, I wrote a short book called "Neither Star Wars Nor Sanctuary" about space and its role in U.S.

defense policy. This was, of course, in the post-9/11, but pre-great power competition phase of the 21st century, and technology had changed. We had very good missile defenses, which, by the way, are pretty good anti-satellite weapons for low Earth orbit satellite in and of themselves with very little further medication as several countries have now proven.

And so we were no longer at a point where you could be quite as pristine and pure of the view that space could somehow be kept away from military competition. And yet, there were still questions about how much we wanted to accelerate that and what we could do to constrain that.

And now we're in a period where the United States is thinking about creating a Space Corps or Space Force. That will probably happen. We can talk more about that today. We are in a period where the National Defense Strategy underscores that space is an area of competition. And we have, again, people on the panel who can do a very good job of helping us understand this.

So my first question to all of them after I introduce them briefly will be to help understand the historical evolution of space as a theater for military competition and potential combat and potential arms control, although the prospects there seem to be fading by the year and they may want to comment.

Madelyn Creedon had senior positions in both the Department of Energy and the Department of Defense in the Obama administration. Her job at DOD pertained directly to issues of space security. And then she later went to the Department of Energy, the National Nuclear Security Administration, which also has quite a few equities and interests in regard to space. And so she will have invaluable perspectives.

Next to her Frank Rose, who, as many of you know, was the assistant secretary of state for arms control verification and compliance during the later years of the Obama administration. But before that he worked directly on space policy. And in the process of doing all of this, as I always love to say and someday Frank may stop me from saying it, but I want to say it again, he was knighted by the country of Romania -- so it's Sir Frank to you (Laughter) --

because of his role in our missile defense efforts in trying to help protect NATO and the United States from potential Middle Eastern launch. But this, of course, is part and parcel of the broader space equation, the ballistic missile threat question.

Next to him Mallory Stewart, who survived several years as Frank's deputy at State and is now on a scholar program with the Stimson Center. And also is based at Sandia National Laboratories in Albuquerque, New Mexico, which, of course, is one of our nation's crown jewels in thinking about and developing technology in regard not only to nuclear weapons, but to many other areas of defense technology, including certainly space.

And then finally, Todd Harrison, who is my longstanding friend, one of the best technical defense experts in the country by far. A trained engineer from MIT; a lot of background working on defense, budget, and strategy questions, but also in his jobs before all of that already was thinking about space technology, working on a startup developing space-related technologies. And since his arrival at CSIS a couple years ago, has added to his defense budget portfolio with what may be his true love, which is interest and concerns about the questions of the military uses of space.

So without further ado, and thanking all of you for being here, let me just pass this question now by baton down the aisle and to ask Madelyn just how do you think about where we are today in this broader 20-, 30-, 40-year evolution of the military uses of space?

MS. CREEDON: So it's clear we are in a very different position than we were many years ago. And yet, even back into the '60s, the U.S. and the Soviet Union were conducting all sorts of activities that really ASAT types of activities. Back to the well-known tests that occurred out in the Pacific at Johnston Atoll. It was an electromagnetic pulse test. It was called Starfish and destroyed some of the elements of the -- or at least damaged some of the Van Allen belts and it certainly took out a lot of the grid out by Hawaii. Russia did the same thing. They did it over Kazakhstan. Actually they had done it first, same thing, destroyed a good part of the Kazakhstan grid in the region.

And so from then on there have always been programs where at least Russia

and the U.S. started to look at ASATs. Back in the '70s, Russia actually tested and fielded an ASAT weapon that may or may not have been operational until the '90s. The U.S. tested an air-launched ASAT in '82 and it destroyed a LEO satellite. And because of the debris that was generated from that test, Congress actually said, no, we're not going to do that anymore. We're not going to do any debris-generating tests anymore. And the Air Force actually terminated that program in '87.

But there were other programs. There were MIRACL laser tests. And so we were never in this idealized historic, well, space is a sanctuary and we'll always be safe. And that is truly a misnomer.

I think where we are very different now is now we have lots of countries and even non-state actors who are working on various sorts of anti-space capabilities ranging from direct ascent to on orbit to GPS jamming and spoofing. So the range of actors is much broader, the range of technologies that present threats is much broader, and that's the situation we now find ourselves in today.

MR. O'HANLON: That's a great framing. One quick follow-up, though. Do you think that the threats to American satellites were particularly acute in the '60s, '70s, '80s, and we just didn't know it or didn't talk about it or at least we didn't talk about it, you know, in public and polite company? Or has that threat really grown with time even though it might have always existed throughout much of the Cold War?

MS. CREEDON: I think it's grown with time. I also think at least on the parts of the U.S. and the Soviet Union that there was a realization because they were both -- you know, both countries are space-faring nations. There was a realization that the debris-generating aspect of the kinetic ASAT weapons was damaging to all satellites. And the debris doesn't care. I mean, the debris doesn't care if you're a U.S. satellite or a French satellite. I mean, the debris is going to hit the satellite no matter what. And I think that was a bit of a come back to Earth, if you will, you know, because that's when they really sort of started to think, well, maybe we have to come up with something else.

So it never matured because I think there was this realization that debris generating is probably not where we want to go whereas now today there's so many other aspects that are not debris generating, but they're are just more technologies and more accurate. So it is a very different environment and our satellites are much more at risk now, including our ground stations, than they ever were before.

MR. O'HANLON: And of course, India generated some debris just this year, although at a much lower altitude than China had in 2007. But, Frank, that's a good segue to you.

MR. ROSE: Yeah. No, I think Madelyn did a very nice job in talking about the history. I always like to say even though the United States and the Soviet Union both developed ASAT capabilities, they never moved forward with large-scale deployment of those capabilities. And I think there were two reasons for that.

First, as Madelyn mentioned, they understood over time the potential damage that anti-satellite weapons could do to the space environment. As Madelyn mentioned, both the United States and the Soviet Union tested nuclear weapons in outer space. Like my mother said about her marriage to my father, it seemed like a good idea at the time. (Laughter) But when we did that we destroyed or damaged a number of our satellites. So we said, well, maybe that's not a good idea.

And that was one of the reasons why we had the Outer Space Treaty and the 1963 Limited Test Ban Treaty, which prohibits the deployment of weapons of mass destruction in outer space in the context of the Outer Space Treaty and the Limited Test Ban Treaty of 1963 prevents nuclear explosions in outer space. And had we continued to detonate nuclear weapons in outer space we might have made human space flight impossible. So that's number one.

But secondly, during the Cold War, Nuclear Command and Control were very closely linked with our space assets. So there was generally an understanding between the U.S. and Soviets if you were going to go after one's Nuclear Command and Control systems

with ASAT weapons, that could be very, very dangerous.

Where are we today? I think things are changing for a couple of reasons. One, we have new actors. But secondly, we're using a lot of these systems that the United States had in the past for strategic missions for tactical missions: GPS, some of the advanced communications systems. And the Russians and the Chinese are looking and they're saying, boy, you're not using these just for strategic missions. You're using them for tactical missions. Therefore, they are fair game.

Furthermore, the Russians and the Chinese since the early 2000s have been very closely watching how the United States fights and they understand how dependent the United States is on outer space. So these ASAT capabilities that they have been developing are specifically designed to, I believe, eliminate an asymmetric advantage that the United States has through it space assets.

I would say that, additionally, the Trump administration's assessments on the outer space threats are not all that much different from the Obama administration's view of the threat. Indeed, President Obama directed us during the last two years of the Obama administration to conduct a major review of U.S. space security. And as a result of that review, we were focused on increasing the resiliency of our space system.

So bottom line, we had quite a bit of strategic restraint during the Cold War with regards to outer space. But that has changed as new actors have come on board, but also as Russia and China have seen that space is an asymmetric advantage of the United States. And they are developing these ASAT capabilities to deny us that advantage.

MR. O'HANLON: Thank you, Frank. Mallory, over to you.

MS. STEWART: I certainly agree with everything that Madelyn and Frank have said. I would highlight a change that Frank alluded to between the Obama administration and this administration in the changing of the narrative.

Can you all hear me? Sorry.

There has been efforts by the Chinese and the Russians to portray U.S. space

actions as aggressive for decades now, and I think that's something that they've been working quite comprehensively on. However, given a different narrative from this administration, talking about space as a war-fighting domain and the need for U.S. dominance in space, the Russians especially have capitalized on that. And so you've seen a change in their presentation of their efforts and the U.S. efforts to try to capture sort of the upper hand almost, the good faith actor in -- especially highlighted by, I guess, this past week the Russian space agency talking about an international dialogue on preventing anti-satellite weapons across the board.

They proposed something similar in 2008, the prevention of placement of weapons in outer space. However, no one really, at least in the U.S., took them seriously because, of course, they wanted to exclude anti-satellite capabilities in outer space so that their ground-based anti-satellite capabilities would dominate.

Now, though, when the proposal comes out after the Indian anti-satellite test, the Russians are portraying themselves as sort of good faith actors. They're the moral high ground in trying to prevent this explosion of anti-satellite capacities. And you've seen the Russian spokespeople saying that the Trump administration's use of the language of dominance, their development of this Space Corps or the Space Force is an aggressive move, and they're trying to change the narrative that the previous administration and previous administrations had worked on of U.S. as an arena that needs to be defended, but not necessarily this flat-out arms race, war-fighting domain. And so I think it's fascinating to see this narrative evolve.

China, the Chinese space agency said that in 2018, they had concluded at least 36 country --- well, they had done space cooperation with 36 countries and 4 international organizations, including 21 space cooperation agreements. Both China and Russia are trying to roll out this greater collaboration internationally when you see the U.S. walking away from its space security dialogues that they conducted under Frank in the last administration.

And so this change in narrative could be dangerous in an arms race context, which is what we face. And we'll see if there's going to be more anti-satellite developments,

such as India did, by other countries that want to appear strong in this race. So I look forward to seeing how that develops.

MR. O'HANLON: Before we go to Todd -- and I know Todd will talk, also, in a follow-up, perhaps after I've asked another question about the Russian and Chinese threats. I wanted to, though, ask you, Mallory, while we're on the subject, are these Russian and Chinese positions purely cynical in the sense that when you call for a ban on ASAT development or deployment, it's really not verifiable? Because the technologies are so similar to either ballistic missile defense systems or to actual satellites themselves that there really is no meaningful way to do this and the only reason you would do it is, therefore, rhetorical? Or am I being a little too harsh?

MS. STEWART: I mean, it's hard to tell at this point. There's good reasons, right, to prevent the generation of debris. In fact, the previous administration tried very hard to develop some international norms on debris generation, to develop some cooperation with our major space competitors on debris generation. And I think Russia is aware of the harmfulness.

MR. O'HANLON: Yes.

MS. STEWART: And, in fact, that was their lead-in to talk about internationally banning anti-satellites because of the debris generated by the Indian ASAT test.

That said, it is hard to not look at it in a cynical light when we know Russia's anti-satellite capabilities are so extensive and so diverse. So it seems like we'd have to see what they're proposal really is. But if it's anything similar to their PPWT proposal, the prevention of Placement of Weapons in Outer Space, they're really just trying to preclude the advancement of anti-satellite capabilities in an arena in which they are not -- they do not see themselves as the leader and to maintain their leadership on ground-based anti-satellite capabilities.

MR. O'HANLON: I'll go to Todd in just a second, but, Frank, you wanted to --

MR. ROSE: Yeah, Mike, let me just come in with one point with regards to Russian and Chinese motivation. I've spent a lot of time talking to the Russians and the Chinese over the last several years.

With regard to the Russians and the Chinese you need to put nuclear deterrents at the heart of their calculations. For the Russians and the Chinese, they see U.S. space-based missile defenses as an existential threat to their strategic deterrent. And if you look at all of their proposals, the Prevention of Placement of Weapons in Outer Space Treaty, the No First Placement Pledge, it's fundamentally about one thing: trying to restrain the United States from placing space-based missile defense systems in orbit. So I would say that is a big driver.

And secondly, they like the moral high ground in these international forums, especially given the fact, as Mallory mentioned, the United States over the last several years has ceded a lot of ground in these diplomatic forums. Where I generally support a lot of what this administration has done with regards to space security, one huge hole in their strategy is a total lack of a diplomatic element.

MR. O'HANLON: And, Todd, over to you to frame the broad picture, please.

MR. HARRISON: Yeah. You know, I would say, just to kind of, in part, summarize what's already been said here, I would say that what's really changed over the past, you know, 30 years or so in the space environment it can be summarized in the four Ds: space has gotten more diverse, more disruptive, more disordered, more dangerous. Right?

So it's more diverse because if you look back at the first part of the space age and during the Cold War, it was really just the United States and the Soviet Union. About 90 percent of the launches during that time were the U.S. and the Soviets. About 70 percent of the satellites we put up there on both sides were for military purposes. Space was dominated by the military uses of space for the U.S. and the Soviet Union. That's what is was like during the Cold War.

And I love it when people say, oh, we shouldn't militarize space. It was militarized from the beginning, sorry about that. It was used for military purposes all the way from the beginning.

But if you at since the end of the Cold War, what's happened is we've got many more countries starting to use space and they're using it in many different ways now. And just

this past year, in 2018, the majority of space launches came from countries other than the United States and Russia. China had the plurality of launches. China had more launches in 2018 than we did into space. Space has gotten much more diverse.

And if you look at who's using it, it's not primarily military satellites anymore. It's primarily commercial satellites. Commercial companies are using space.

Space is much more diverse and it makes it much more complex. That means what the military is doing in space is not the overriding factor about what's happening in space. There are a lot of other concerns there.

Space has gotten more disruptive. We see a lot of new companies that are developing new technologies. Reusable launch vehicles, you know, 10, 20 years ago, didn't think that that was going to be cost feasible. Now it's a reality. It's happening all the time.

We see companies trying to do things in space, commercial companies, that used to be the exclusive domain of governments. And we see companies doing things that governments haven't even done yet. We're looking at new applications in space, like on-orbit servicing, on-orbit mining of resources, on-orbit manufacturing. These things are not too far in the distant future. We're going to see these things happening. I mean, for on-orbit servicing within a couple years we'll see demonstrations on that. With in-space manufacturing there's a 3D printer right now by a company called Made In Space that's on the International Space Station making parts. These things are starting to happen.

And that leads me to my third D, space has gotten more disordered. We don't have the laws, the treaties, the regulations, the policies to govern a lot of these new applications in space. This is a domain where there are not a lot of norms, and that's causing problems for us. Simple things like how close is too close to get to someone else's satellite without their permission? How much can you eavesdrop on someone else's satellite? How publicly available should space situational awareness data be? You know, a lot of interesting questions like this that we just have not really answered yet. We don't have the same history of developing international norms of how we're going to operate in this domain like we have centuries of

developing norms, you know, in terms of like the law of the sea.

And then it brings me to my last D. As space has gotten more dangerous, we see countries, not just China and Russia, but Iran, North Korea, others, are developing or deploying, operationally deploying, and proliferating in some cases, counter space weapons of a variety of types. We love to focus on the kinetic counter space weapons, the direct ascent ASAT weapons, you know, a missile that shoots up from the Earth, hits a satellite in space, or the co-orbital weapons where one satellite can maneuver into another and hit it, but those are just one small subset of the counter space threats that we see today.

The biggest threats I think, personally, are the non-kinetic forms of attack, forms of attack that are reversible, that may be difficult to attribute, and that will have effects that aren't necessarily visible to the public, so like jamming systems. With every satellite you have to communicate with it to command and control it, also to receive the data from it. If someone cuts you off by jamming your RF signal, that satellite is no good to you as long as you're being jammed. But it's a reversible threat. Turn off the jammer, it's back on again. It doesn't leave permanent damage.

It's a great type of gray zone tactic that countries can use that is likely not to trigger escalation. And, in fact, we've seen it's not been triggering escalation on our part when countries do this to us because it happens all the time, you know, and they think they can get away with it. And they're conditioning us so that they can get away with it.

And so we see all of these different types of threats. We see laser weapons. You know, the Russians are out there with this A-60 plane that's modified with a laser. It's very clearly intended to be able to dazzle or blind the sensors on satellites. They're not even trying to hide it.

China and others have reportedly been testing those types of capabilities, so we see a lot of counter space weapons being deployed out there. It's not even just state actors. We've got evidence that non-state actors have been employing some of these jamming systems to jam some of our space systems, as well.

So it's out there. The cat's out of the bag. The question is how do we respond?

And the final point I would make is, you know, a lot of time we try to compare our capabilities to other countries to determine, oh, are we falling behind or not? If you compare our space capabilities to any other country on Earth, we are leaps and bounds ahead. That is not the issue.

The issue is how do our space capabilities and the protections that we have for those capabilities, how do they compare to the threats, the counter space systems that our adversaries are developing? And that's where we're falling behind. Our adversaries are making advances in counter space capabilities and we're not keeping up with the protections to our space systems. And so I think that is the big issue that we've got to deal with today.

MR. O'HANLON: So you've all helped me see how to condense a couple of the questions we were talking about earlier, and so just one follow-on, and maybe we'll start with Todd and work this way. And I'll pick up on your point about the distinction between militarization that you and Madelyn and others have all made today versus let's say outright weaponization.

And what I want to ask is, are there any meaningful constraints that we should be trying to retrain or impose or regulate or legislate or negotiate through arms control? You say the cat's out of the bag, Todd. Does that mean, you know, short of putting nuclear weapons into space in violation of the 1960s treaty, that we're basically going to see everybody do everything and it's just a question of how fast do you get up there and how survival can you make your systems when everybody's shooting at them? Or are there ways in which -- and I know Frank's got some ideas on debris-related questions here, but that may be the one point that he'll make to start, but let him speak for himself. Are there any other ways in which we should be imposing constraints on this race towards not just militarization, but outright weaponization in every way, shape, or form of outer space?

MR. HARRISON: Yeah. So when you talk about weaponization of space, you know, I work at a think tank, right, so let's define the terms. I think it gets thrown around and a

lot of people mean weaponization in very different ways. So here's how I would break it out to think about it and you tell me what you think is weaponization.

You've got Earth-to-space attacks, so something that is launched from the Earth, either from the ground, the sea, or the air platform, that goes up into space and has effects on a satellite. You've got satellite-to-satellite forms of attack. Then you've got satellite-to-Earth forms of attack. You know, things like "rods from god" that could be used to de-orbit something and hit a target on Earth. And then of those three types you've got kinetic and non-kinetic, right? Six different flavors there.

So which of those do you consider to be weaponization of space? I would say I think all of them are. There are different types of weaponization of space. I think almost everyone would agree that a space-to-ground kinetic weapon is a space weapon. I think most people would agree that a space-to-space kinetic weapon is a space weapon.

MR. O'HANLON: Or even a destruction laser, for example.

MR. HARRISON: Yeah. Well, and I think some people actually start saying, well, but if it didn't produce debris, maybe it's not. But we can debate it, but, you know, think about it in that framework of where the action is happening and if it's kinetic or non-kinetic. And I would say that the cat's out of the bag. Like regardless of how you define it, you know, like space-to-space kinetic weapons, Russians were doing that back in the '60s, already exists. Ground-to-space weapons, we have that because we have missile defense systems that we have used in that capacity before, like the SM-3. You know, obviously India has that, China has that. It's out there.

The one thing, the line that I am not aware that we have crossed is space-to-ground kinetic. And I think there's good reasons we haven't done that, that it's not cost-effective. It's better to use a ballistic missile if you're going to hit something like that. So, yeah, I think it's out there.

Now, what can we negotiate? What should we try to prevent? It's going to be difficult, especially with the non-kinetic threats because how do you verify who has it and

whether they've used it or not? I would say that what we should start with is trying to get folks to agree to a moratorium on debris-producing tests in orbit. That is the thing that's going to set us all back, set humanity back, is the production of debris in space.

And I know we can't necessarily tell people to get rid of the weapons they already have because we're not going to be willing to get rid of ours either, our weapons that have that latent capability. But at least we could get an agreement, I think, to not do any more debris-producing tests like the Indians did. That would be a good first step.

MR. O'HANLON: Although our missile defense tests happen -- 80 percent is high, right?

MR. HARRISON: Well, but we're not -- we're intercepting something that's not in orbit. It's on a suborbital trajectory.

MR. O'HANLON: But if the concern is debris.

MR. HARRISON: Yeah, if it's an orbital trajectory, it's much less likely that any of the debris is going to stay on an orbital -- or, you know, move to orbital trajectory. But, I mean, that's got to be part of the discussion, right? Is what's a responsible way to do missile defense testing? What altitude? What velocities? What intercept trajectories are you going to use? All of that should be part of the discussion, but I think that's something where we should be able to find some agreement. And it's in all of our mutual interests to not be polluting the space environment with debris that, in many cases, is going to last decades or centuries.

MR. O'HANLON: Mallory, over to you.

MS. STEWART: Yeah, I mean, I think debris should be a low-hanging fruit potentially that there could be some agreement on recognizing its effect on all users of space. What I'm fascinated by and what I think really needs to be focused on at some level is the challenges of transparency and confidence-building in outer space when you have both military players and now a very rapidly growing commercialized factor that's actually taking over some of the militarized role.

And so where is the risk level that folks are comfortable with? There's a

different risk comfort level for a corporate entity than a military entity. And how do we know where those lie? How are we addressing some of the confusions in operation between a military role and a commercial role? And really are we sufficiently trying to transparently show good intent if we're sort of above-board behavior? Is there any way to show transparently that you're doing on-orbit servicing or something else? I mean, it's a struggle that we're going to have to face more and more as we have this diverse space environment, as we have a change in the players. Right? When you have a corporate entity running a large part of a space organization and they may have other obligations not just to the national security arena, but also to their stockholders, how does that dichotomy result in a risk analysis? How does it result in a comfort level with threat? These are questions that aren't answered.

I will say that the development of norms was one effort to address some of these challenges. The norms development process seems to have faltered, if not stalled, entirely. But I think that would be something that could be restarted at a very sort of step-by-step approach to try to at least figure out where the gray areas could have boundaries. Right?

So I completely agree that there is this pushing of aggressive maneuvering in space to see how comfortable other countries are with close proximity. With even a certain amount of debris generation with questionable space maneuvering, where are countries feeling threatened? Where are corporations, when their private commercial satellites experience some challenge in this arena, where are they feeling threatened? Where did they object? These are all gray areas. They've been gray for some time.

But now that we have more commercial actors, more prevalence of diverse players, even non-state actors in space, taking these maneuvers and doing this sort of questionable, gray area activity, the threat analysis may be different. And the comfort levels of the different and diverse space players is different. And that's why you come back to the importance of outreach and cooperation and space security dialogues to say this is what we're doing. These are the threats we perceive. Please tell us if you agree with us or if you disagree or if you have some reason to know this is not threatening.

Space diplomacy, as Frank mentioned, is so important in an arena of heightened risk and threat and arms race. And so, you know, while I don't know that there's a movement or an effort in this administration to talk about arms control in outer space, there should be a recognition of the importance of conversations about risk and threat. Because that's the first step to actually defining that gray area and thus trying to minimize the confusion that's going to be I think growing in a diverse environment, such as outer space.

MR. O'HANLON: Great. Frank?

MR. ROSE: Let me build on a point that Todd made. I agree with Todd. It will be very difficult to get international consensus on space arms control anytime in the near future. So I think you need to aim for the low-hanging fruit. And if you look at the history of the space age, the biggest advances in space security have come when the security of the space environment have overlapped with the environmental sustainability of the space environment.

For example, the 1963 Limited Test Ban Treaty, as I mentioned earlier, also prevented the testing of nuclear weapons in outer space and helped maintain the space environment. The 1967 Outer Space Treaty prevented the -- or prohibited the deployment of weapons of mass destruction in outer space. The 2007 U.N. Debris Mitigation Guidelines tried to limit the amount of new debris generated in outer space. So I agree with Todd. The area where I would focus my attention on is trying to strengthen the international norm against debris-generating events in outer space.

Now, you may be surprised, but several senior administration officials in the Trump administration have talked about the need for norms. Former Secretary of the Air Force Heather Wilson was very articulate about it. She actually stole a couple of my lines from previous speeches I gave in government with regards to China. And Scott Pace, they've talked about the need for norms. But we have not seen much action.

Going back to Mike's point about the Indian ASAT test, I think the Trump administration missed a real opportunity for leadership. Now, I understand why they did not want to overly criticize the Indians. One, they tested it in a way that would reduce the amount of

debris in low Earth orbit. And secondly, they view India as a strategic partner, especially when it comes to balancing China.

But that said, they could have used this as an opportunity to get the major space-faring countries together to fortify that norm against debris-generating events. My hope is that they will pick up this baton, but hope is not a strategy.

MR. O'HANLON: Very good. Madelyn, we've heard discussion of, you know, a treaty that would -- or at least a stronger agreement that would limit the creation of debris and maybe codify that. We've heard some discussion of preserving the 1960s treaties that don't allow nuclear weapons or explosions in space. Is that the extent of what we can prohibit or should prohibit or are there other meaningful restrictions we should be looking to sustain or impose, as well?

MS. CREEDON: Well, certainly I think debris, as everybody has said, debris is the number one problem and it's debris generated by ASAT tests and it's other sorts of debris. So the agreement now that satellites in orbit have to maintain sufficient fuel and not become large hunks of debris themselves at the end of their service life is important. Because that was also a debris-generating event when the dead Russian satellite collided with (inaudible) satellite in I think it was like 2009.

In any event, so as we see more and more commercial satellites, we're now talking about thousands of commercial communications satellites being launched privately, the private sector has to also play a role in this. And whereas I think before most of the norms talks, the debris talks, certainly the U.N. talks were in the context of a government arena, this is an opportunity to do something a little bit different and to bring in the private sector. Because if all of these companies are, in fact, successful, which is a big if, but if they are successful in their business cases for launching all these satellites, they'll have more satellites than the governments do. So they're going to have to play a huge role in figuring out how to mitigate debris.

And the second piece is that they will also have to play a very big role in terms

of the proximity and the proximity operations and movements. Because they're -- again, with their satellites, with their maneuverability, the way they're going to have to maneuver to get out of jamming, all of these things, they're going to play a huge role.

And so that said, it's a new paradigm. It isn't just government development anymore. It's got to be more detailed.

Maybe one of the ways to do this is since there are commercial situational awareness capabilities, as well as government space situational capabilities, maybe one of the ways to attack this is to get -- I think, Mallory, you may have mentioned it -- is to get somewhat more transparency into space situational awareness. Because maybe this is the beginning of understanding what people are doing.

There is some value in understanding actions of satellites. So one of the things that I think sometimes maybe China, Russia think if they have a satellite and they can get away with something, well, that's okay because it wasn't known, so it's unattributable and so it's not escalatory. But if there were greater space situational awareness shared amongst everybody, then it's like, no, no, you're not going to get away with that little maneuver or being too close or getting in somebody's footprint.

And so I think there are a lot of opportunities here, but they're going to have to incorporate a lot of new thinking and they're going to have to be much broader than just government-to-government.

MR. O'HANLON: So final round of questions from me. I'll just put it on the table now and then ask you to start with Frank and then Todd, but then Mallory and Madelyn can comment, too, please, if they wish. Because I'd like, Frank, for you to give us a quick update on how you see the creation of Space Command.

MR. ROSE: Yeah.

MR. O'HANLON: And originally, thank you for trying to get General Raymond here and we thank him for trying to make it, even though in the end he couldn't. We also, I think, want to, at least I personally and I'm sure many of us want to, thank and salute General Paul

Selva as he steps down from the vice chairman job today. He's done remarkable things, including in the spirit of technology.

But we'll ask Frank to talk on Space Command, then Todd to talk on where things stand with the possible creation of a Space Force or Space Corps on Capitol Hill. It looks like it probably will happen. The House and Senate bills both include variants that are not fundamentally or diametrically opposed, but, again, it's not over till it's over. There's no legislation that does this yet. And Todd can perhaps update us a little bit on how he sees the prospects, which some of us on the panel are for and some against, but we'll leave that out until we get to your Q&A or until we get to Madelyn and Mallory to wrap up with this round.

So, Frank.

MR. ROSE: Great. Well, excellent question, Michael. I believe reestablishing U.S. Space Command makes a lot of sense. Now, many of you may not know, but from 1985 to 2002, there was a United States Space Command headquartered in Colorado Springs. But it was merged into a new Strategic Command back in 2002 because at the time the Department of Defense thought it was important to have one combatant command responsible for integration of strategic capabilities: space, nuclear, missile defense, cyber.

And I agree with the point that you need to look at these capabilities in an integrated manner because space, cyber, nuclear, they're all integrated. But over time, as these capabilities developed, it became very clear that there were probably too many missions in the new U.S. Strategic Command. And over the past five or six years, what we have seen is a shedding of STRATCOM's additional missions. First, U.S. Cyber Command was spun up; now U.S. Space Command.

But that said, I still support establishing U.S. Space Command, but there are a couple of things that we will need to address as we move forward. First and foremost is how we do the integration between U.S. Strategic Command, U.S. Space Command, and U.S. Cyber Command. I don't know exactly how to do that. I have thrown out some ideas, such as establishing a strategic capabilities council within the Pentagon, chaired by the deputy secretary

of defense and the vice chairman, to make sure we do that integration. Reestablishing Madelyn's old job at the Department of Defense, the assistant secretary of defense for global strategic affairs. One of the big mistakes in my view that the Obama administration did was eliminate that position in 2014. So the bottom line, it makes a lot of sense.

I'd also add that as we set up a new combatant command, we need to make sure we have mechanisms to integrate our allies into its operations. Because as we move forward, cooperation with allies is going to be critical. And a number of allies, we saw just last week that the French have set up their own Space Force or Space Command. So we're going to need someone at the combatant command level to integrate allies.

So as they stand up Space Command, I would really encourage General Raymond, who was confirmed just a couple of weeks ago, that he ensure that we have allied liaison officers at the command.

MR. O'HANLON: So Space Command is happening and we have a commander and we have probably 500 to 1,000 people ultimately who will be associated with it. But, Todd, we're talking now about either a Space Force or a Space Corps that would be a separate military service, perhaps like the Marine Corps within the Department of the Navy. Who knows exactly how it'll work out? But that would be much larger than what Frank's talking about, but much smaller than the Marine Corps or any other service, so please give us the sense of how that's going.

MR. HARRISON: Yeah. So, first of all, to distinguish between Space Force or Space Corps, whatever you want to call it, and Space Command, U.S. Space Command I could say because we have an Air Force Space Command today that's part of the service; it's very confusing really as words go. (Laughter) But the difference between U.S. Space Command and a Space Force is a Space Force would be a military service. Its job is to organize, train, and equip forces. A combatant command, like Space Command, its job is to employ forces in real-world operations. So very different functions.

We have the same thing, it's like the difference between the U.S. Army and

CENTCOM. They are different, they have different jobs. So they are not redundant in that sense.

Now, the debate over the Space Force, Space Corps, obviously part of it is over the name right now. So the House two years ago -- was it two years or three? No, two years ago the House had a bill, long before President Trump had ever talked about this, that would have created a Space Corps under the Department of the Air Force. That is basically what the House is pushing this year in the NDAA.

The Senate is also saying they want this service to be under the Department of the Air Force, so coequal to the U.S. Air Force under the Secretary of the Air Force. And maybe they rename it Secretary of the Aerospace Force or Air and Space Forces. Who knows? But it would be under the Department of the Air Force, coequal branch of the military. They differ on the name. At this point it's just a name. Right? Call it whatever you want. I personally would prefer Space Defense Force. I think that more accurately emphasizes what it is, the job of our military Space Force is, what their job is. It's to defend our assets in space. That's the primary job.

But who know what they'll decide on? It'll be led by a four-star call it a commander, call it a commandant, we'll see. But a lot of those details will be worked out.

The big issue, though, I think is how they do the implementation. And specifically, what forces transfer into this new organization? It's not as if we're creating something new from scratch because we already have space forces today. We've talked about all the different things that the U.S. military is doing in space, all the different capabilities that we have in space that are at risk. Well, we have units all around our military that are organized to do those things.

The problem we have today is those different pieces of the military that do space, our spaces forces, are fragmented across the military and across the services. So in my mind, the main reason for creating a Space Force is to integrate all of those different units that do space, all the different people that do space under one unified chain of command. That

would be the main reason to do it.

Now, the Senate right now in their bill, they're really just talking about moving what's already under the Air Force into the Space Force. The House is a little more wishy-washy about it, but I think that's going to be one of the important things that comes out of this is what authorities do they give and what guardrails do they put on the military in terms of deciding what transfers of from the other services? Because there have always been parts of the Navy that do space. The Navy has always built, launched, operated our narrowband satellite communications systems. The latest generation is called MUOS. You know, they've always done that.

The Navy just recently in a memo sent to the Air Force and said, hey, we're not doing that anymore. We're out of narrowband coms. That's over to you, Air Force. They changed the name of SPAWAR to take out the S in "space." And they say, hey, we're not in space anymore. I think they're trying to do that so that they don't have to transfer anyone and they don't lose any top-line budget. But I would call BS on that and I would make them move people, move some of those billets, take some of the budget that's associated with it.

The same is true for the Army. The Army is trying now to minimize how much they actually do in space. The Army has a lot of space operators. Space and Missile Defense Command has an S in it. They have a lot of space people. They're now trying to minimize that.

The Army actually operates, launches and operates its own constellations of satellites now. And I have heard rumors that they are arguing that that should not even transfer over to the Space Force, that the Army should be able to keep its own satellites and all of the infrastructure that goes along with operating it.

If we're going to do this right, we should learn from 1947. The last time we created -- the only time we created a new military service, we created the Air Force. And what did we do? We did not move all fixed-wing, land-based aircraft into the Air Force. We ended up with four Air Forces that we have today, not even including the Coast Guard.

So I think we need to, you know, be cognizant of that. Hopefully, when they're

in conference committee they will think about these things and make sure that if we're going to create a Space Force or whatever we end up calling it, that we actually move all of our space capabilities in the military into that organization so that we can achieve the benefits of that and not end up, you know, much like we have today where you have very fractured chain of command and a lot of different units and a lot of different organizations and paralysis, organizational paralysis because of that.

MR. O'HANLON: So I want to turn to Mallory and then Madelyn for any quick follow-up that you may have. But one question that's still on my mind having listened to Todd's excellent explanation is, are there enough disagreements in the legislation in the two Houses that we could actually see the whole thing fall apart? Because, again, if you're disagreeing over large chunks of who might be moved, it sounds like we're not really very close to a deal. Worrying about resolution of a name seems easy compared to moving, you know, huge chunks -- well, modest-sized, but still substantial chunks of people from one place to another.

Mallory, you want to comment?

MS. STEWART: I mean, I think that's right. I think that there is a lot of disagreement or meaning that needs to be clarified. And I think for those of us on the fence with respect to the upsides versus the downsides of this organization, those details will be important, right, to see how they play out.

I would say that with respect to Todd's suggestion of naming it the Space Defense Force, that would make me feel a lot better from a diplomacy angle, given that that's what it's truly meant to do, to defend our assets in space and to protect our capabilities. The fact that the Space Force rollout is playing into a Russian narrative that the U.S. is trying to dominate outer space is not helpful. And if we could tamper that in some way and perhaps reflect it both in the name, which would make a difference, but also with the details of its organizational capacities, it's utilization of existing capacities versus creating new entities, I think we could help the diplomacy side and help the U.S. win back the narrative as to what it's intending to do with this Space Defense Force.

So that's just sort of my quick thoughts on that. I don't know if Madelyn has more to say.

MS. CREEDON: So, you know, I think one of the things that we forget that the fragmented nature of national security space has been with us for a very long time. When Lyndon Johnson was the majority leader in the Senate, he tasked the Senate Armed Services to try and their arms around this, referring to it as the incomprehensible organizational problem of managing national security activities in space. And given that there have been multiple efforts to try and fix this, including at one point establishing U.S. Space Command, which helped for a while, but in some respects both isolated space and then the Air Force lost interest in space.

One of the reasons that Congress periodically gets very frustrated with how space is run is because it continues to be extraordinarily fragmented. It continues to be extraordinarily uncoordinated in all of the approaches, so in the approaches to acquisition, in the approaches to defense of space assets, and also in the approaches to whatever we're going to do with respect to offensive space.

At one point the Congress looked at the U.S. Space Command and realized that, with one exception, all of the heads of U.S. Space Command, which was also dual-hatted back then as Air Force Space Command, they were not space operators. They were, for the most part, Air Force pilots. And so there was huge frustration and Congress acted, and this is what see again.

There's this continuing frustration on the part of Congress that the space management is so fragmented that you get consistent and perpetual problems in acquisition, in the whole role that Todd was talking about, about the service's job to train and equip, and even in space policy has really been very fragmented amongst the services. And then the big elephant in the room that we don't talk about is, of course, the NRO. The NRO has very large satellites. They have a different acquisition and they have a different approach to protecting their satellites.

So when you think about, well, how do we fix this very dysfunctional, very

fragmented space organization, the way to fix it would be to bring all national security space under one entity. That's probably the way to fix it and then you fix the -- and that becomes your service and they become how to do the train and equip functions. But it's never going to happen. I mean, even the small components of the Navy and the Army, everybody has gone to their corners to protect their assets, their people, and to prevent it from moving.

NRO probably has some of the strongest defenders in Congress. It's never going to get moved -- in my view it should, but it never will -- into the Space Force.

So as a result, whatever comes out of this, and there will definitely be something that comes out of this, whether you call it a corps or a Space Force or whatever, there will be something and it will, for the most part, be the Air Force. And it will still report to the Air Force and it will still be saddled by all the problems that the Air Force has always had, a lack of attention, a lack of resources, complicated acquisition that is not well-suited to space acquisition. And even with some of the reforms that Congress has tried to make on acquisition, it doesn't help space acquisition.

So it'll happen and I think in another 10 years Congress will be just as frustrated with this whatever it is created and there'll be yet another Space Commission and yet another gnashing of teeth and wringing of hands about the fragmentation of national security space. So I hope it works.

I am, by the way, a fan of the reestablishment of a U.S. Space Command. It will be interesting to see if as U.S. Space Command it is separate and apart from Air Force Space Command. But it does have, it should have, it needs to have a combatant command role. The problem is making sure that space really does get fully integrated in all of the operational plans that are, for the most part, the regional combatant command jobs and taskings.

So as long as Jay and his successors can figure out a way to come up with clear requirements, which is a unified combatant command, and work with the regional guys to actually get space incorporated into plans, then that's a good move. But in terms of fixing the overall problem I'm not very optimistic.

MR. O'HANLON: So Frank and I will already reserve the auditorium after this for July 31, 2029, so you can please mark your calendars for that review session, if not before. (Laughter)

But let's open it up to you. Please wait for a microphone. I'm going to take about three questions at a time and then ask the panelists to selectively each pick one or two to respond to. We'll start with the gentleman in the back right there, please.

MR. JACKSON: Hi. Alec Jackson, a legislative analyst at Thompson Gray.

I just wanted first to note that it's actually even worse than the panelists had indicated with regards to Congress because they didn't appropriate anything to actually establish the Space Force on the House Appropriations side. So even if the, you know, SASC and HASC authorize a Space Force or Space Corps, there's -- as of right now, there's no money for it.

I wanted to get the panel's opinions on the Space Development Agency and how they think that new agency, new-ish agency, will fit into this overall picture, whether it'll make it better or worse. We've seen some, you know, turf wars between the NRO and the SDA already. So I just wanted to get your thoughts on that. Thank you.

MR. O'HANLON: Great, SDA. We'll stay in the back for a second. The gentleman on the other side, please, and then we'll move up here.

MR. HUMPHREY: My name's Peter Humphrey. I'm an intel analyst and a former diplomat.

Do you guys know the term "rods from god?"

MR. O'HANLON: Yes, I used it earlier.

MR. HUMPHREY: Is there any chance that we could outlaw that weapon on the drawing board?

MR. O'HANLON: It's a great question, thank you. I'm glad you asked that. And then the woman here in the sixth row, black shirt. Yeah, right up here.

MS. MACHI: Thank you. Vivienne Machi with Defense Daily.

You mentioned in passing France's announcement of the Space Force, so I was

just curious if you all could give your reaction to that news, your opinion about it. Does that complement what we're trying to do in space or does it complicate it? And do you see any other nations moving forward in that way, as well?

MR. O'HANLON: Great, thank you. So why don't we go with responses now, starting with you, Todd?

MR. HARRISON: Sure. To the budget question before, or the comment about it, I think we're looking at it the wrong way, that already today we spend about 15 billion a year in DOD unclassified on space. Those funding lines, those people that are funded, those programs would just transfer under the Space Force. So there is funding for a Space Force.

What we're talking about is how much extra funding are you going to get to stand up the new headquarters that would be here at the Pentagon? And in terms of standing up the headquarters, I think the Senate's clear position is you've got to take this all out of HIDE. Any new people you want to add to your headquarters' staff have to come out of existing headquarters. Right? Which actually is not a bad idea.

I mean, we've got a lot of folks at Air Force Space Command Headquarters that, in theory, should just be transferring over. You are going to have to add some new general officer billets; there'll be some money associated with that. They will probably need some contractors to do studies and help them in the transition period.

So, yeah, I think the House appropriators put in like 15 million. I think the Air Force had requested 72 million. You know, in the grand scheme of a $738 billion defense budget, that's billion with a B, this is dust. And so you can easily reprogram that money if you need it later on.

But, yeah, so I think the funding issue is really a red herring. The funding's already there. This is just transferring people, organizations, programs that already exist into a new chain of command and then adding some headquarters function, which you could take out of HIDE, out of other headquarters. So I don't think that's a big issue.

In terms of "rods from god," I don't think it'll happen because it's not a good

idea. Just in terms of the physics of it, if you want to hit a target anywhere on the Earth in 45 minutes, use an ICBM, even with a conventional warhead. Way easier. You don't need to have these things in orbit. You have to put hundreds of them in orbit and then be prepared to de-orbit them and hit something within 45 minutes. You look at the physics of it, it just doesn't make sense to attack targets that way. I think that's why we haven't done it. And so I think, you know, that will hold.

MR. O'HANLON: Okay, thank you. Well, we have the lawyers coming next, so we'll keep going down. (Laughter) Mallory, over to you.

MS. STEWART: I mean, on the "rods from god" it just highlights how this language is so harmful. Right? It's an unrealistic sort of inappropriate idea that's framed in a way that's not helpful for the diplomats. And I just think if we could try to use words that more accurately reflect what we are worried about, right, that we are defending our assets in space, we are trying to look at space as something that we rely on more heavily perhaps than any other country, and we're concerned that we need to defend that. And so we don't want to use language that's inflammatory for other countries.

With respect to France rolling out its own Space Force, I think you will see more of that. I think countries are watching what the U.S. is doing, especially our allies and non-allies in other countries to see where they potentially need to play in this new and burgeoning space arms arena or space -- I won't say militarization because I agree with you, but space war-fighting domain. And so I think you're going to see more of that going forward.

And is it harmful or helpful? It comes down to how we utilize allies and how we play well with others, and hopefully, how we use language that's conducive to collaboration and cooperation and not in any way closing off that possible future cooperation with countries that are interested in engaging in space cooperation with us. And that's the key is that China and Russia know this and they're engaging in these countries and developing these relationships at a time where we're trying to figure out our Space Force development. And we're losing a possible option to connect with these countries and to explain our concerns and to try to work

with them going forward.

And so if we can use better language and we can actually utilize their interest in space to say we're all working on this together, and trying to more comprehensively have a diplomatic rollout, that allows us to gain greater cooperation with both our allies and also burgeoning space players.

MR. ROSE: With regards to France, let me give the French some credit. Amongst all of our allies they probably have some of the best military space capabilities. And we need to find ways to bring the French and other allies into an integrated approach to national security space.

In addition to the French, as Mallory mentioned, you have a number of other allies who are standing up space commands or space forces. For example, just a couple of months ago, Japan announced that it was setting up a force. And I think the allies from a military point of view are going to be more important.

As I mentioned in my opening remarks, Russia and China are targeting U.S. assets. One of the ways that we help protect our capabilities is by increasing the resiliency of our system. One way to enhance the resiliency of U.S. systems is to have better integration with allied systems because it makes it much more difficult for potential allies to target if we are working with our allies. So I think there is a strong military argument, not just a diplomatic argument, for greater integration with allies.

With regards to your question on "rods from god," I agree with Todd. I don't think that we would ever deploy these types of systems for technical and operational reasons. But with regards to the legal limitations, I have a hard time seeing the United States Senate giving its advice to a legally binding treaty preventing us from doing that or forswearing an option. I could be wrong, but the Senate has not been very favorable towards any types of treaties that significantly limit U.S. missile defense or space capabilities.

Call me a skeptic, but I spend a lot of my time working on Capitol Hill. Madelyn may have a different view, but my gut is that you would receive a lot of opposition if an

administration went to the Senate and asked for the Senate's advice and consent to such a treaty or agreement.

MR. O'HANLON: And Madelyn?

MS. CREEDON: So I completely agree with Mallory and Frank on the whole discussion, and it is just completely impractical on the "rods from god."

But I think on the other question on the organizational issues, it isn't just France and Japan. Russia and China have also done the same thing. They are consolidating their space forces because, in many respects, space is different. It is another commons, like air or like water. And it does make sense at this point in time to have a very separate and specific focus on how to think about the training, the equipping, the defending, all of it for space. And because of that, it's why I think having a U.S. Space Command is a good thing.

But it's all of the things that would underlie the U.S. Space Command that I think Japan and France and Russia and China have managed to consolidate into their space force. We're not going to make it quite as comprehensive. And I think that may be the biggest long-term problem.

MR. O'HANLON: Let's go to a second round. We'll start with the gentleman in the blue shirt.

SPEAKER: Can you answer (inaudible) question, the Space Development Agency question?

MR. O'HANLON: That's good. Yeah, okay. We'll bring that into the answers to round two. Thanks for the reminder.

MR. TRUGEVE: Hello. My name is Mikhail Turgiev. I'm with the Russian News Agency right now, Novosti.

My question is, we see the U.S. waiting JCPOA, INF, and according to John Bolton the New START Treaty will unlikely be prolonged. Is the Outer Space Treaty in a safe position now that you mentioned?

MR. O'HANLON: Is the Outer Space Treaty in jeopardy? And then we're just

going to move down this row, so the gentleman here in the jacket and then we'll come to the -- we'll have four this round.

MR. ABDULLA: Namo Abdulla with RUDAW. Just one question about Iran.

What do you know about Iran's space capabilities? We know in the late '90s, I think, they created Supreme Space Council. How far has it come? Does it seek or has it sought equipment or know-how from other countries, such as China and Russia? Thanks.

MR. O'HANLON: Great, thank you. And the woman here in the second row, please.

MS. RIESBECK: Hi, I'm Luc Riesbeck with George Washington University Space Policy Institute.

If the New START Treaty is not renewed, then there will be a loss of prohibitions for non-interference with national technical means of verification. And I was wondering if I could get the panelists' opinion on how that might affect national space security. Thank you.

MR. O'HANLON: Thank you. And then finally, the gentleman here in front.

MR. GIAS: Idi Gias, (inaudible).

All the arguments led to the creation of a space corps are interesting, but in the beginning of the year there was a report saying that the tapping and patching of all the cyber capabilities or military (inaudible) has flaws. So a cyber command unifies one, which is much more urgent right now because it can use -- I can hack the systems of a satellite to use your satellite to harm your own satellite, and then I have deniability. It was your mistake.

The idea to unify, to not have everything too fragmented, how do organize the cybersecurity of all those systems?

MR. O'HANLON: Great. Well, let me start with Madelyn and work down the other direction this time.

MS. CREEDON: Well, let's see, on the Space Development Agency question, sort of kudos to Mike Griffin because I think he was trying to come up with a more creative way to solve a problem. Unfortunately, I don't think it was the right answer because it creates yet

another entity that's trying to do space acquisition. And if we're going to really fix space acquisition, then I am a believe in what the Space Commission back in 2001 came up with and that there should be a single, integrated acquirer for military space capabilities. And that also brings me to why I think the NRO should be part of this.

Let's see, on the Outer Space Treaty, I haven't heard anything that would indicate that there's any problem with the Outer Space Treaty. And like the New START Treaty, I still think it's in the U.S. national security interest to be a part to that. It's also a multilateral treaty, which makes it very, very different than a bilateral treaty.

On Iran, I think Iran surely has an interest in the space program. They have launched I think at least two satellites. There have been some launch failures. I think the biggest question that is still outstanding with Iran is, is there a serious desire for a space program or is the space program simply a way to continue tests for longer-range missile development? I think that is an unanswered question with a lot of suspicion on the one side.

On the national tactical needs, I completely agree with you that the loss of the New START Treaty would be very detrimental to U.S. national security interests. And that's just yet another reason of why the loss of New START and a failure to extend it would really have an impact on the U.S.

MR. O'HANLON: Great, thank you.

MR. ROSE: I have not heard anything about the United States getting out of the Outer Space Treaty. I think that would be a disaster for the United States, to be quite honest with you.

You know, the reason we are getting out of the INF Treaty, effective on Friday, is Russia's been in violation for many years. And I've spent a lot of my career trying to bring the Russians back into compliance, but they are not coming back into compliance. So that is a point that I will give to the administration and they did try to bring the Russians back into compliance.

With regards to Iran's space program, I think Madelyn is absolutely correct.

Yes, they have done some space launches, but I think the big concern is that they are using space launch program as a way to continue to develop longer-range ballistic missiles.

That said, you should take a look at Todd Harrison's recent report about Iran's counter space program. Like the Russians and the Chinese, they understand that the United States and our allies are very dependent on space to conduct military operations, and they are developing their own counter space capabilities.

And finally on New START, I agree with Madelyn. I think leaving the New START Treaty would not be in the interests of the United States for a couple of reasons. One, I think the New START Treaty helps us maintain stable deterrents with Russia and without the New START Treaty it will be difficult to do that. But secondly, it provides us verification measures we would not necessarily have without the treaty. So getting out of the treaty, I think, would be a colossal mistake or not extending it.

MR. O'HANLON: Mallory.

MS. STEWART: Yeah. I mean, I don't want to be too repetitive because I completely agree with what was said before. I will just highlight Todd's CSIS report on the space threat from 2019 has a good discussion on several of these issues, including the Iranian question, as does the DIA unclassified space report that came out in 2019, as well.

The JCPOA and the INF Treaty are entirely different than the Outer Space Treaty. I don't think there's any discussion of getting out of the Outer Space Treaty. That doesn't make any sense to anyone.

You know, I won't go into my personal opinions. I'm sad that both of those agreements, the JCPOA being a political agreement and the INF being a treaty, on a multilateral basis I'm sad that both of them are going away. I think there are problems with that, but I understand the political and sort of national security angles that have been discussed for both of those.

As for the New START Treaty, completely agree. It's detrimental to not continue it on many levels, not the least of which is our verification capacity. I think it's

detrimental to both the United States and Russia. And having had the privilege to be on that negotiating team for a couple of weeks and seeing how really beneficial the relationship development capacity could be by continuing this agreement. I'm uniquely concerned about the end of that treaty.

Cyber is so intimately combined with space on many levels. I think Frank had mentioned earlier having a cyber com and a space com very comprehensively intertwined in certain respects and working together. I think it's an ongoing program. You have countries that may not have a space capability, but they have an amazing cyber capability and thus become space players to certain degree. And I think that's an important concern. And I think it highlights the problem of coordinating all of the space players in one place without acknowledging the connection to an entire different arena that also has its similar coordination, certainly, concerns and challenges.

Back to the Space Development Agency, I know we've all sort of given that question short shrift. I think the Missile Defense Development Agency has had its own problems and so we need to avoid some of that if we're going to create another acquisition entity, but bringing an acquisition entity into a very divide community where NRO is going to maintain its own acquisition capacity has big problems. Right? When you talk about turf war and acquisition together it makes a bigger problem, so I don't think that's going to go away easily just by developing an SDA.

MR. O'HANLON: And Todd.

MR. HARRISON: Yeah. So I'll start with the SDA, Sandra's point, glad she brought it back up. I think, you know, of the three major space organizational reforms that this administration proposed, you know, the Space Force, the Space Command, and Space Development Agency, the Space Development Agency was actually the first to stand up and to get a leader. I think it probably is the first one to go away, quite frankly.

I think there's always been some fundamental questions about what is its role going to be and how is that different than the other space organizations we already have? And

why is it not being organized under the Space Force? If we're creating a whole new branch of the military to try and integrate all of our space capabilities, why is this new organization not being put under that. That is a big question, and so I have my doubts about it continuing.

You know, a big problem that we have is that in space acquisitions, responsibility for delivering capabilities to the warfighter has not always been aligned with authority. And the authority I'm talking about is budget authority. You've got to align your budgets and your responsibility together if you want to be effective in acquisitions. That's a big, big help to get you started. That, by no means, solves every problem, but I think creating a Space Development Agency off on the side just further fragments things and misaligns us.

In terms of the Outer Space Treaty, I agree with everyone else here. There is really no serious discussion in the United States of getting out. The JCPOA is a totally different issue. That was a political issue. That is something the President campaigned on. The President is doing what he said he would do during the campaign. The Outer Space Treaty is not the same way at all.

I actually have heard one, you know, public discussion of potentially changing the Outer Space Treaty. It was in a committee hearing I think maybe a year ago. Senator Cruz openly mused in the committee hearing about maybe we need something better than the Outer Space Treaty, I'm paraphrasing here. But there is nothing more beyond that in terms of serious discussion. Quite frankly, I don't think we can do better than this multilateral treaty that we already have in place.

Yeah, in terms of Iran's counter space capabilities, you know, I commend you -- we have a whole chapter in our Space Threat Assessment of 2019 report, co-authored with Kaitlyn Johnson and Thomas Roberts. I refer you to that. Iran has very limited space capabilities. They've had a few successful launches, I think two; you know, very limited capabilities. So what's more interesting about Iran are their counter space capabilities, which are primarily non-kinetic. And Iran has been pretty active in jamming SATCOM links. They've even managed to jam satellite uplink in our hemisphere. I'll let you go to the report and you can

read about when they did that.

MR. O'HANLON: So we have time for a lightning round and concluding remarks, which we'll combine together. So, let's see, we've got the gentleman in a uniform in the 11th row. And then we will -- let's see, where else can we go to geographically balance? Here in the second row up front.

MR. PERMAN: Ben Perman, U.S. Coast Guard. We talked a lot and I think the panel covered very well some of the less than lethal issues, including increased commercialization of space and perhaps the implications that that has. I was wondering if the panelists could just speculate quickly on whether that implies the need for a constabulatory civil regulatory agency or perhaps a hybrid agency that has both military and constabulatory, regulatory roles, dare I say a Space Guard. Add a third item to the lexicon. (Laughter)

MR. O'HANLON: Excellent, thank you. And all the way up here, please, the second row.

MS. KULLIYE: Thank you. Rox Kulliye with Secure Down, private sector entrepreneur.

I would like very much Madelyn to talk about the role of the platform providers in space. Because the alternative motive doesn't mean necessarily serving. Sometimes there's a board of directors, investors, foreign investors, and a platform, so regulation would be put in place for companies like Amazon. Don't hold me on that because it's the biggest one playing. So in space, I would like to know more about that, if you could. Because you mentioned a board adviser's influence and I also am concerned about foreign investment influence.

MR. O'HANLON: And because those were quick, we'll add one more question. My friend in the North Face hat here in the fifth row. And then we'll start with you on the responses and work down. Remember it's the lightning round.

SPEAKER: I want to thank the panel for a very good presentation. I'd just like to ask this question: Who are the non-space actors in space?

MR. O'HANLON: Okay, so over to you for any all. And then any concluding

thought you have, you want to mix in, too.

MS. CREEDON: So first to the Coast Guard question. There's a whole debate going on right now in terms of something that looks like air traffic control in space. Right now the regulatory side of space is, particularly on the civil side of space, but it does have some bleed over into the national security side of space, is pretty fragmented, as well. And there's a huge debate going on in Congress about just who -- what's FAA's role? What's Commerce's role? And I know that's not anything we mentioned. That in and of itself is an entire panel worth of discussion.

But if that ever got sorted out, then I think your question is actually a really good one and one that's not been discussed. But if there is ultimately something that looks like the same way that air traffic management is managed on a global coordinated basis, and if there ever is a space global coordinated space traffic management sort of function or entity, that is your question. And how do you enforce those things? What is the international body for that?

And we're a long way from that, but I think it's an extraordinarily good question and something that we need to keep in mind, particularly as we have more and more commercial entities in space. And I'm going to tie that to your question because not only are we going to have more and more commercial entities in space, but I do believe over time there will be more state actors in space and that the commercial entities will also have much broader ownership among a much broader number of investors, which gets back to my other point. It's why we really need to have commercial entities and all of their foreign investors be part of a discussion going forward in terms of debris management and the space situational awareness, which then will eventually get back to the global air/space traffic management.

MR. O'HANLON: Excellent. Sir Frank.

MR. ROSE: Yeah. I would just say with regard to your question about space traffic management, there's a debate going on right now. Technically right now the Department of Defense handles the space situational awareness or space traffic management mission. Some people use these terms interchangeably.

It is supposed to flow to a civilian agency sometime in the near future. The Trump administration would like to send the mission to Commerce. Other people believe it belongs appropriately over at the Federal Aviation Administration. At the end of the day, Congress will have to decide because it will require an act of Congress, and it's up in the air. Indeed, I testified before the House Science Committee a couple of months ago. This was one of the key issue that was discussed and debated. There are different views in Congress and, quite honestly, within the administration.

My fundamental point was this. One, I think it's important that we have the military doing the military mission and getting out of the civilian space traffic management mission. But secondly, and, again, this is the most important point, we've got to make sure that this transition from the Defense Department to a civil agency is done correctly. We cannot afford to mess the transition up.

And my plea to the House Science Committee was not to send it to this agency or that agency, but to make sure that they use their oversight authorities in a way to ensure that we do the transition from the Department of Defense to a civilian agency right.

My final point is we've talked a lot about many issues today, specifically about many of the military organizational questions, and I generally think that this administration is moving in the right direction on these issues. We face real threats and we need to defend our assets.

But as I mentioned a little bit earlier, one of the big, gaping holes in their strategy is the utter lack of a diplomatic component. If we are going to really ensure the security of U.S. space assets, diplomacy needs to play its proper role.

MR. O'HANLON: Mallory.

MS. STEWART: Again, I'm going to not repeat and just highlight some elements that haven't necessarily been flagged as much and it's just that the legal framework for both the commercial side and the military engagements and the evolution of the players in space has to catch up and it hasn't caught up. So don't know how there's going to be any sort of space

traffic management organization between commercial and military internationally. Right?

So in the aviation world you do have a lot of important treaties on a multilateral basis that help the international traffic, essentially aviation traffic, operate. And it gives rights to passengers and it tries to allow for an important understanding on a legal basis as to the relationship between these players. We don't have that and yet we're rushing forward to a commercialized outer space and we're rushing forward to close interactions between governments and, even going to the platform question, foreign investment in commercial operators that may then have military significance. And how are we going to catch up legally when we don't necessarily have an understanding of how this is playing out?

And so these are huge open questions. The fact that we're still trying to figure out exactly where space traffic management ends up is only one of them. It's only one of the problems we're going to face as this all comes to a head.

Finally, with respect to --

MS. CREEDON: Mallory, if I could --

MS. STEWART: Yeah.

MS. CREEDON: -- I think just to further complicate your point, it's absolutely well taken, but now as we even think about the introduction of people into space and space tourism, it's further complicated by the lack of the international treaties.

MS. STEWART: Yeah, and you only need one disaster to really lead to the open questions when you have many different countries involved in a particular launch or a particular, you know, passenger incident. And then who's fault when there's debris or there's an interaction in space that was sort of preordained by an existing anti-satellite test? So I think these are open questions and legal challenges that we face going forward.

Just on the non-state actor question quickly, I just want to highlight in addition to CSIS's report that also includes a discussion of non-state actors, DIA has a report on it. But non-state actor doesn't necessarily always mean something nefarious. I think sometimes we forget that. There's a lot of education institutions, there's a lot of NGOs, there's a lot of -- you

know, not just in the commercial arena, but in research science and technology development that operate.

MR. O'HANLON: Are they active in space?

MS. STEWART: Yeah, they have satellites. I mean, define “space actor.” Right?

There’s also no a nefarious basis a capacity to jam satellites, GPS jamming, that non-state actors have. So I think, you know, it’s defining who a space actor is. Is it if you own a satellite? Is it if you operate the satellite? Is it if you have a portion of the launch capacity, if you utilize the satellite’s capabilities? You know, there’s a lot of different definitional issues involved. And I think we just have to, again, going back to the four Ds, the diversity of space can’t be underestimated.

MR. O'HANLON: Todd, last word to you.

MR. HARRISON: Yeah. So in terms of non-state actors I’ll give you a good example. I think you can find the video of this on YouTube. A company called Surrey Satellite out of the U.K. They recently tested an on-orbit, active debris removal system. So it’s a good purpose, right, to be able to grab debris from space and bring it down. One of the systems they tested is a harpoon, so you can watch this cool video of them in space on one of their own satellites launching a harpoon and going through a plate that they used for a test, and harpoon a piece of debris.

You look at that and you say, okay, well, maybe you can remove debris that way. Maybe that’s also an ASAT weapon. (Laughter) This is a private company. This is a non-state actor that developed this and tested this, you know, so it’s complicated.

And yeah, definitely non-state actors, terrorist groups even, insurgent groups, have gotten into the jamming business. And we have seen that, we witnessed it in places like Iraq and Afghanistan.

In terms of the Coast Guard, I think, you know, a pessimistic view of humanity is wherever commerce goes, conflict will follow. And I think once we get to a point, if we get to a

point, where there is significant commerce going on in space, whether it's on-orbit mining for materials, resources, or space tourism, once that becomes significant commerce, there is the potential for conflict. And maybe then, 20, 30, 40, 50 years in the future, we should be thinking about do we need some sort of space guard for us to protect our commerce? Much in the way that our Navy was originally conceived of something as being there in a steady-state basis to protect our sea lines of communication.

The last point I would make, when it comes to space situational awareness and what we like to call space traffic management, although you can't really manage traffic in space, you know, it's a real challenge. And I think the comparisons to what we do for aviation only get us so far.

In aviation you can manage your own sovereign airspace. You have Air Traffic Control, it manages your sovereign airspace. And then we do need to have international agreements because our airspace intersects with other people's airspace, they're adjacent. And then we have international areas that don't belong, that are not the sovereign domain of any country.

In space it's all international. There is no territory. There is no sovereign space in any orbit for anyone. It does not work that way. And so it is all one big international area where we all have, you know, in theory, rights under the Outer Space Treaty. We all have responsibilities. And we need to coordinate.

There are some orbital regimes where we do that pretty well today. In geostationary orbit we do a lot of coordination through the United Nations and the International Telecommunications Union. And I think that works pretty well. We have pretty well-established norms. People know to keep your satellite within the box that you're assigned, operate within the frequencies that you're assigned. And when someone doesn't do that, we know that's abnormal behavior and they get called out for it. For other orbital regimes we just don't have the same governance structures in place. That's where we need to do a lot better.

I would say that definitely, I think we all agree, the military needs to get out of

the business of being the traffic cop in space and issuing all the collision warnings to folks around the world. That belongs somewhere else. I would argue it doesn't belong in the U.S. Government. This is fundamentally an international issue and we need to get an international consortium together to do space situational awareness and to provide that data more globally.

And I'll tell you that the companies that are doing -- or the organizations that are doing the best of this today are private companies. You know, yes, the U.S. military can have very exquisite space situational awareness data that we'll never be able to release. But private companies, first of all, if you're a satellite operator you know where your satellite is better than just about anyone else. And you know where -- you know, when you're going to make maneuvers you know what orbit that's going to put you in before anyone else even knows.

And so you see consortiums developing of private companies where they are giving this data to each other so that they will know where other people's satellites are with greater precision, so they will have warning before other people make maneuvers. I think we need to build on that and there does need to be some sort of international government governance over that to help facilitate the process. But I don't think this is a U.S. Government problem.

MR. O'HANLON: Well, with that, thank you all for coming. Happy August and please join me in thanking the panel. (Applause)

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