



10 Years of the Wolf Amendment: Assessing Effects and Outcomes
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Zoom Webinar

Speakers

Conversational keynote with former NASA Administrator Charles Frank Bolden Jr.

Followed by a panel discussion featuring:

- **Marco Aliberti**, European Space Policy Institute
- **Jon Lowet**, National Committee on US-China Relations
- **Scott Pace**, Space Policy Institute
- **Kevin Pollpeter**, CNA
- **Makena Young**, CSIS
- **Victoria Samson**, Secure World Foundation (*Moderator*)

Victoria Samson: Hello everyone. Thank you for joining us today. My name is Victoria Samson. I'm the Washington Office Director of the Secure World Foundation. The Secure World Foundation is a private operating foundation that focuses on the long-term sustainable use of outer space.

We push for best practices and norms of behavior to make sure that space is accessible to and usable for all the long term. Today's conversation is "10 Years of the Wolf Amendment -- Assessing Effects and Outcomes."

In April 2011, Congress passed the Wolf Amendment to put speed bumps in front of possible cooperation with China in space, and has reaffirmed the policy annually in subsequent legislation. 10 years later, sufficient time has passed to ask, did it accomplish what it set out to do?

In order to understand how this legislation has shaped US national interests and activities. Secure World Foundation is hosting a discussion that looks at the original intent of the legislation and how it has evolved, presents you as experiences in carrying out its requirement, examines consequences of legislation, and analyzes possible paths forward for engagement with China and space.

Really quickly, we have a fantastic group here. To the next slide, please. How to turn on closed captions. Basically it's a pretty easy process. Step one, find the closed caption button. Click it.

Step two, click on show subtitles. We have a live closed captioner here who we are very happy to have here and should be able to do the work for us.

Next slide, please. Will we take...Can you go back to the part...? Thank you. All of our panelists, our keynote speaker and our panel, have agreed to take questions. We're really excited about that. You can start thinking about questions you may want to ask and start submitting them even as I speak.

How to ask questions, step one, find the Q&A button and click it. You may want to up vote and then if your question isn't in there already, put your questions in the space and we'll try and get through as many as we can before. All right. Next slide, please.

Just a really quick background before we go into our keynote presentation. Basically the first question is, what is the Wolf Amendment? In April, 2011, the 112th US Congress wanted to put speedbumps in front of OSTP, the Office of Science and Technology Policy at the White House, and NASA, as they wanted to engage with bilateral agreements in coordination with China.

As stated, the legislation read at that point, "None of the funds made available by this division may be used by NASA or the OSTP to develop, design, plan, promulgate, implement, or execute, a bilateral program, policy, order a contract of any kind to participate, collaborate or coordinate bilaterally in any way with China or any Chinese owned company unless such activities are specifically authorized by a law enacted after the date of enactment of this division.

"The limitation in subsection (a) shall also apply to any funds used to effectuate the hosting of official Chinese visitors at facilities belonging to or utilized by the National Aeronautics and Space Administration."

That's what the law said in 2011. Each year it gets passed in subsequent legislation and it has been modified a little bit through time. The most recent version of the 2021 version, I'll read just really quickly. It's basically the same thing.

"None of the funds made available by this act may be used for NASA, OSTP..." They've since added the National Space Council since it's been restarted, " to develop, design, plan, promulgate, implement, or execute a bilateral policy, program, order, or contract of any kind to participate, collaborate, or coordinate bilaterally in any way with China or any Chinese-owned company unless such activities are specifically authorized by a law enacted after the date of enactment of this Act.

"None of these funds made available may be used to effectuate the hosting of official Chinese visitors in any facilities belonging to or utilized by NASA."

"The limitations described in subsections (a) and (b) shall not apply to activities which NASA, OSTP, or NSC, after consultation with the Federal Bureau of Investigation, have certified—

(1) pose no risk of resulting in the transfer of technology, data, or other information with national security or economic security implications to China or a Chinese-owned company; and

(2) will not involve knowing interactions with officials who have been determined by the United States to have direct involvement with violations of human rights.

(d) Any certification made under subsection (c) shall be submitted to the Committees on Appropriations of the House of Representatives and the Senate, and the Federal Bureau of Investigation, no later than 30 days prior to the activity in question and shall include a description of the purpose of the activity, its agenda, its major participants, and its location and timing."

Again, just wanted to set the stage properly. It's not a ban necessarily as you can see, but it does require pre-notifying Congress and vetting partners. That's why we've been describing it as a speed bump.

Looking back at some of the language of the original sponsor, Representative Frank Wolf of Virginia, what was it intended to do? What were the main goals at that point? Definitely, there was an interest in punishing the Chinese for human rights violations, also for cyber attacks on US and its institutes.

There was a concern about using it to keep the Chinese from stealing, whether it's US intellectual property or military technology. There is an interest in not helping the Chinese developing its space capabilities, specifically keeping them out of the space station.

At that point, it restricted bilateral, not multilateral meetings, and placed no restrictions on activities involving individual Chinese nationals unless they were acting as official representatives of the Chinese government. In general, it's fair to say it was a response to gaps, whether real or perceived, in coordination with Trump between Congress and NASA.

With that brief opening, I'd like to point out that we have a fantastic conversational keynote. Let's get started. Let me get my notes up. Charles Frank Bolden Jr. is a Major General (retired) of the United States Marine Corps. He was astronaut and flew on four Space Shuttle missions, and of course, former administrator of NASA from 2009 to 2017.

He is currently founder and CEO emeritus of the Charles F. Bolden Group LLC. As NASA administrator, Administrator Bolden directed the transition from 30 years of Space Shuttle missions to a new era and the use of the Space Station and space and aeronautics technology development.

Under his direction, the agency develop the Space Launch System rocket, SLS, and Orion spacecraft to carry astronauts to deep space destinations, such as asteroids and Moon to Mars, and also established a new Space Technology Mission Directorate to develop cutting-edge technologies.

I can probably spend a good chunk of the hour describing his background, but I won't because I'm anxious to have him speak. Administrator Bolden, can you please talk a little bit about, looking back, your trips to China prior to the Wolf Amendment and maybe your early goals when you first became NASA administrator in engaging with the Chinese?

Charles Frank Bolden Jr.: Thanks very much, Victoria, first of all, for inviting me to be a part of this organization this day. Let me go back, if I can, and everything you said is very accurate. If we go back to the very beginning, what brought about the Wolf Amendment, President Obama had two initiatives that he really wanted to push.

One was Muslim outreach. Both of these initiatives caused the administration quite a bit of turmoil. Muslim outreach was one. I did that when I went to the Middle East and we established relationships with what the President described as nontraditional partners, countries like the UAE that now has a Mars orbiter and now a big player in the family of spacefaring nations.

The other initiative was to have me travel to China to meet with representatives of the Chinese Space Agency and evaluate the feasibility of working cooperatively with them in human spaceflight, because we had a very strong interest in bringing them to the International Space Station.

Not making them a member of the partners of the International Space Station, but just allowing them to participate in the research that was going on.

I, for one, was concerned that if we did not open the door to the Chinese, because they had a 50-year program in place, they had a plan for 50-year development of their space program, that they would go off without us because, economically or any other way, they didn't really need us. Over time, they would probably begin to attract some of our partners. That was my fear at the time.

Before I went, met with Congressman Wolf because he was the chairman of the House Appropriations Committee responsible for NASA funding. He asked me not to go. In fact, he told me not to go. I reminded him that I work for the President and that my direction came from the President, but that we would do whatever he needed for us to do before we went and when we returned.

That was where the stipulation came out prior to the Wolf Amendment that we meet with the intelligence organizations, get briefs, assure them of what we were going to do, and that we would not violate any of the safeguards that later became a part of the Wolf Amendment.

We did all that. We traveled. I took Bill Gerstenmaier, who was the head of the human spaceflight program at the time, Peggy Whitson, who was the chief of the astronaut office. We spent about a week traveling through China. We went from Beijing to Shanghai, out to their Gobi Desert launch site for all their human missions, and pretty much had open access to everything that they had.

At the time, they were working on Tiangong, their first space station. They allowed us to get into the module, to take a look at it, to look into the capsule that was in development at the time to carry their crews.

One of the highlights was actually meeting the first two women that had been selected to be Chinese astronauts. They were mesmerized by meeting with Peggy Whitson. She was a legend there, and everybody knew who she was.

The highlight of the trip for all of us was to go to the Gobi Desert, to the launch site, and actually have an opportunity to look at their capabilities. Not much unlike the Kennedy Space Center. A lot of the systems that they use were like we did, although they had a much better underground facility for long-term stays in the event of some catastrophe at the launch site. That's neither here nor there.

We came back. Our recommendation, we went in and gave a report to Congressman Wolf, gave him a complete and thorough report of what we had done, what we had seen, and people with whom we had met. He said that he appreciated all that, but he was going to make us and OSTP pay. He actually reduced significantly the OSTP budget that year.

He did not do anything to NASA's budget, other than putting in what became known as the Wolf Amendment, the amendment in the budget that limited bilateral activities. It turned out that it really did not limit, to any great extent, anything that we were able to do with the Chinese aeronautics and science, or in any other field except for human spaceflight.

When we say the Wolf Amendment 10 years on, did it accomplish its purpose? If you look at what was Congressman Frank Wolf's purpose, which was to try to isolate the Chinese into more closely abiding with our norms in human rights, it did not accomplish its purpose at all. If we're looking at slowing their program or keeping them from developing a space program, it did not do that at all.

Whatever its purposes were, it did not end up doing any of that, because we already had safeguards in place to keep them from getting our technology. We were limiting the access on the part of students who came to China. We were working with intelligence communities and everybody else.

Unfortunately, what it has done is caused us to now be on the outside, looking as China presses forward with their 50-year aerospace program and doing things that some people say they're moving at an incredible pace. They're moving at the pace that they set way back in 2010. Nothing that they do surprises me. They're just doing everything they said they were going to do.

Victoria: Thank you. Going back to your goals as administrator, was there any interest at that point in doing human spaceflight cooperation with China, maybe bring them on to the Space Station or anything like that?

Charles: That was the intent. The intent of the trip, from NASA's perspective, was to travel to see, technologically, were they up to speed? Could we bring them to the International Space Station? Did they have the capability of getting there on their own, without us having to provide any technology?

We became very comfortable, because their systems were not that much unlike the Russian Soyuz and the like. We actually took the plans for the autonomous docking system, what we call the International Docking Standards.

We were hoping, in the design of their human capsule, that they would design in a docking mechanism that would be compatible with what we had on the International Space Station, so that if, at some time in the future, we were able to reach an agreement where they would fly Chinese astronauts to the International Space Station, they wouldn't have to go through the process of trying to figure out, how do you dock with a with a vehicle that's not the same system as ours?

Whether or not they adopted our design concepts or not, I do not know. My guess is they did, or my hope is that they did, because we were looking at any number of things like the fact that, at some point, we may need their help for rescue of a crew or we may need their help.

America's human spaceflight program exists today, or still is sustained today, because we went for about 10 years, depending on the Russians. We didn't want to do that, but the Columbia accident forced us to go that route. We were able to continue to operate on the International Space Station while shuttle was not flying.

We were able to complete the International Space Station pretty much on time, about a year late, because we were able to use the Russian Soyuz to get crews to the station while we used the shuttle to transport the workgroups. Those are the kinds of things that we were looking at. That's the reason we took Bill Gerstenmaier and Peggy Whitson, because they were the technical experts, not me.

They evaluated the systems that they had and said, "Hey, looks like Soyuz to me," and so we can work with that. We came back and began to work with the National Security Council and other organizations to draft the language that would go into an agreement. We worked on that for the balance of the two terms of the Obama administration. Several times, we thought we were almost there.

We essentially used, as a template, the agreement that we had worked with the Russians for bringing them into the International Space Station Program, substituting China or taking out Russia and putting in China. We thought that would work for us.

Victoria: You said, in terms of how NASA functions, it didn't really affect it too much.

Charles: No.

Victoria: Were there any times where NASA decided, "OK, this is worth it enough for us. We're going to put in the request. We're going to let Congress know. We're going to ask them to vet possible partners for us to do anything"? Can you describe a little bit, if that was the case, what that process was like or if there was any burden involved there?

Charles: We never went back to them to get agreement that it was OK to do human spaceflight. There were a number of initiatives in terms of aviation safety. We were working with the US FAA. We work with the Chinese equivalent of the FAA, which is really the Chinese People's Liberation Army Air Force.

We work with the Chinese government in trying to put in place some of the new systems of air traffic management and air traffic control, because it turned out that China was always the bottleneck in transportation to and from Asia because of the old systems that they had, safety in ground movement at airports, safety in just movement back and forth in their air traffic system.

We went to the Congress and said, "Hey, we're meeting with them and we want to help them with this." We went to Congress when they flew in Chang'e, I forget which number it was, Chang'e-3 or whatever, which was their first lunar lander that was going to have a rover in it.

We went and briefed the Congress that we were going to provide landing site data from our missions to them to help them select a landing site. We did that. We provided landing imagery once they were on the surface and even imagery of their rover as it came out of the lander.

We worked collaboratively with them in a program called SERVIR, which is a multilateral program, so we didn't really have a problem there, but we did have to have bilateral meetings with Chinese in areas like looking at earthquakes.

We worked in particular with them in a project that was looking at glacial characterization in the Himalayas. There's a part of a program called SERVIR, where it was Chinese and American scientists working together.

For a period of time, we worked very well with them, mainly in the science area but also somewhat in the aviation safety arena. We sponsored a Chinese aviation safety person to head up the International Safety Council.

IFA was the name of the International Federation for Aviation regulation or something like that. I forget what the acronym stood for. We actually sponsored a Chinese to become president of that organization, and he was elected and served a term, and did a pretty good job at it.

Victoria: Before I ask my next question, just a reminder to the audience that Administrator Bolden will be taking questions. If you have any please submit them, we'll try and get them through. Going back to the Wolf Amendment, in your experience, did it affect having Chinese nationals at NASA facilities or NASA conferences?

Charles: It did initially because we overreacted. If you look in Wikipedia, they will cite an incident where...I forget which conference it was, but we had a conference at Ames Research Center, and they denied access to any Chinese participants in the conference.

I actually think it was Congressman Wolf who came out and said, "Look, this is not what we intended. If you can vet these people, we're fine with them participating. It's just you can't spend any money to make their participation possible."

It didn't stop them from participating, but it really began to slow things. It was not just Congressman Wolf and his committee in the House. There were people inside the State Department, even inside the National Security Council who were not exactly China fans.

The State Department would slow roll on visas. Even when you briefed the Congress and you got the authorization, sometimes we weren't able to get Chinese here in time to participate because they were slow rolling on visa approvals.

Victoria: I believe it. Question. Do you have any ideas of what the ISS partners may have thought about the Wolf Amendment? Is it something that they would have spoken with you about it?

Charles: We talked about it all the time. What we did was we encouraged because they weren't subject to the Wolf Amendment. We encourage the partners to work with China to the greatest extent possible.

Samantha Cristoforetti, who is one of the Italian astronauts, who actually flew on the International Space Station and is getting ready to fly again early next year, the Italian and the Chinese worked a deal where she actually went and trained for the potential of flying to the Chinese Space Station, Tiangong.

It turned out it didn't work out for the Italians so she never flew. She actually trained with them and was prospectively going to fly with them. We encouraged the international partners to work with China because they weren't restricted.

Had we ever been able to get over the hump, we would not have had a problem at all getting Chinese clearance to come aboard the International Space Station to service crew members.

Victoria: Let's go. Let's go. I could probably ask questions for a while, but I know our audience is anxious to get some thoughts from you. There's one from Justin Kurth saying, "Suppose the Wolf Amendment could be changed to allow for more pro-engagement, what sort of opportunities for norm building do you think the US would seek to engage with China on?"

Daniel Porras has one that's kind of related, "Could repeal the Wolf Amendment be used as a carrot to get China to join efforts to develop norms?"

Charles: This goes back to the debate that Congressman...by the way, Congressman Wolf is a dear friend. I have the utmost respect for him. The thing that a lot of people didn't understand about Congressman Wolf was his passion for human rights.

He has probably spent more time in China, Myanmar, and other places like that than any other living American. He had a very strong bilateral, bipartisan group, Barbara Boxer, a number of members of the Senate and the House who were passionate civil liberties advocates and human rights advocates.

That was his driving motivation. It was interesting. We thought when he left the house and Congressman Culberson took over the committee that the backing for the Wolf Amendment might wane, but we found Congressman Culberson was even worse because he was paranoid about the Chinese.

He didn't want us to fly any equipment that had Chinese components on the international space station. He didn't want us to take anything to the international space station that had come from China and the like.

At least Congressman Wolf was passionate for a purpose, a real strong belief. We never did figure out what it was about Congressman Culberson that made him object other than the fact that he just did not like China.

Victoria: Understood. We're getting close on time. Looking ahead, where do you see the US-China relationship evolving in space? Is the Wolf Amendment going to be a continued part of this? As you said, it wasn't a huge factor for NASA. Is it more optics? What sort of engagements do you think might be possible in the future?

Charles: I'm not a prognosticator, but in reading what people think are the hopes for the Biden administration, I haven't seen anybody that expresses any optimism that there's going to be any change in the enthusiasm of the Biden administration trying to normalize relations with China from the standpoint of human space flight.

I tell people all the time that human space flight is a unique ability to conduct soft power. I always say that NASA is maybe not the number one soft power tool of the United States, but it's definitely number two next to the State Department and a little bit ahead of the Department of Defense, believe it or not.

When you can work for 20-plus years with Russia and never leave the international space station no matter what's going on down here on the ground, then that says something about the value of that bilateral relationship.

There will be people who will disagree with me on there. Everybody's wondering what's going to happen to the international space station and the crews of the Russians challenge President Biden and go into Ukraine like they did in Crimea. That remains to be seen.

When they went into Crimea, we were able to be nuanced in our foreign policy and understand that you don't throw out the baby with the bathwater. We found ways to continue to work to put a...President Obama and President Putin put a bubble around the international space station so that it was never a subject of sanctions.

There were people who wanted to consider it in sanctions, but we never violated that bubble, and we continued the space diplomatic relationship that we had with the Russians. My hope would be that, at some point along the way, hopefully, in my lifetime, we'll begin to find a way to be nuanced enough in our relationship with China that we do the same thing.

Victoria: I think that's a fantastic note to end this portion on. Thank you, Administrator Bolden. It was really fascinating to hear your insights. I'd like to move on now to the panel, but Administrator Bolden has said he'll stick around for the Q&A portion of that as well. If you have more questions for him, you can ask him at that point.

Moving on to our first speaker on our panel, Makena Young, Makena is an associate fellow with the Aerospace Security Project at the Center for Strategic and International Studies, or CSIS. Her research interests include international collaboration, space security, and orbital debris.

Prior to joining CSIS, Makena worked for the FAA as an aerospace engineer focusing on automatic dependent-surveillance broadcast certification and integration with small aircraft. Makena, the floor is yours.

As I said before, we'll be taking Q&A later on. Please feel free to submit questions, but please submit them to the Q&A and not the chat. Thank you very much. All right, Makena, anxious to hear your thoughts.

Makena Young: Thank you so much, Victoria. I believe my video is off. If the host could turn that back on, that would be wonderful. I can get going here. I wanted to thank you, again, Administrator Bolden and Secure World Foundation, for hosting this event.

I'm so happy to be involved and a part of this conversation with such an incredible panel. Victoria and Administrator Bolden gave a wonderful overview of the Wolf Amendment language. I just wanted to second that the language doesn't literally bar collaboration. There are methods of collaborating with the Chinese in space.

It makes it extremely difficult. It certainly discourages it by jumping through all these hoops to work with this particular country. Representative Wolf retired just three years after the amendment was introduced. The effects have created a decade-long divide in the civil space domain between these two superpowers.

It does not seem to have made any grand political strides like Administrator Bolden pointed to. Rather, it's pushed China to become even more of a rival to the US in space. It's further pushed collaboration away, especially scientific collaboration, which can help everyone learn more about space and who we are.

Possibly, this happened more than what Representative Wolf initially intended. As was mentioned, Chinese scientists were unable to participate in conferences, other NASA facilities. It became, really, a much greater divide than was initially intended, I believe. It hasn't worked that well. We have not seen these desired changes in human rights policies because of this amendment.

China's global influence has continued to grow rather rapidly in just about every single domain, including space. Being left out of these US-led missions has not discouraged the Chinese in space, rather it's almost propelled them to make their own programs and missions to rival those in the US.

I know some of my fellow panelists will speak more to these specific capabilities. An example is the ISS, International Space Station. Without a way to contribute, China began to develop and test their own module space stations to create their own environment for humans in low-earth orbit.

They have two test-beds right now that have been launched in 2011 and 2016 to test out this permanent space station. With the ISS approaching its retirement pretty soon, other countries that support this long-term human presence in low-earth orbit may be interested in participating and partnering with China on their space station instead of partnering with us in our ISS that may be going down soon.

It's been interesting to see how they have just continued to create their own programs that rival ours. Similarly, as NASA enters its new era of exploration with its Moon to Mars projects, it touts international collaboration as a really integral part of these plans. The Artemis programs, and similarly Artemis Accords, are very reliant on international cooperation to sustain.

The Artemis Accords, in particular, NASA is very proud of. They describe a shared vision for existing in space together as civil space agencies. Over a dozen countries to date have become signatories and others have indicated interest as well. Closing China off from cooperating in these projects could be a really big strategic mistake.

If we can't come together to at least sign onto some basic norms of operations, I think that's a really big missed opportunity. As China continues to grow as a space power, US cooperation and collaboration in some of these space projects, it's a real missed opportunity of understanding the goals and the capabilities of their space programs.

Further, it would establish avenues of communication and trust between the two nations that could be mutually beneficial. Collaborating with non-allied countries in space is not a foreign concept to NASA or the US. It has proven to be very successful, actually, with the Soviet Union during the Cold War.

It's continued to this day with Russia. The fact that this break with Chinese trust in space is pretty giant considering the relationship we've been able to sustain with Russia over the past few decades. The space domain is unique. It is so far removed from the ground. A lot of these

diplomatic relationships are able to sustain regardless of the geopolitical tensions happening a couple miles down.

To mention, we have worked collaboratively with them a few times in the last decade. Particularly, we were able to document the landing of the Chinese rover on the far side of the moon. While this was not a groundbreaking collaboration, it sets a good precedent for trust-building that we can work together in space safely and securely.

Particularly, also, the Chinese commercial sector is growing. They are promising really extensive launch services that are at a low-lucrative price for foreign entities. There are many avenues for our fellow allays to collaborate with China in space. The fact that we are not interested is a big missed opportunity, in my opinion.

To sum it all up, in my opinion, the Wolf Amendment has neither discouraged Chinese space ambitions or altered China's behavior on these human rights issues. It's only modeled our relationship with China and created a wide opening for a challenger to rival NASA's historic leadership role in space exploration.

These provisions are not needed to protect our technology. They almost suggest that China is the only country that we need to be worried about with this technology threat. That is simply is not the case. The Wolf Amendment continues to serve only to stifle mutually beneficial cooperation for our science and exploration. Thank you.

Victoria: Thank you, Makena. That really laid out the case, I think, very thoroughly of weaknesses of the Wolf Amendment in what it was actually not able to accomplish. Thank you very much for that. I feel obligated to point out as a Secure World employee, Makena brought up commercial space for China.

My colleague, Ian Christensen, has been doing some groundbreaking research on looking at the Chinese commercial space sector, I would encourage those who are interested to look at. I also feel obligated to support and promote the excellent work Makena has been doing in CSIS in general in and counterspace assessment.

They put out a fantastic counterspace assessment that SWF is happy to coordinate with them as well. I think Makena has been very involved with it and doing great work on the Russia part as well, I believe. Looking forward to continue to collaborate with you on that.

Thank you, Makena. Moving on to our next speaker. We have Kevin Pollpeter of CNA. Kevin Pollpeter is a research scientist in the CNA China Studies Division. He's an internationally-recognized expert on China's space program, has widely published on Chinese national security issues, focusing on Chinese military modernization, China's defense industry, and Chinese news on information warfare.

Kevin, the floor's yours. I do believe you have a PowerPoint. We should be...

[crosstalk]

[crosstalk]

Kevin: Yes, I do.

Victoria: ...in a sec.

Kevin: Thank you, Victoria. Thank you to the Secure World Foundation for organizing this. Been asked today to talk a little bit about China's space program, and I'm also going to add in a little bit about US/China relations because I think that also affects how we view the Wolf Amendment.

Just as a disclaimer, these are my own views and should not be regarded as representing the opinions of CNA or any of its sponsors. I think you'll hear the same drumbeat that Administrator Bolden and Makena had talked about.

If you could advance the slide for me. Looking at evaluating China's space program, one way to do it, simple way, is just to look at the number of launches that they've conducted. It's truly amazing the amount of progress that China has made since, let's say, the 1990s, up until now.

Mid-1990s, China was conducting just a few space launches and those that were launched had a tendency to explode, had a terrible failure rate, international customers were afraid to launch their satellites on Chinese rockets.

What happened with some illegal technology transfer from US corporations, as well as widespread reforms within the Chinese space industry, they've been able to turn around their launch system. You can see here that since 2010, they've been pretty much in the ballpark with competing with the United States on the number of launches.

Moreover, more importantly, they've upped the reliability, whereas in the 1990s, they maybe had a reliability of somewhere in the low 70 percent. Now, China's there at the international standard of around 95 percent reliability.

They have come a long way in both the quality of the rockets, of ensuring that they're safe and reliable, as well as the sheer amount of launch numbers. If you could advance the slide. What we've seen then with the increasing launch rate is that the number of satellites in orbit for China has dramatically increased.

At the end of 2020, China had over 400 satellites in orbit, second-most behind the United States, which I think at about that time had between 1,100 and 1,200 satellites. The US is still very much in the lead, but the PRC is catching up quick.

Here we see this dramatic increase in the number of satellites. China right now has just about every type of satellite. If you could go back, there we go, thank you, just has about every type of satellite that a country could possibly want. They've established a global 24-hour, all-weather

Earth remote sensing system. They have a global satellite navigation system similar to the US GPS system.

They've launched missions to the moon. They've landed two rovers on the moon, they've had a lunar sample return mission. They've conducted a mission to Mars that orbited, landed a lander, and then also a rover. They've just been achieving outstanding progress.

Not to mention human spaceflight. China has conducted a number of manned and unmanned missions since 1999. Eight of those have been manned flights. They have launched too small, what they call space laboratories of around eight tons.

They right now have a more permanent, long-term, I should say, space station, a 20-ton Tianhe that they're going to attach two other 20-ton modules, or for our 60-ton space station. Still much smaller than the ISS but nevertheless, a good step forward.

China's made some substantial progress. In fact, General David Thompson just recently -- he's the Vice Chief of Space Operations for the US Space Force -- has said that China is accelerating at twice the rate of innovation, or twice as fast as accelerating their space program as the US is.

Right now what the Chinese say is that they are probably the third-leading space power. That they are behind Russia and the United States, but they are absolutely coming on strong. Next slide, please.

One of the things that we also need to keep in mind as we evaluate the Wolf Amendment is just the overall tenor of the US-China relationship. It's safe to say that in the past 10 years, the relations have really taken a turn for the worse. There are now concerns of an emerging cold war between the US and China. Relations are probably at their worst now since the 1960s.

Here in the US, there's a view probably across nearly all constituencies that China has become more aggressive, less politically and economically open, and that China has become a strategic competitor of the United States.

When Chinese leader, Xi Jinping, makes statements like it is for the people of Asia to run the affairs of Asia, or that the Pacific Ocean is vast enough to accommodate China and the United States, many in the US here is that this is really code words for China wanting to dictate what happens in Asia.

If you slice the Pacific Ocean in two, United States gets everything on the eastern side, and China dictates what happens on the western side.

Of course, in regards to human rights, there's been crackdowns in Xinjiang against the Uighur Muslims and, of course, in Hong Kong, restricting democracy and voting rights there. We've had a steady drumbeat of intense military coercion against Taiwan.

The PRC view, on the other hand, is probably just as dire. They see themselves in an existential conflict with the US. They're accusing the US of trying to foment a color revolution in China.

They argue that the US plays a destabilizing role in world affairs that is intended to restrict China's rise as a world power.

One of the reasons why people are saying this is an emerging cold war is that we've had the military competition, we've had the economic competition, but now we see a growing ideological competition where China is now trying to position its mode of governance, of authoritarian, state-run capitalism as the best model for governing a country and for the entire world.

You see, the CCP, the Chinese Communist Party, argues that China provides a model for countries that want to accelerate development and maintain their independence. They also state that their performance, especially since 1979, has declared to the world with indisputable facts that the CCP is qualified to be the guide of the new international order and international security.

There's a real sense here that this competition is being met by both sides. Next slide, please.

We'd also need to take a look at the PRC's space program itself, take another look. Sometimes when I give these presentations, people say, "Well, isn't space just something that countries do?" I would answer, "Well, yes and no."

We need to keep in mind that China may do space, but they also do it for real hard national interest reasons, that it can't be divorced from what the Communist Party envisions China to be in the future. China states that it is now wanting to transition from being a major space power.

I stated they now view themselves as the third major space power, to being a strong space power by mid-century, which likely means that they want to be equal to the US in some aspects, but in some aspects, probably superior to the US space program.

We also need to keep in mind that China's space program is inherently tied to the Chinese military. For example, the China-manned space engineering office, which runs their human spaceflight program, is a military office. There's really a military dimension to the whole Chinese space program.

They are using it to develop a global C4ISR architecture to enable long-range precision strikes. They have a robust counterspace program. The vice chief of space operations for the Space Force has said that China and Russia are regularly attacking US satellites.

There's also this ideological dimension, especially when it comes to human spaceflight. The Chinese people are told that China's human spaceflight program proves that they should insist on exerting the political advantage of the socialist system, and that human spaceflight is used to reinforce the master narrative of the essential role of the Chinese Communist Party and Chinese society, that only it can lead China and the Chinese people to greatness.

You can't divorce what China is trying to do in space with what it's trying to do here on earth. We also have to keep in mind that China is probably going to do what it wants to space regardless of whether it cooperates with the US or not. China has its own ambitions.

I can tell you from my own research that when the Chinese human space flight program was approved in 1992, it was about competition with the United States and about China's position in the world at that time. They viewed that human space flight was one way that they could demonstrate to the world that they were a major space power.

Next slide, please. Final slide here. I know I've taken up a lot of time. What am I trying to say here? I'm not saying that we shouldn't have restrictions on cooperation with China. I'm not saying that we shouldn't protest human rights abuses in China, but we also need to keep a realistic assessment of what our ability is to change China.

Similarly, we should keep a realistic assessment of what China wants to do in space, that they view space as an inherent part of their program to become a superpower, and space plays an outsized role in demonstrating that. Finally, here is some food for thought looking forward at how we should maybe think about the Wolf Amendment.

There is one organization that has been maintaining cooperative activities with China through all of these ups and downs, and that's the Defense Department. In the 2000 National Defense Authorization Act, due to the perception that the US military was giving away more than it was getting from China, there were restrictions placed on US mil relations with China in 12 operational areas.

You can see those at the bottom. It had required the secretary of defense to submit annual certification that no violations occurred. That requirement was removed in the 2012 NDAA. Since 2000, the Defense Department has kept up a number of activities, including high-level talks. We have defense attaché offices in each other's capitals.

We've conducted ship visits. We've conducted humanitarian assistance and disaster relief exercises. There's a thing called the MMCA, the Military Maritime Consultative Agreement, where we discuss actions encounters between the two militaries on the high seas. There is an avenue.

There is an approach here to maybe how to govern relations with China that don't have to give away the technology that is possible here with what's cooperation space.

Next slide, please. With that, if you have any questions, feel free to contact me at the email, but I'll turn back over to Victoria.

Victoria: Thank you so much, Kevin. Appreciate that overview of the Chinese space capabilities. I appreciate even more the thoughts for how we might look ahead to future engagement. Before we move on to our next speaker, I'd like to point out there was a question in the chat a few minutes ago, asking for links as to the documents that I mentioned.

One of my Secure World colleagues came to the rescue. We have links for the Secure World global counter space threat assessment. Link for the CSIS space threat assessment. Then, the link to the 2021 SWF Report in partnership with the Caelus Foundation on US perceptions of commercial space activities in China. Those you can access through the chat.

With that, I'd like to have our next speaker. Be ready. Marco Aliberti. Marco is an Associate Senior Fellow for the European Space Policy Institute. He is also a member of the Space Power and Policy Applied Research Consortium at Flinders University, Adelaide.

Prior to joining ESPI in October 2012, he conducted research activities on international relations of East Asia at IGS, an Italian think tank, and had experience in the private sector. He is the author of five books published by Springer and more than a dozen policy papers, conference proceedings and public reports, and space policy matters.

Marco, we're looking forward to hearing the European perspective on the Wolf Amendment. Thanks.

Marco Aliberti: Thank you very much, Victoria. Good afternoon, everyone. Thanks for having me. What I would like to do is maybe to provide a European perspective on both the Wolf Amendment and on cooperation with China since the two issues are closely interconnected.

I would maybe start by saying that it's a bit tough to present a European approach to China since there is no single China policy in Europe, but rather a variety of different and sometimes containing China policies. Views on China vary across European member states and between European institutions.

Even within the same institutions, there are different views based on the specific issue and considerations. For instance, within the External Election Service, China is simultaneously labeled as a corporation partner, as an economic competitor, and as a technical rival.

From an overall perspective, however, we can say that in space, Europeans have traditionally seen China as a certainly difficult actor that should be, however, engage through policy dialog and programmatic cooperation rather than isolation and confrontation.

This answer is well reflected in the great number of comparative ventures taking place at different levels, including at the ESA levels, EU, and national levels. At ESA level, there is a longstanding cooperation with different Chinese entities that date back to 1976.

Just one year after declaration ESA several domains have been covered from space science to exploration, and from human space flights to applications. The current focus is on space science. We join missions with the Chinese Academy of Science underway, for instance, Smile, or the Einstein Probe, or ESA possible participation to the Xuatian space telescope.

Another area is, for instance, earth observation. Here, ESA and the National Remote Sensing Center of China recently launched the Dragon 5 Program for the exploitation of Chinese, ESA,

and other European satellites, including Copernicus, for geoscience and applications development.

Another important area is human space flight, where ESA has been cooperating with the Chinese Center for Space Utilization on microgravity experiment onboard Tiangong. Also, with the ocean center of China with regard, for instance, to ocean training. There have been also discussion on ESA contribution to Tiangong in return of flight opportunities for European astronauts, although these has been put aside.

At EU level, the European External Action Service has established a comprehensive space dialog with China where civil and security-related space issues are being discussed. China is also participated in several space-related calls in the EU framework program for research and innovation with most of the calls covering space science and applications.

For instance, GNSS applications, but also topics relevant to safety, for instance, space weather, Neos, address though from a scientific and hence a less [inaudible 53:19] angle. Besides EU and ESA, there is also a strong partnership between EUMESAT and the China Methodological Administration.

We also have many, many cooperation experience between European member states and China. Examples include a CNES-CNSA joint oceanography satellites, or CNES contribution to the space variable object monitor satellites to study gamma ray burst, or for instance, as a contribution to the China Seismo-Electromagnetic Satellite to study earthquakes.

Now we have to say that this cooperation between ASI or CNES or DLR and Chinese counterparts is almost exclusively focused on programmatic proposes. In some cases, there is an industrial dimension, but it's not politically laden.

From a political perspective, what we can say is that European countries and institutions see that relations with China are inevitably complex, because we do not share the same values, we do not share the same political systems, or approach to multilateralism.

To say with President Asha Mitchell, cooperating with China is not only an opportunity, but also a necessity for Europe. These more comparative stances compared to that of the US builds on several considerations.

First of all, the recognition that you cannot build effective solution for a global space governance without China participating in it. That we cannot set defined norms or rules for the safety, security, and sustainability of space activities, only through coalitions of the willing that do not have China on board.

Second the fact that engagement in any case leads to a higher degree of understanding between partners, reducing misconception, and possible tensions. Sustained policy dialog is now a view per se, and important to CBM.

That can allow us to better understand the underlying intention and concerns of China's space program, but also to learn more about their interests, needs, and priorities for the future. A third element is the belief basically that is through cooperation rather than seclusion, that we could have a chance to influence, or at least inform, Chinese programmatic direction.

Fourth element, the discussion of space cooperation also draws on the belief, well pointed out also by US analysts like Alanna Krolkowski, that any form of operational non-cooperation will have domestic effects, including empowering some extortionate expenses of others

For instance, we can use international cooperation to make civilian actors more prominent and influential within the ecosystem. The Dragon 5 program that I mentioned before was basically elevated to a flagship program by the Minister of Science and Technology, an operation that comes with higher budget and more political visibility within the system.

Another element is that, in our view, Beijing is an important potential partner for future large missions, and clearly a costly one to exclude. Basically, leaving untapped the opportunities offered by its ascendancy may prevent European space programs from being effective, or may be way too much dependent on its historical partners.

A final consideration that I wanted to make here on the rationale for engaging with China is that Chinese statement and positions within international fora, for instance COPUOS, have not been necessarily detrimental, but actually have been constructive to European views and interests.

One for all, China views space as a community of shared interest, and that is at least on the surface, important to the concept of open and inclusive governments.

Although this pro-cooperative stance is now under questions for a variety of reasons, and collectively we cannot deny that we have become more worried of China, and we are also very far from the golden years of similar European cooperations, when we even proposed China to jointly develop Galileo with us, we still prefer to maintain a dialog and cooperation channels open with China.

This is why our assessment of the Wolf Amendment is not so positive. Actually, we see it as having had detrimental effects, not only for the US but also Europe, of course. Here there are many differences.

The common view is that the Amendment has been, in a sense, effective in achieving only one objective that is preventing substantive cooperation between the United States and China, but has been, in a sense, disastrous in terms of effects.

Basically, it was a self-imposed ban that was in our view -- or at least in the view of many -- informed by domestic political consideration rather than a trans-strategy towards China. It was also explained by a NASA Administrator.

For one thing, as was also mentioned by Makena before, the progress of Chinese space activities during the Obama and Trump administration really showed that restriction have not achieved basically the underlying objective of inhibiting China's rise, and actually have been productive.

As a matter of fact, they have only, in my view, strengthened China's resolve to develop its space program and assert itself as a space power in all respects. What is more, sanctions or sanctions the ban has severe, the links between the two countries, and made the new generation of Chinese scientists and intellectual even more suspicious and resentful of the US.

What they think is a two standard approach when it comes to the moral argument by Congressman Wolf. Third, is the goal was to limit or even control Chinese access to space technology. We cannot deny that the restriction has been in effected because they have pushed China towards other countries more, I would say, dispose towards corporation.

Ironically, this has offered less control over technology transfer than corporation scenario, as also put by Professor Johnson Freese. The US actually had more chances to determine what globally available technology China could get through engagement rather than detachment and by stressing innovation and staying ahead rather than trying to constrain China.

Closely related to this, another point that I want to make is that the ban has made the US less effective in influencing or at least understanding China's programmatic directions, technical capabilities, and intentions while the lack of transparency of China's space calls always creates the need of worst-case assessment.

Also, often hyper [inaudible 60:14] or even [inaudible 60:17] in many stances. A regular dialog and exchange could have helped the two nations to understand each other's intention more clearly, and potentially could have given way to a mutual assurance of intention while increasing transparency across the board.

A final point, before I close, is that the ban is completely, in my view, or the amendment has completely overlooked the fact that the alternative to cooperating with China was inevitable of essence into a space race, whereas corporation, not necessarily, but could have in principle avoided this scenario.

Also, could have prevented or at least inhibited the formation of antagonist blocks, particularly the Sino-Russian axis, while their relation remains an axis of convenience, as Pablo said. China exclusion policy has been cementing their cooperation and is eventually scoring the emergence of a new bipolarization of the international space community.

In my view, it was in Washington interest not to make this happen because this bivocation is going to have very detrimental effect on the ultimate goal, at least the ultimate declared goal, of ensuring strategic stability in space. With this, I stop and thank you for your attention.

Victoria: Thank you, Marco. Appreciated hearing a European perspective. Oftentimes, when we in the United States talk about the US-China relationship, we don't acknowledge that there are ripple effects for other space actors. It was interesting to hear your viewpoint about the negative consequences all the way around for US-China in Europe. Thank you very much.

With that, we'll move on to our next speaker, Jon Lowet of The National Committee on US-China Relations. John is Deputy Vice President Programs for the National Committee on US-China Relations, where he oversees a committee's congressional education effort, including leading staff trips to China and programming its hill briefings for new members of Congress and its 40 under 40 style Young Leaders Forum.

He launched the US-China student leaders exchange in programs, a variety of other committee projects. John, the floor is yours.

Jon Lowet: Thank you so much, Victoria. Thanks to you and the Secure World Foundation for having me here today with the administrator, Bolden, and my fellow panelists. For any agenda that my last-minute arrival in this Zoom room may have caused, I apologize. I'm delighted to be here.

Just want to start off with a ready acknowledgment that I'm a different type of panelist from the scholars with whom I'm sharing this afternoon stage. I'm not a space policy expert or indeed a US-China policy expert.

As a Deputy Vice President at The National Committee on US-China Relations, I work for this US educational nonprofit founded back in 1966 which is committed to establishing and maintaining a safe space to talk about China and the US' policy towards China.

We were established 13 years before diplomatic relations were established. Going back to Kevin's comments, arguably when the relationship was at another point of a huge trough in the relationship. We understand the importance of discussion and of engagement when times are even bad to try to improve what the future may look like.

We made our first big splash in '72 when we were tapped to program the Chinese ping-pong team's return visit to the United States, the first time a delegation from the PRC set foot on US soil. That's the perspective that I want to see about for the next few minutes.

Frequently, our work takes the form of people-to-people diplomacy, so that we're looking for ways to increase the nuanced understanding that Americans and Chinese have of each other. We engage in a lot of public education, bringing together Americans from different perspectives and increasingly bringing them into discussions with Chinese and other perspectives, Europeans, others from Asia, etc.

One of our big goals is to make sure that US government and American thought leaders are as well-informed as possible so that US policy can be as well-informed as possible. We've seen

multiple opportunities in our 55-year existence where we believe that US' narratives about China and the bilateral relationship have perhaps grown distorted.

When that happens, we see the US pushed in ways that arguably are not in our own best interest. So we are trying to make sure the discussion is taking place such that the US is acting in its own best interest.

I became aware of the Wolf Amendment and the US' shifting attitudes towards US-China space cooperation back in 2013, a couple of years after the Wolf Amendment's passage. I had been planning a forum for US and Chinese emerging leaders in greater Houston.

We had selected that in large part because, in our alumni base, we had two NASA astronauts that we were very proud of. One of them in 2013 was serving as the chief astronaut at the Johnson Space Center.

We saw this fantastic opportunity not only to have a great forum and discussion, but we were working directly with NASA to bring a big chunk of the forum participants over to the Johnson Space Center. We were working closely for a couple of months to make that happen.

About a week or a week and a half before I had 40 people flying into Texas, NASA informed me that our visit was not going to be able to take place, that they were erring on the side of caution. We could visit as ordinary tourists, that they would not be able to prevent that -- there was no citizenship check -- but that any kind of special access that we had been talking about would not be able to take place.

The future years when the annual forum moved back to China, we wanted to again include active NASA astronauts, as we had done with two others prior to 2011. This time, again, we saw a big shift. Whether that's following the letter of the law of the Wolf Amendment or whether that was just reflection of changing attitudes, our request to have an active NASA astronaut join us for a conference in China was simply shut down. That was not going to happen.

It was simply disappointing because here we were trying to establish unofficial channels of communication, just trying to have one astronaut in a delegation of 20 or so Americans have conversations with Chinese nationals and that that was going to be impossible, certainly when that was taking place on Chinese soil.

I want to shift a bit. I suppose I'm echoing some of Kevin's statements here. Here we are, the 10th anniversary of the Wolf Amendment. It comes at a challenging time in the broader US-China relationship. We have to acknowledge that.

I agree with Kevin's statement that the relationship today is arguably at its lowest point in many decades, perhaps since the National Committee's own birth. For all of the reasons, the Taiwans and the Hong Kongs and the Xinjiangs, all of that, there are real concrete reasons why the relationship has sunk so low.

Even though we're seeing an occasional thawing in the relationship and we've seen a toning down in the rhetoric since President Biden took office, things are still remaining at a low, at an incredible low. We're at a point in the relationship in which everything is being viewed through a national security lens.

We've seen the pendulum swinging back and forth over the last many decades between security and business. We are strongly on the national security side of things. This is, of course, being seen quite acutely with respect to tech in which everything, or virtually everything, is seen as being potentially dual-use technology.

Export bans are certainly on the rise, blacklisted companies, so forth. This translates quite directly into the economic and investment sector. There's the Committee on Foreign Investments in the United States, CFIUS, an interagency committee.

They have been authorizing all of our transactions looking at foreign investment coming into the United States and anything that has the potential of being compromising National Security, those investments are rejected.

There was a major reform in 2018 with the Foreign Investment Risk Review Modernization Act. Now today we're looking at discussions on the Hill and draft legislation to potentially establish an American outbound investment screening mechanism to screen Americans who want to invest abroad, and that's largely directed at China.

The notion is no one wants to be paying for the rope that's later going to hang us. Space and space cooperation cannot be viewed in a vacuum. It's part of a much larger context that has been going on for several years.

Many within and outside of the current administration have started pushing less for decoupling, the watchword of the prior administration that we've got to sever these connections between the US and China, and shifting more towards a small yard, high fence approach.

Let's figure out really the strategic assets that we need to protect, but let's not give up the wider benefits that we gain from cooperation and economic partnership. It's that concept, when applied to US-China space relations, which I think offers some room to move forward. It certainly fits in with the Biden administration's framework of cooperate, compete, and, when necessary, confront China.

Pushing forward, finding the areas of space cooperation that we can drive a wedge in to create more space, from the National Committee's perspective, these are all good things. It seems to me, speaking personally, it's inevitable that in the years and decades ahead, there's going to be complete recognition that we need to speak with the Chinese -- space traffic management, space tourism, the preliminaries, and other more sensitive strategic topics.

As the Chinese space program continues to develop, it's going to become a necessity. Getting from where we are today, when so little has been happening to where we will be in coming

decades. Figuring out how we bridge that gap during this intervening times, that seems to be critical.

I very much applaud today's discussion as a step on this journey to figure out how we can have these discussions with China. I very much look forward to seeing where discussions like ours today, where it pushes the US, our allies, and China itself for future cooperation.

Thank you, Victoria. Thank you very much.

Victoria: Thank you, Jon. I'm curious to hear where this conversation leads to as well, and it was really fascinating for me as a person who is probably too involved in the space side of things, to hear a non-space perspective about how the Wolf Amendment had negative externalities on the US-China relationship independent of space things. Thank you very much for coming here today.

Our last speaker is, I'd like to move on to now, is Scott Pace. Scott is the Director of the Space Policy Institute and professor of the practice of international affairs at the George Washington University's Elliott School of International Affairs.

He is also a member of the faculty of the Trachtenberg School of Public Policy and Public Administration, and most recently he served as Deputy Assistant to the President and Executive Secretary of the National Space Council from 2017 to 2020.

Scott, the floor is yours.

Scott Pace: OK, thank you, Victoria. Pleasure to be here and pleasure to see Charlie again. This is the part of the program where one says everything has been said and everyone has talked, but not everyone has said everything or some variation like that.

First of all, I want to start by commending and agreeing with Charlie on his description of events and some of the nuances that he described in the history of how we got there with the Wolf Amendment.

It should also be noted that this thing didn't begin with him, but actually Sean O'Keefe had one of the first meetings with the Chinese national space agency on the ninth floor at NASA headquarters, that Mike Griffin went to China.

In fact, I was working for Mike and we talked with Congressman Wolf before that trip, wasn't thrilled about it either, but we did talk to him about what we would do and what we would not be doing.

Some of this need for engagement with non-traditional partners, as Charlie put it, not only was there in the Obama administration, but also continued into the Trump administration. As Charlie was our science envoy for space in 2018 and 2019, where he visited Vietnam, Malaysia, Jordan, UAE, and a number of other countries that, of course, we hope to see involved.

The thing that maybe sometimes confuses space people or space community about the Wolf Amendment is that it's about more than just space. As was rightly pointed out, Mr. Wolf was very, very much a human rights advocate. This is a serious and moral point for him.

Discussions of cost-benefit analysis and what would work or not work wasn't the primary thing. It simply is wrong to cooperate with countries which have particularly egregious patterns of human rights abuses. Issues of utility are not primary.

The other half of it, though, was issue of confidence and whether or not there was in fact, a strategy. Charlie's description of NASA's approach was rather clear and straightforward and Congressman Wolf was actually supportive. Charlie's description of maybe some NASA overreactions that Mr. Wolf didn't support is also accurate.

The reason that Mr. Wolf was more flexible on one of these things was because he understood what NASA's intentions were and that he could understand what boundaries NASA would be looking for. What is not mentioned is the lack of confidence that he had in the science advisor, Dr. John Holdren.

Some of the confrontation that led to the OSTP budget being cut, in part, was because Mr. Wolf felt, rightly or wrongly, that his concerns weren't being given serious attention by the White House. That the White House was going to do whatever he wanted to do without necessarily consulting with Congress.

That is not a good stance to take with an appropriator who then responds in an appropriately blunt manner. A lack of a clear strategy or plan for engaging with China that could be discussed is also it led to the Wolf Amendment.

Now, when Charlie was over there and I think it was him, if it wasn't his quote, that he can correct me. One of the things I recall, the Chinese saying, was very bluntly, "Well, look, you know, we don't need you. We can do whatever it is we want to do and we don't need you." Nod, it's probably true.

Then the second was, "You don't need us." I'm like, "Well, yeah, that's true. We don't." The third was, "But we could do great things together." "Well, yeah, that's true. We could do some good things together." There are things that we could do with China, certainly, in areas of science cooperation.

We did do science cooperation with the Soviet Union in a number of areas that we're not particularly technically militarily sensitive, that were mutually beneficial. In a number of summit statements that we had with China and other broader issues, we use the phrase cooperation, which is transparent, reciprocal, and mutually beneficial.

It was certainly possible to find areas like that in space science, whether it's exchange of rocks or biomedical data, certain environmental data, you could all go out and do. In human

spaceflight, that was different. It's different in terms of symbolism. It's different in terms of the larger impact it makes. It's different than the degree of trust that has to be built.

First of all, I think we should distinguish between unmanned, scientific and robotic cooperation where I think there are opportunities and human spaceflight cooperation, where I don't believe there are opportunities.

From a NASA standpoint, I can again see the argument for wanting to explore human spaceflight cooperation with China, but from a larger diplomatic standpoint, I think the argument is no. The reason it's no is because cooperation doesn't precede the relationship. It follows the relationship.

In space, cooperation tends to be a lagging indicator. We don't have space cooperation, and then decide we like each other and we'll do more things together. It's when there is a general geopolitical concordance or an intention to pursue detente as the case was with the Soviet Union, that we then find ways of symbolizing that through space cooperation.

When we brought Russia into the Space Station program and during the Clinton administration, it was just symbolize a post-Soviet relationship that the Soviet Union was no more. We wanted to symbolize that there is a new order things.

Russia was making progress, or trying to make progress toward a democracy. They had fundamentally changed. The military situation was different. The political situation was different. Simply saying that we had cooperated with Russia, really misses the big geopolitical change that had to occur. That change has not occurred in China. In fact, it's gotten worse.

The kinds of progress that we were seeing over time in China that led to say entry into the WTO, during the Clinton Administration. Either we saw with Deng Xiaoping and Jiang Zemin and Hu Jintao, all of that has largely come to a stop and reversed with Xi Jinping.

China is a big place. There's a lot of different views. There are different parts and stakeholders, but I don't think it can be overstated how much of an influence Xi Jinping has effectively as a modern emperor in probably a more extreme situation that you really have to go back to Mao to find something similar. It's not Mao. It's different.

It is a very, very concerning environment today militarily, economically, politically. As a result of the decisions the CCP has taken, and the direction that Xi Jinping has decided to go in. That colors pretty much everything we do and space is really just been a very, very small part of that.

When you look at things again that we might do together, I think that all of them can be done with the Wolf Amendment in place. In contrast to maybe some of the other speakers, I think the Wolf Amendment is maybe important, symbolically, the statement of principle, if you will, and I can understand the criticism that it didn't accomplish what it was set to accomplish.

A lot of things didn't happen because there is no reason for them to happen. In the case of Russia, cooperation with the space station was important politically, but also they had things to offer -- the long-term life expo, orbit experience, they had vehicles. There was something there.

There is nothing, to my mind, really compelling that the Chinese have in human spaceflight, that would justify the amount of political energy necessary to engage with it. By the way, engaging with a regime, that is absolutely antithetical.

Would we cooperate with Russia the way we are now if conditions that they are now existed back then? No, we probably wouldn't. We've kept it isolated, we've kept it going, but certainly the conditions with Russia today would not support say the brand new creation of a station program, and the situation with China, I would argue, is even worse.

The Wolf Amendment, I don't think frankly has been that big a deal. People have made a lot about it, but I just don't think there was some large backlog of wonderful projects that would have happened if only for the Wolf Amendment. I think other reasons have been in the way.

Now, the question was raised about what we have to have a dialog with China. We should keep lines of communication open with them. Absolutely agree with that. That's why I say there are probably some unmanned scientific things that we can and should explore doing.

We have a civil dialog with China that occurs routinely. It certainly can cover things like space traffic management and other issues of space environment sustainability. We do not have, to my knowledge, a national security or space dialog. We did have one with the Russians in 2020. In Vienna, we should probably have more. We probably should have one with China.

Certainly China's buildup of new ICBM silos in Western China, we'll probably like to have a discussion about the nuclear arms control to include them as well as Russia. There's nothing that really prevents us from having that kind of security dialog, and we probably should look forward to it.

I would argue that the Wolf Amendment will likely stay in place because there is bipartisan support for it. It's not fundamentally getting in the way of anything really important. The things that we might do could certainly pass the tests laid by the Wolf Amendment.

There is a need to keep engaged with China. We also should recognize there's larger geopolitical trends which are going in a bad direction that will fundamentally constrained space more than Wolf Amendment had or will. Let me pause there.

Victoria: Thank you, Scott. Really appreciate your insights and looking at it from your perspective from pre-Administrator Bolden's work and then looking at more pragmatic way in what we might be able to accomplish.

With that, I'd like to open it up to the whole panel. If you guys can all turn on your cameras, please. Anyone who wants to speak, just pipe up.

First question coming in is from Rob Ronci. Rob asks, "Given that the impacts of Wolf Amendment can't be done, and that the geopolitical realities have grown and complex in the years since it was first adopted, what do you hope could be done with the amendment moving forward?"

That's a real question, what we see moving forward. Who'd like to take first crack at this?

Scott: I could describe some things that we've already tried and things we could do more with the existence of the Wolf Amendment. If you want to start with, "If the Wolf Amendment changed, what would we do," maybe that's a different question.

Victoria: If you'll able to take any wild prognostications at this point, go crazy.

Scott: I would say issues of behavior. For example, even in the Russian Space Station case before we had the Russians on space station before Czar and [inaudible 88:47] were launched, we had the Shuttle-Mir program. We had an on-ramp, if you will, of experiences that we built up over time.

There were some really rocky periods in that. This was not a cakewalk both technically, politically, and all kinds of issues. It takes a while to build that trust, even with the political direction.

Some baby steps that could be taken right now would be -- not at that scale -- simply scientific data sharing and trust. The Chinese put, for example, restrictions on who has access to scientific databases in and they want people to have authorization and permission before accessing those bases in ways that are more restrictive than NASA, ESA, or other partners do.

We'd like to see Chinese at least normalize access to their public scientific data in a manner that's similar to what we do. People like Jim Green, Chief Scientist at NASA, can talk about that.

We'd like to have commitments or even handshake agreements be observed. There was a case of a mission where the Chang'e spacecraft was going to then, to clear out debris that was going to crash into the moon and create a plume.

Therefore, that would produce an opportunity for a lunar reconnaissance orbiter to observe that plume and get some data characterization out of it, and we would share that data. The Chinese go, "Sure." Then the vehicle crashes into the moon without warning. We go, "Well, wait a minute. Weren't you going to give us a heads-up." "Something happened." We're like, "Right."

That's not exactly, builds confidence because what was agreed to at the scientific level is not what was eventually approvable. They really had to seek higher authority.

The really big case of this was, which still colors things, is, of course, the Chinese ASAT test. It wasn't just the Chinese ASAT test by itself in 2007. My god, we've done ASAT tests, so who are

we? They had prior, earlier that year, at COPUOS in the technical subcommittee, had agreed how to mitigate orbital debris.

If they were to conduct that test, we knew they had technical people who could have conducted that test in a much cleaner manner. Frankly, just as the Russians in recent testing could have done it in a cleaner manner. They chose not to.

We don't think they're incompetent. Therefore, we think they must have done this intentionally for some reason, which again means what was agreed to at a working or technical level frankly didn't have political backing or political support. Those are the kinds of things that lead you not to particularly trust what they say.

Now, if we got back into a more healthier pattern of small agreements, building and being executed, and trusting at a small level, that would be a good place to start at before talking about larger, more grandiose ideas of human spaceflight cooperation. I'll stop my rant.

Victoria: Thank you, Scott. Always love your rants. Other thoughts from any of the panelists about moving forward?

Charles: This is Charlie, I'll echo what Scott said and I think I put it in the chat within the Q&A. If given an opportunity, I would think that you would need to go back and work with Congress to renegotiate the Wolf Amendment.

I agree with Scott, that there are a number of benefits from it without a doubt, but finding things that it should apply to...One of the things that I don't think will sit well with people is you've got to know who you're working with. We need to admit that anytime you do any work in space, you're working with the People's Liberation Army Air Force.

When you're working in aeronautics, Scott mentioned, the fact that we could look at space traffic management, when we finally signed the agreement on air traffic management at the very end of my tenure as the NASA administrator. We had worked on that for years, I was in China to sign the agreement and all of a sudden, there was no signing ceremony.

I happen to go to a chamber of commerce, meeting up in Shanghai, and met a gentleman from Boeing who said, "Hey, you haven't talked to the right person. You've got to get this general from the People's Liberation Army Air Force to agree and it will go like clockwork." He was absolutely right.

We brought them into the discussion informed them of what we had been working with the Chinese equivalent of the FAA. I mean, it was like that. The agreement was signed, but it wasn't signed when I went over there to sign it, because we were working with the space agency and the civilian aeronautics organization.

Anybody who thinks you're going to work with China in aeronautics and space and not talk to the People's Liberation Army Air Force doesn't understand how things work over there. We've

got to bite our tongue, do like DOD does, because I think it's Kevin, that mentioned the fact that we've been working with the Chinese military for decades.

I remember when I was still on active duty in the Marine Corps, and we brought the hierarchy of the People's Liberation Army Navy to San Diego, California, and took them aboard this highly complex, highly classified communication ship for the Third Fleet and watched their eyes just bulge as they saw the complexity and the capability on that platform.

At that time, the Third Fleet commander had a distinct purpose. He wanted to show them what they were up against if they decided that they wanted to tangle with us there. Those are opportunities that we have, but I would go back and always work with Congress. Scott pointed this out.

One of the reasons I had such difficulty in the Obama administration was because I wanted to work with Congress. I wanted to engage Congress in budget planning. That was a no-no. That was OMB said, "No, there is no budget until the President signs it." We would always say, "How do you get to a budget that's going to float in Congress if they are not engaged?"

That's what DOD does. DOD just ignores OMB and goes and works the budgets they want. That's why they get what they want.

Scott: To a degree.

Jon: To a degree. Yes.

[crosstalk]

Victoria: Thank you. Very smart. Congress needs to be worked with absolutely. Thoughts by the other panelists?

Marco: Yes. I wanted to expand a little bit on this because Scott gave an excellent point of reflection. I would say, in the research, I was doing some years ago when I was studying year US-China relation. I indeed get the impression that the Wolf Amendment came into place because of, I would say misbehavior, not of NASA but of the OSTP and not even the OSTP, but in the person of John Holdren actually.

The point that I want to make is that how is that that we put in place an amendment that is intended to, in a sense, punish a person that is not behaving well or at least behaving well according to your standards, the standard of Wolf. The repercussion is that you are in creating limitations on US ability to do things, on NASA or the OSTP ability to do things when this decision should be...

This is a reflection for everyone, should be a political decision. It should not be a decision that arise from a legal obligation. That was the point that I was making before. It should be part of an overall strategy. I'm not cooperating with China because I do not want to work with China, not because the law prohibits me to cooperate with China.

I don't think that, eventually, the amendment did not punish China though, but punish only the US in a sense. It did punish the US and its ability and its freedom of maneuver when it comes to space diplomacy.

Also, in space diplomacy, we have some, I would say instances, where space cooperation acted as a foreigner of broader diplomatic advancement, which was again in my view report, well, by Kissinger, needs a decision when he send Low, who was NASA administrator back in the 70s, to Moscow to negotiate the Apollo-Soyuz test project.

In a sense, I have the hope that since space has such symbols, it can act as a forerunner of diplomatic advancement. That's it.

Scott: Marco, I can agree with a lot of that, but I think the problem is the sequencing that is the administrator was sent to Moscow for Apollo-Soyuz, but this was after the 1972 Nixon Brezhnev summit agreement on detente. We had a political condition first that we then used space, which is very powerful symbolically, as you say, to then cement that.

Again, that's where space is a lagging indicator, not something that leads. Then, we come to what do we think XI Jinping is going to do. If Xi Jinping said that he had no problem with recognizing Taiwanese independence, I'd have the Chinese on the space station tomorrow. That's not where we are in the broader relationship.

Victoria: Any other thoughts from the panelists?

Jon: Let me add, Scott just reminded me of one thing. My trip to China was not done in a vacuum. It was not something that was generated because President Obama just wanted to do something. It was one of the products from the latest US-China space dialog that came out of President Obama's meeting with then President Hu.

It was an agreement mutually made by the two presidents that we would have reciprocal visits. The second visit, the reciprocal visit, which was supposed to be a Chinese delegation to JPL, Johnson Space Center, and Kennedy Space Center never occurred because the Wolf Amendment and Congressman Wolf forbade that.

Scott: The way to restart again, even under the context of the Wolf Amendment, would be to have a civil space dialog, for example, with China, and then bring up some of these things. What I would caution, I would absolutely have that dialog, I wouldn't try to load it up with too much freight, particularly, like the most human thing I would do is maybe an exchange of biomedical data.

I wouldn't give any indication that we're going to be flying Chinese astronauts or anything like that. I would keep it very much at a scientific exchange level, and to open up that line of cooperation, but still keeping the really big symbolic stuff and high trust stuff off the table, because you would just break the system if you try that too fast and too soon.

Charles: I agree 100 percent with that. That's a confidence building maneuver that allows the Chinese to agree to the stipulation that what they do must demonstrate transparency, reciprocity, and mutual benefit. If they're not willing to do what Scott says, then we know they're not serious.

Victoria: Thank you. Actually, I would like to shift gears a little bit. There's been an interesting couple of questions or comments in the chat, I'd love to hear the panel's thoughts on.

One comment is by Greg Schuster. He says, "The Wolf Amendment has really handcuffed Earth Sciences here at Langley. I've been told not to even answer email from Chinese domains. From this perspective, the Wolf Amendment has stopped much Earth Science work from ever getting started."

Along those same lines, Jim Crawford asked, "Given the extreme breadth of NASA's portfolio, does anyone see an opportunity to separate some aspects of Earth Science from the amendment? For example, dialog and environmental issues of global public interest, such as air quality and climate change have separate at the agency."

I would just add, given the Biden Administration's interest in fighting climate change, maybe this is something that might be a possibility. Just curious, what do you guys think about that? Who wants to answer that?

[pause]

Victoria: I'm seeing grimacing.

Scott: I just don't want to bigfoot anyone. I'll say, absolutely, multilateral cooperation is perfectly fine. There are actually a number of multilateral organizations in climate and earth environments, like Group on Earth Observations, for example, that could be part of this.

We cooperate and engage with China all the time in the ITU as a multilateral thing, protecting space spectrum and such. This is really focused on bilateral issues, and especially more sensitive human spaceflight issues, which is right for it to do. There is sometimes overreactions and sensitivities.

The fellow at Langley maybe shouldn't be responding to emails from Chinese domains for separate purposes, not just the Wolf Amendment, that maybe from a good security practice standpoint, he wants to be careful who he's talking to. That's simply a matter of any federal employee being current on IT security, export control rules, and all the rest of that.

There's a ton of multilateral engagements that we're already part of, including environmental ones, that you could imagine having conversations with. We cooperate and talk with the Chinese all the time in COPUOS on long-term sustainability of space activities, the Chinese were fairly constructive in many cases, more so than other countries, and where we could find common ground.

There are these openings here. They fundamentally depend on the Chinese leadership. This is where I keep coming back to Xi Jinping in the tone that he's taken. In every other area of shared domains, whether it's been the South China Sea, whether it's been in region, Tibet, Taiwan, whether it's been in cyberspace, or even in Polar Regions, we have some really problematic activities.

It has not yet crossed that way into space as much. Never mind the ASAT test. I've been trying to find out, and I keep asking Kevin if he's seen it, the latest Chinese whitepaper, which is supposed to have been out this year. Every five years, they come out with one. I haven't seen it.

I would be looking for key language that the party uses on issues of vital interest, which usually signal them being inflexible. They have certain language they use when they talk about China, talk about Taiwan, or they talk about Hong Kong, Uyghurs, or other issues, where you go, "You know, there is no discussion here to be had."

They haven't really gone that way in space. They've left themselves flexibility. I wouldn't be surprised if Xi Jinping decides to declare space a vital interests of some sort, in which case all that flexibility goes away. There's still hope for space to be less confrontational than other areas. Chinese behavior in other areas is not encouraging.

Victoria: Thank you, Scott. Other thoughts? None. OK.

[crosstalk]

Makena: This is an area where, as Scott mentioned, there is a lot of room for more cooperation with Chinese scientists. Science and climate data, that's a great entry point to that trust building, and just sharing information, continuing to work on science. Climate change is something that's going to affect all of us, similar to a lot of issues in the space domain with norms and space debris.

Opening the door to some of these really vital interests just to start the conversation, start this trust building a bit, that's a great place where we could see some continued small cooperation that could lead to something bigger in the future.

Scott: The question is, how demanding are we in those cooperative areas? An example is there's a thing called the University Space Research Association, association of all 105 or more PhD granting space institutions, mostly US but we have international members in USRA. Chinese University of Hong Kong, for example, was a member.

There was a number of discussions about how that would work. People got comfortable with it. With the suppression of Hong Kong in recent years, there's not much happening with Chinese University of Hong Kong. In fact, people are looking to get out, and other entities who it might have worked with.

A number of Chinese universities that we might want to go to are under sanction for technology theft or their ties to the PLA. You actually have to work to find an entity. They do exist, but you really have to work to find entities that aren't really terribly tainted or suppressed.

Again it's a very, very small space, getting smaller, in which to move. It doesn't mean we shouldn't offer it, but we should be I think very realistic about what the prospects are.

Victoria: Thank you, Scott. Marco, looks like you wanted to add in something.

Marco: Yeah, I just wanted to add to it. Of course I fully agree. I think there is a lot of room actually to initiate incremental steps of I would say corporation, starting with scientific dimensions, for instance, even related, as I was mentioning.

For instance, we want to deal with or treat, address safety issues, we can start from scientific corporations for instance with regard to space weather or NEOs that do have an impact on other issue area, but can be addressed incrementally as little steps from a scientific respect, so scientific exchange, also do university exchange or just exchange of data.

This can lead to a higher degree of understanding and additional exchange into new areas, basically. It's a functional approach that, of course, we can start from scratch inviting them to the International Space Station. They may not be interested anymore, but we can start out with the incremental step. Chinese new white paper should be out in two weeks or one.

Victoria: Two weeks or one, how exciting. Thank you.

Scott: Christmas, Christmas.

Victoria: [laughs] Happy New Year to us. Actually, moving on, there's a question for Jon, hoping to get some experience from his background.

As Scott earlier talked about the potential role of an official civil space dialog, Jon, does your experience at the Committee offer any lessons for what role civil society can play, whether it's on Track II conversations and other ways in supporting or enabling such official discussions? What's been your background on this?

Scott: The National Committee, it currently runs about six Track II dialogs on a variety of topics that all move into more sensitive areas, so everything from human rights and rule of law to maritime law and economic issues, preventive defense. There is opportunity.

I will say that during this pandemic period, where all Track IIs are taking place virtually, we're a little bit more in maintenance mode than we are having real conversation.

An America watcher, a prominent America watcher in China, who was in our office a few years ago, but during this downturn was asked, "Are Track IIs still worth having today?", and he said, "Absolutely. You should have plenary sessions for 15 minutes, and then coffee breaks for 45."

That everything is taking place on the sidelines, and that the plenary sessions, when everyone is listening in and the ears of technology and so forth, is not where the best exchanges take place.

"That option doesn't exist right now, but you still have to maintain the foundations for the moment when we're going to be able to sit down across the table."

There is potential, for sure. I didn't mention our healthcare Track II, so the notion of scientific cooperation in limited areas. Many of these areas frankly fit within what the CCP's looking to expand on, but within limited areas, Track IIs play a vital role, and having some that look at space within all of these contexts would be quite fruitful.

Kevin: Victoria, if I could chime in with a question, using the prerogative of one of the panelists. In looking at our ARTEMIS program, and then also looking at the joint vision that China and Russia have issued on man's lunar exploration, they look awfully similar establishing an orbiting station around the Moon, setting up a base in the South Pole.

I'll just put out a question. My own question to the panel is looking forward, if the Chinese and maybe the Chinese-Russian vision actually comes about, is there anything that we need to do, or both sides, or all three sides need to do to deconflict in our activities on the moon and around the moon, and is any of that prevented by the Wolf Amendment?

Scott: Let me take a shot, and let me see if Charlie can correct me. The short answer is there's a lot of stuff which is already in place. The interoperability on docking systems is already there. Actually, the Shinzo atmosphere is comparable would need a ridiculous airlock to do cross support.

Certainly talking about safety and rescue operations is certainly one could imagine a civil dialog on. The Chinese use open standards communications and navigation standard from Consultative Committee on space data standards, which is an international organization of all the major space agencies. They participate in the International Space Exploration forum.

As a general understanding of what people's various plans are, the only thing I would probably say as the next step is have China sign the Artemis Records. If they don't feel they can sign the Artemis Records for whatever reason, they should develop something similar with the Russians.

Then we can do cross recognition there because we're not doing anything, and the Artemis Records is not under existing international law anyway. I would, first of all, happy to have them sign the Artemis Records.

If they don't want to do that, then happy to discuss some other guidance system that they would want to have for their cooperation on the International Research Station. We should obviously be talking to each other if around the South Pole. All the technical pieces already really exist.

I think meeting the Chinese on the moon and coordinating for safety and responsible activities there is maybe the most ambitious thing I could imagine doing. They're not going to be inside our program. We're not going to be inside their program, but we can certainly imagine meeting on the road.

Kevin: Thank you.

Victoria: That actually leads to a question from Mariel Borowitz. Scott answered it. I'd love to hear the rest of the panel's very quick response since we're in our last five minutes. Mariel asked, given the current trajectory of US China relations and the plans of the respective nations with regard to lunar development, what actions do you think the US should or could take in this arena?

Should we attend more engagement, or should we view this as an area strategic competition? Who'd like to answer? Kevin, you want to take a shot that?

Kevin: Scott probably address most of that. I made the point in my opening remarks, was that we can't really separate space with what is happening down here on earth.

There is that ideological contest that is going on. Maybe that's distasteful that to say to someone when we're talking about space, but there's a certain benefit that that both sides get to doing their own thing in human spaceflight and also manned lunar exploration.

There are some downsides to cooperating extensively with the Chinese on the moon. Each has its own purposes. The Chinese have their own reasons for doing it. Thinking that, we could maybe co-op them. It's maybe a bridge too far.

Victoria: Other than that?

Scott: Something I can't imagine thinking of being not requiring signing the Artemis Records but maybe taking a portion of them is we don't want anybody walking on Neil Armstrong's footprints. They probably don't want us to steal their rovers.

A agreement to talk about non-deconfliction and how we respect each other areas, maybe gently on historical sites, and such an agreement could be open to any country that has demonstrated the ability to soft land on the moon. It doesn't mean every country, but it means countries who've demonstrated soft-landing capabilities, like China, like Russia, like ourselves, potentially Israel maybe make progress.

Again, being very focused on operational matters, safety matters, non-interference kinds of things from a very practical standpoint. I could see something like that happening, and I don't see the Wolf Amendment being really a barrier to that one way or the other.

One has to find things of value to do that are worth doing, and overcoming the otherwise large political barriers that are put in place. Political barriers go down because conditions improve, you do more things easily.

If political barriers are high because geopolitical conditions aren't good, then you really, really have to have a big value proposition to make it worthwhile. Station has sustained, for example, that value proposition, even against things like Crimea and threats to Ukraine, but it's not invulnerable.

The station is coming near the end of its life. Conditions are not improving. What comes next for human space flight will probably not be a singular facility like the station.

Victoria: Marco, really quickly.

Marco: Yes. I think three things that should be addressed actually for the coming way off lunar exploration activities, as Scott mentioned, protection of cultural heritage, but also what the creation of safety zones on the moon will actually imply, and three, also the resource issue, possibly.

It isn't clear whether the international lunar reserve stations by China and Russia will be linked to some government's principle in the same way the Artemis did. In any case, there is a need to ensure convergence between the views of China, Russia, and the US and Artemis signatories on these three topics MOU.

Victoria: Thank you. All right. I think we're just about at time. I recognize everyone is a little Zoom'ed out these days, so I don't want to take too long. I would just like to, first of all, thank all the panelists for their excellent insights, and especially thank you to Administrator Bolden for his conversational keynote.

There's clapping going on the chat. That's great. This conversation has been recorded and the video will be posted fairly shortly up on our website. I'd like to, just in final thoughts, it seems to me having listened to the conversation today, there was agreement that the US needs to find some way in which to engage with China as a space power, and the US is doing it at the multilateral level.

As Scott pointed out there are a number of ways that could benefit from cooperation, that are transparent, reciprocal, and mutually beneficial. In the commercial sector, understanding their commercial space sector, which is burgeoning, would help US companies compete, and develop a more informed business or competitive strategy.

In terms of national security, it's important to build a more informed understanding about the capabilities or plans of China so the US can have strong policy responses. Then there's a need to work together -- coordination issues -- whether it's space traffic management, mega-constellations, looking at space for climate change or things of that nature.

Just in general, engaging with China is critical to enable space operations so that space can continue to be used in a sustainable manner that is equitable and accessible for all. With that, thank you all for joining us, and we really appreciate your interest today. We look forward to seeing you at future SWF events.

I hope everyone has a great end of this 2021. Here's to a good 2022. Thanks a lot. Bye-bye everyone.

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