

Industry Support of International Approaches to Space Sustainability

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[background conversation]

Marcia Smith: I think the appointed hour has arrived. I'm Marcia Smith. Uh, I, um, have my own consulting company, Space and Technology Policy Group. But I also have the website spacepolicyonline.com. And, uh, the rest of my bio and the bios for everybody here are in your package.

I'm just gonna very briefly mention who they are. And their, uh, role today is to talk about the private sector's viewpoint of these guidelines. We have Mike Gold, who works for SSL, which is a satellite manufacturer, but he's here today in his capacity as chairman of the FAA's Commercial Space Transportation Advisory Committee, COMSTAC.

Next to him is Elliot Pulham from the Space Foundation. Madi Sengupta from AIAA. She's substituting today for Sandy Magnus. Frank Slazer from the Aerospace Industries Association and Charity Weeden from the Satellite Industry Association.

As Ken Hodgkins said on the previous panel, most private sector activities, most space activities today are from the private sector. Other people may have other measures of, uh, how you calculate space activities. But I think that at least in terms of revenues, it is absolutely true that most of it is from the private sectors so their views on these guidelines, I think, are very important.

And as Ken pointed out, uh, the US government has brought the US private sector into these discussions all along the way, so some of these individuals or their organizations have been very much involved, uh, in the discussions at the UN.

So each speaker is gonna talk for about 10 minutes and then we'll have hopefully a lively Q&A session so please be thinking about your questions while they're chatting. Mike, you wanna begin?

Mike Gold: Sure. Thanks to Marcia and I just, just terribly busy I was today that I didn't have the chance to begin my day with spacepolicyonline.com which I read every day as possible. It's, uh, a great resource. You know, thank you so much for the invitation in the Secure World Foundation. Uh, the invitation I was gonna expect as part of State for the invite.

As we all know, we are looking at a substantial transition in space field from government-driven activities to commercial and private sector, particularly in the globe, but going beyond and that requires some change in the interactions in terms of foreign policy, in terms of regulatory with the local and domestic and how America engages with the rest of the world.

And it has been, uh, an absolute pleasure to work with Ken Hodgkins and his team at Department of State because I think they have moved forward in terms of engaging the private sector because now with the private sector conducting all of these activities, you have to have them at the table, that where there's long-term sustainability guidelines and discussions at COPUOS, the fact that its new players requires new players at the table.

And I complement Martinez and those in those efforts and the members of COMSTAC including as staff of COPUOS Foundation, United Nations. Uh, we've been participating in these calls so there's individual organizations, as well as this concept in general. And I believe that that early engagement will lead to quality, as we've seen with long-term sustainability guidelines.

But I'd regret on this, if I didn't bring up my favorite topic [inaudible 03:54] and my absolute favorite article of the Outer Space Treaty, that is Article 6 that even before we get to the long-term sustainability guidelines and any other obligations that we have a little later internationally, I believe that it's incumbent upon the United States government to ensure that we are meeting our obligations under Article 6, which relevant part states that the signatories of the treaty must authorize and provide continuing supervision for the private sector space activities.

And the reason that I think it's important that we meet these obligations and establish a benevolent approach that supports commercial development rather than deters it is because many people may be familiar with the ITAR and what is an export control and what that did to commercial activities.

And the words that we have talked there are exactly the same as in the United States stream government supervision. To me, two of the most dangerous words in the English language, the commercial space development.

We have the opportunity now working with members like Congressman Bridenstine, working with the FAA Office Commercial Space Transportation to establish an approach, uh, this means such technically enhanced payload reviews.

Whereas part of the existing payload review process, a company would be able to submit information relative to their activities, that would be relevant and allow department of State and the aeronautic agency process, to review these activities to ensure that we are meeting existing pre-obligations and are not, in any way, causing harmful interference with domestic or foreign activities.

If we can't get that done, we are going to continue where we are today, which is the status quo that is rife with confusion, uncertainty, and unpredictability. And, I assure you, if there's one thing that investors hate, it's uncertainty.

And, this is not an academic issue, or just something that we're pontificating on, uh, right now, my company, for example, is bidding on satellite servicing contracts, DARPA Robotic Servicing

of Geosynchronous Satellites, NASA's Restore-L program. When insurers look at those programs, they'd only ask whether the regulatory issue is involved.

Who's responsible in the US government for those regulations? And, there are no good answers, right now. Moon Express was sort of, the test case for this and that effort took seven months, nearly went off the rails in the end. This is an untenable situation.

And, if only someone had said something and I, I think 10, may have been 10 years ago, the department of State was raising the red flag on this issue, so it only took us a decade to catch up to the department of State's warnings because the department of State, like the rest of the US government, wants commercial space to succeed. They want it to thrive.

But, unfortunately, the regulatory issues and congress, right now, is behind the technology. And, what we don't want to happen, is for the regulatory environment in the US to become so pernicious and so confused, that it chases commercial space activities overseas.

Uh, I was recently in Bangalore, India as part of the National Academy's effort, engaging ISRO and Indian government officials, because they're drafting a national space law, which, among other things, will address their Article 6 obligations. I had met, recently, with United Arab Emirates. They've put together an incredible, comprehensive piece of legislation that addresses these issues.

The US is behind now. Our allies in this effort, and if we expect to continue and support and develop commercial space, you know, call your congressman, call your senator. We really, really need to get moving on that.

Uh, finally, in terms of long-term sustainability guidelines, specifically, uh, first of all, they cost me several dinners and several drinks because I bet that there were no way we're [laughs] going past, so I'm absolutely thrilled with the progress that's being made in that arena.

Uh, I'd like to see more and I think that they benefited substantially from the input of the private sector and, again, congratulate the department of State for integrating that, means, again, the commercial sector are the players here. If we're not involved in developing these ideas as guidelines, you know, it will only create problems down the road.

So, uh, I look forward to continuing to engage, uh, with State and with my colleagues in the commercial space industry to implement, develop more long-term sustainability guidelines but would just end by commending us that we need to resolve that Article 6 issue as a threshold development before we can go on to do much of anything and before discussing that more up close.

[applause]

Elliot Pulham: Well, thanks. Mazlan Othman told me that I should lighten things up here. Um, so, I'm gonna tell you that everything is just ducking in the streets, as happy as it can possibly be. Um, actually, uh, that, that, that's not too much of an exaggeration.

Um, the Space Foundation has been involved with the State Department and with, uh, COPUOS, for [sighs], how is it long, I wanna say 16 or 17 years now, since, uh, since we started working

with y'all. And, uh, the way we do that is, uh, we are, uh, you know, we're comprised, uh, uh, uh, of many, uh, members of industry.

We have about 160 members from, uh, mostly the United States, but also, from Asia and Europe, now. And, uh, so, we, uh, tag along as the private industry advisor to the State Department and have done for about, as I said, 16 or 17 years.

So, we've, uh, had the privilege of sitting through the 10 exquisite days of brilliant, uh, dialogue and oratory that is the UN COPUOS meetings. Uh, and we've been there, uh, to, uh, to advise, uh, because we do have such a diversity of membership, uh, we have to be careful all the time, you know, that we're, we're taking positions that, that industry broadly can support.

Uh, and so, we've done that an-, and, uh, I was just, uh, delighted as I could be, uh, that, that, we managed to pass this thing in, in the current session. And, I'm sure candidates, all because I was back there for the first time in nine or ten years, or whatever it was, so, we'll take all the credit.

Um, industry, you know, industry is not a, a big, monolithic thing that all thinks the same way. Um, you know, I know we've got 83, 84 members on the committee. I'd say I've got a 160 or so, uh, on the Space Foundation. And, so, trying to get everybody to a consensus point of view is, is not an easy thing.

Um, and even within our industry, there are, there are differences of opinion. I, I happen to think that, that, what, uh, Bob Richards's team did with Moon Express is brilliant, I'm sorry to have said that once, that here's a, a, a, example of a company that is looking out at the future, in a culture that has an appreciation for the international environment.

I think that comes from Bob having spent, you know, his formative, uh, years, uh, getting the ISU started. And, so, he's got a very...

Male Participant: He is a Canadian.

Elliot: He's...OK, we'll give him...check that mark. International board member. Um, so, I think he did a, a, a very good job, uh, in plowing some new ground. Unfortunately, not everybody, uh, uh, in the industry has the same view. I think, by and large, uh, the established space companies have, uh, uh, a real profound understanding of how important the protection of space environment is.

Um, you know, they all build things that go up there or they operate things that are up there or they want to, you know, build some, uh, satellite for somebody or, uh, launch or something, whatever it is, and they all have a very fine appreciation for the, the perilous nature of the space environment.

Uh, I think where I become more concerned is, uh, is in some of the, the startups, uh, that we see, um, you know, we have, uh, some interaction with Silicone Valley sect and a, and venture capital sect and, and I, and I, actually heard venture capitalists, uh, say that they don't care, you know.

Their job is to build French satellites, get them up there, flip the company, take the money and run and who cares if they, if they don't function. I mean, they were a little more cautious than worse than that. Basically, that's, you know, that was, was the attitude.

"We're here to, to make a quick buck, flip it, sell it to somebody else and, and no, I don't want to put a transponder on my satellite. I don't want to put a thruster on my satellite. It's just a dumb rock. It's just going to be up there sending down the data."

So, I think we have, uh, all of us, a, uh, a, uh, a job to do here in education, uh, in terms of, uh, educating, uh, our policy makers and, uh, some of our own, uh, companies and, and, entrepreneurs. Uh, I will say that there are entrepreneurs, like, like Bob and, and Elon and others, who are very, very appreciative of, of, what kind of environment it is.

So, industry, by and large, is, is, uh, supportive of these measures. It had been put to organizations like ours, uh, and, and it's nothing, nothing to be alarmed, uh, about for industry, these, these, uh, regulations, um, guidelines, I'm sorry.

Um, the other thing that, that, uh, I think has been a fundamental bene-, benefit for industry in terms of being engaged in this process is, is, uh, is a lot of organizations like Space Foundation to develop much deeper and more meaningful, uh, relationships with, uh, our own State Department, as well as with, uh, the UN and, and other organizations, uh, so that we can, we can do a better job of working, uh, together and bringing in input from the industry, input from the private sector, uh, into what's, uh, what's going on in our, in our international relationships, uh, pertinent to space.

Uh, we've been very privileged to, uh, work with the State Department on the, uh, bilaterals with South Korea and those were incredibly en-, entertaining and exhausting and, and almost frenetic. Uh, uh, we were, uh, all together in Seoul, uh, in June, I think it was or maybe, it was May, uh, and signed a, a, a treaty with, uh, South Korea, that took only two years to, uh, to negotiate because those bilats were so successful.

Uh, we've gone down to same road, uh, you know, if you'd have told me that I would be walking the streets of Hanoi with people from the State Department, 20 years ago, I would have said you were out of your mind. Uh, but we did.

We had the opportunity to, to go and, and meet with, uh, colleagues -- new colleagues, new friends -- from, from, uh, Vietnam and, uh, to bring industry perspective and to work as a, as an unofficial, informal organization, uh, exchanging views, uh, talking about culture, getting to know one another.

Uh, these things spilled into our other activities and many of you are aware that, uh, my organization conducts the Space Symposium every year out in Colorado Springs, and, uh, that's, you know, just, you know, me and 10 or 11 guys, who are friends, out there having a great time.

Uh, but over time, that or-, that event itself, has also become an, an international melting pot and it's because of all the work we've been able to do through our support of the UN, through our support of the State Department, all the people we've been able to meet, uh, to develop new friendships and new rela-, relationships that, uh, really help us to build bridges, uh, around the world with our fellow, uh, space-faring nations and with those nations that aspire, uh, to that kind of, uh, that kind of a future.

Uh, we'll be leading a, a group out to Manila in November. Uh, that should be fun. There'll be no, uh, no rhetoric or political intrigue there to look at, uh, whatsoever, but, uh, it's, uh, it's the PR staff meeting that was referenced early, uh, earlier. Uh, Jack's has, uh, a terrific job, uh, with that and, and, and we've also do a great working relationship with Jack's over the years.

So, uh, this, you know, I, I think, for a lot of Americans, di-, diplomacy seems to be a, a kind of detached, ethereal, you know, that's diplomacy is for the diplomats, there's help people who State Department and Secretary of, of State that, that deal with that.

Uh, but I, I think that diplomacy is, is, uh, much more effective when it's a team sport and we're all engaged and so, uh, it has just been a delight to, uh, be part of this and we look forward to continuing this for the efforts going forward. Thank you.

[applause]

Madi Sengupta: So, I'll try and keep it short and sweet because I think we've been hearing a lot of the same themes coming up in each of the panels. Um, and just before I start, on behalf of Sandy Magnus and the rest of the AIAA staff and organization, thank you very much for having us here.

Um, I think we've heard over and over, um, today, uh, that the future of space exploration, um, in and beyond LEO, is going to be an international effort and it's largely, um, we're seeing more and more commercial actors play in that field.

And, so, establishing best practices versus well more use of aerospace seems like a very crucial, um, step as new actors go commercial and government, um, come into play, uh, to ensure an effective and efficient, but also, sustainable, use, um, of, of the, um, playing field.

For [inaudible 17:30] our members come from a range of, um, backgrounds and expertise and so, a lot of them do align with some of the subject matters that we've covered, um, that we heard about earlier today in the expert groups from [coughs], excuse me, in the, in the working groups from [inaudible 17:45] development.

And, we've appreciated the opportunity to leverage some of their expertise in order to contribute to some of the work that's been going on and developing the subject guidelines. Um, and, I think, one of the things that it also brings back to our organization and, um, our members and their respective organizations, is the, um, the appreciation and the understanding of how...not only how the guidelines are developed, but how, um, diplomacy and foreign policy development works.

Um, because, I think, it-, uh, many of us, coming from technical backgrounds, that's not, necessarily, something that's, um, easy to pick up or, or i-, integrated into our, um, our, uh, education. So, it's, I think, beneficial for them to have that experience and exposure.

And, I think, it's been encouraging to see kind of the collaborative nature's been mentioned, um, uh, uh, of the development process with the US, um, especially, bringing in the academic and nonprofit and, and commercial sectors, to be able to contribute to the development of the guidelines.

Um, I think, it's also demonstrated the recognition of the importance of having all the stakeholders at the table because, ultimately, these guidelines will affect, um, those stakeholders in, in varying ways.

And, so it's good to have, uh, them have a, have a role in, in the development and hopefully, that model can be used, um, as the next phase of development goes on for, not only the guidelines but, um, future activity in coordination within COPUOS.

[applause]

Frank Slazer: So, so I'm here today from the Aerospace Industries Association, which, as some of you may know, is, is nearly a century old, was founded in 1919. Um, one of our founders was Orville Wright.

And, if you go to the, uh, Air and Space Museum or go to any aviation, uh, museum, you see all these wonderful planes, particularly for an engineer like many of us are here, you tend to focus on the shape of the wing or the material of the aircraft or the type of the propulsion system that's used on it.

What you don't realize is the context that enabled all those things to work. How can a jet airplane fly over multiple international jurisdictions?

How could it land at an airport thousands of miles away from where it was built to take off and smoothly fit into a legal, uh, and, as well, as a, an operational, uh, allo-, system that, that allows profit to be made, allows us all to travel internationally and allows us to do all these many things that we do with airplanes, which we're at the start of creating that for the space, right now, which is a really exciting time.

And, if you think about it, it's not the first time we've done this, right? There's already hundreds of millions of dollars in geosynchronous telecommunications, principally, in some lower tower of telecommunications, that enabled by earlier efforts of the space treaty.

By earlier, a greenhouse...like Intelsat, that, that created these, uh, structures for business and for legal activities, that now provide tremendous benefits to the world. And, now we have new space systems, whether they're low-Earth orbiting satellites, that provide new ways of observing the Earth, from providing telecom or providing WiFi signals from space.

All these new capabilities are being thought of and starting to be implemented and developed, uh, with, literally, also, hundreds of millions of dollars of private capital in the United States, and some capital from other nations, as well.

How do we make sure that that all doesn't go to waste because we created a, a horrible environment that's polluted, that's congested with, with debris, that is unsafe to operate or is unreliable for investors to put that kind of, uh, a long-term approach with it all in, uh, in place? So, I, I think the, the, the ingredients for each, so far, are important.

I, I think we should try to keep moving. Obviously, diplomacy operates at a different clock speed than, than business. Uh, you know, um, and, and, and, so, it's good that progress has been made so far. It's good that more progress is, is still being made.

It's, it's, also, good to see that, uh, it will get internationally, we're starting to see more and more nations starting to establish, you know, spa-, responsible space, uh, actors, for lack of a better term.

Something like with the FAA, with launch and reentry licensing, or the FCC, with orbital, uh, you know, frequency utilization licensing, that'll provide the fr-, the framework for spacecraft to come and go, for, for, potentially, taking off from overseas locations or landing after a trans-atmospheric, uh, trip.

You've got, you got a number of our member companies, such as Virgin Galactic, Sierra Nevada, Boeing, that are, actually, working right now on developing commercial space transportation vehicles that, literally, will need to be able to have the capability to f-, take off in one international jurisdiction, land in another, and safely carry people through space.

So, I, I wanna, I wanna set up the context for this. This is, this is really important to the businesses that are out there operating now. That are out there, aspiring to do more bolder and newer things in the future.

And, we look at aviation in history and what aviation has done for the world and the past and compare to it if I touch some, for both, seeing how important this is and also, how important it is that we complete the job of, of, of, finalizing, uh, world's first space sustainability to enable these wonders to happen. Thank you.

[applause]

Charity Weeden: Good afternoon. First, I'd like to convey, uh, Satellite Industry Association's thanks to the US State Department and Secure World Foundation, for holding this ev-, event and for the invitation to participate.

SIA's comprised of over 30 members in satellite operations and services, manufacturing launch ground systems infrastructure and we're proud to have been engaged over several years with US delegation to COPUOS, in its efforts towards space sustainability.

And, like any good en-, diplomatic engagement, there's been mutual benefit to the satellite industry and to the COPUOS membership through US government.

By bringing industry into the conversation, whether through trade associations or individually, an avenue is opened for part-, participation, for those who want to be more involved in COPUOS, as, as it discusses items that similarly impact commercial assets. And, there's greater opportunity to collectively comment on proposals and pos-, positions.

In essence, this is about the ability to have a voice in a government-to-government, international body, which is often focused on all of countries activities.

As a result, there can be greater understanding of COPUOS activities and processes leading to a more productive engagement. There's also benefit to COPUOS members. Commercial satellite owners and operators tend to serve globally, have ground stations throughout the world, have customers everywhere.

They do this through 700 of the 1,381 s-, active satellites today by delivering commercial services. The scope of the commercial satellite industry, its interests, the activities, the participation, can and should be communicated to COPUOS' 83 members.

As such, SIA, having supported the US delegation, has addressed the COPUOS body and brought this message forward and its members have been involved in long-term sustainability working groups. The commercial satellite industry is starting to get more active and willing to contribute to the conversation, enhancing a productive engagement on long-term sustainability of space.

This involvement in the space sustainability dialogue is paramount. Extremely strong in-, incentives exist to operate responsibly in space. To do otherwise, would put at risk the tens of billions of dollars industry has invested, in building and launching spacecraft to serve customers. Further, it would imperil the future of our industry. In other words, space sustainability is not just good judgment, it's good business.

The commercial satellite industry has had a 50-year legacy of operating in space, applying a tremendous amount of expertise in conducting safe space operations. Items, such as redundant operation centers, encrypted control signals, efforts to minimize the effects of radio frequency interference and processes developed for detailed and planned maneuvers, are built upon this 50-year legacy.

Other volunteering measures by industry exist to ensure the long-term viability of most useful orbital regimes and they are, largely, centered on data and information sharing. The Space Data Association, where positional and radio frequency interference data is shared amongst operators worldwide, and government agencies, has aimed at reducing the risk of collision and avoiding harmful interference.

Industry has also engaged in a commercial integration satellite US Strategic Command and benefits from bi-directional data-sharing agreements. With these items, the commercial satellite industry is demonstrating a commitment to space sustainability and responsible space operations. However, what started as a slow shift is accelerating towards an abundance of activity.

There is growth in almost every way, in accessibility, capability, customer base and revenues. This, this, number of downstream applications is also increasing. And, most relevant to this discussion, the number of operational satellites is growing with varying expertise in its operators. 59 nations, now, operate, at least, one satellite or are part of the consortium that operates satellites.

Many do so through a private sector entity, with many running commercial satellite services. It's interesting to know, that on average, that is one for every year since Sputnik. Yet, all nations benefit from satellite use - communications, broadband, security, resource and climate monitoring or scientific discovery.

This growth, these changes are happening in a space environment where debris events, can, and have occurred, which can put at risk the investments and progress made in the space industry to date. So, there's more to be done.

More best practices to be developed, more guidelines, norms to be established, more interaction, increased sharing and better use of data to address orbital congestion and space sustainability.

And that starts with dialogue. Dialogue on all ethics, whether industry, national or international, this discussion is not complete without the private sector. This is why UN and COPUOS set them center of important and why encouraging more opportunities for active industry engagement makes sense.

Events like the High-Level Fora will be doing just that in preparation for UNISPACE + 50, as well as continued support for industry input into long-term sustainability guidelines.

The global nature of satellites and sustainability of space requires a global solution that takes into account all stakeholders. We, ultimately, hope these solutions, to address congestion and risk of collision, will lead to greater investment and innovation in space. SIA looks forward to making a positive contribution to this effort. Thank you.

[applause]

Marcia: Thank you all for being so prompt and I don't think anybody, even, took up their 10 minutes of time. My timer just went off but that was, actually, for Frank's talk, so...

[laughter]

Marcia: So, I hope all of you have got a lot of questions, uh, on your mind to ask our panel but I'm going to start off with one and it's picking up, really, on something that Charity just said about the importance of the activities at COPUOS, in terms of the business environment.

And, Mike, you made the joke that you lost a lot of dinners and drinks because you thought they weren't going to happen, so from a business perspective, how important is it to have these UN principles and what will happen if they don't, in fact, go forward to the UNOOSA assembly in 2018? Mike, why don't you start?

Mike: So, uh, let me say first that, uh, I know we have some engineers in the panel and out in the audience. I'm not an engineer. I'm an attorney so I'm biased but I think the engineering is the easy part of all of these, for example, the Moon Express. I don't think the Moon Express ever doubted that they could build this system, that we'd go to the moon and take a lunar sample.

Whether they could get the authority that they needed out of the FAA and US government, that was the question and suddenly, you know, I think members of the COMSTAC, the satellites like my own company, you know, companies represented by FAA and all the space associations here, I think we're confident in our technology, in our ability to build.

The question is due to the political will exists to preserve that environment and allows them to operate safely and that I think is really a part of the question that keeps me up at night and if I could steal it from Doug Loverro, from the Department of Defense, the first time that a thousand-dollar cube sat smashed into a \$400 million satellite, there are going to be repercussions.

And I fear that those repercussions could be meager, will be quick and will not necessarily be the prudent ones that if we take action now, be it long-term sustainability guidelines, be it work with COPUOS, be it working internally here domestically would create an environment and will allow business to succeed.

So, not only do I think that it's critical that if we get these long-term sustainability guidelines if we get international buy-in on a system of norms, safety etc., and I think we need to do it quickly because that accident is out there. It's common. It's not a matter of if, it's a matter of when so we need to expedite these activities and I think it's also important than they're to lead.

So many of these commercial space activities are coming from the US. And because of that, I think we got information that no one else has and if we accept that we lag behind the other countries, I think that hurts the overall global effort. So, I hope that the US can get engaged and I think these are very important activities of the COPUOS and I hope we can get over with [inaudible 33:03] .

Marcia: Elliot?

Elliot: So, the first I heard Doug Loverro describing the cube sat as a debris sat, I, uh, uh, I immediately got what he was, what he was talking about. Um, there are some problems with a lot of the cube sats that are out there and, and, uh, you know, something like 20 to 25 percent of them are not degrading an orbit the way they're forecasted.

And this is because we're using ballistic models based on spherical shape, which none of these things that are, and, and so you're calculating your orbit based on cannonball and not...anyway you can go, all the way down that more in fuzzy, funny trail. Um, but I would sit and answer question, Marcia.

There are two things that businesses really have hard time tolerating is risk and uncertainty. The risk can be managed. It could be managed in a number of ways. It could be managed to the amount of engineering and tests and research you just put into our product. We can test the destruct, you can simulate and do everything we can to drive down the technical risk as much as possible.

But the uncertainty part, uh, it's something that you don't have functional control over and the degree of which, uh, rules of the road like these are promulgated throughout the international community, that helps business to have confidence in the environment they're operating in and in less uncertainty and when they, when they have the uncertainties is, is low and the risk is low. They can make a, a business decision very quickly.

Marcia: Madi, Frank, Charity, anything to add?

Charity: Um, I'll echo Elliot's remarks there. It's about security and confidence. Confidence of the international community cares about the issue. Uh, confidence that there are actually being taken to create sustainability and that, I'm sure lowers risk and builds confidence in, uh, venture capitalist and investors in the, uh, satellite community to move forward on new innovative commercial opportunities.

Frank: I think we'd build on what Mike rolled on which is the key rule the United States to comply, which is something that is we first did it with commercial states launch, and then coming up with the regime for FAA ASP do licensing. Literally, it became a template that is now being used around the world for commercial space activities.

And so, to the extent that the United States is maybe leading first in this because you got other technology and hope they increase their investors or something else, uh, I think it's, I think it's helping, the, the government to facilitate that process, uh, and it will also help with the global process of, of, bringing space to reality.

Well, other detail that, uh, I just mentioned real quick that I think we all have heard so far which is that as it happens with the commercial satellite and the commercial watch list currently, uh, one way to mitigate something, there's going to be risk is with the insurance but just as investors need some certainty in order to be able to, uh, place that by putting up a capital.

The insurance companies need some certainty of what the legal structures that are in place in order to, um, able to figure out. When they were starting they need to know what the environment was like, what it's likely to be like five or ten years in the future, so I think there again, there's another attribute of, uh, successful business market that we, and we don't often think of as its contents. It's vitally important to that these kind of immense in our support.

Marcia: OK, I don't want to put anyone on the spot but I would like to invite those of you who are or have been involved in developing these guidelines to talk about the value that you see in the private sector being at the table to give their perspectives and do other countries do it or is it just the, uh, United States that brings the private sector along. Simonetta, Mazlan, think Da-

[crosstalk]

Marcia: David?

David Kendall: Yeah.

Marcia: David.

David: Uh, yes, thank you and I have a question.

Marcia: Sorry, you weren't in the front row. I didn't see you. [laughs]

David: That's fine. Um, one of the, uh, areas that I think is, is important to us who are developing these guidelines and, uh, working, uh, with the, uh, with the working group is how does it see any gaps that we're, that we're missing here. Uh, is there anything that is not, in their opinion, strong enough for their areas, which we are just simply not, not really addressing in the current guidelines?

[silence]

Male Participant: I, I guess I'll turn on that since that you have said...You know, I, I would need to get into a, a gap analysis that might cause someone to want to really look at first dozen guidelines that are, that are sealed, examined and approved.

Um, I, I think if, if you look at things for long enough, you, you always find something else you do that in there and so the question in my mind is of the remaining un-, uh, un-adjudicated guidelines, if you will, how many of those can, can be moved, uh, before the, the entire package goes to the, to the full United Nations in 2018?

Uh, and I, and I just don't know. I think one of the, you know, the essential differences between government and especially with space agencies these days is a, is a government and, and diplomacy especially moves much more slowly as, as I think Frank, uh, was looking to the industry.

The industry is moving so fast. Uh, right now, the, the time in 2018 comes around, um, it's going to look pretty substantially different and when you guys first started talking about these, uh, guidelines, all that you expect, um, but that's, I know that's not much of an answer. Before I end my answer, I, I do want, uh, give a, a, a shoutout for some that contribute, if you will.

Um, for those of you who have been to these meetings, um, they are, they are very, uh, long and they're very engaged and there is so much patience and so much so many site meetings between nations and, and to participate in, in that process over many, many, many years, uh, it takes a really special kind of person.

And I just want to thank the person is I think is the most amazingly patient diplomat I have ever met for all that he's done for us and that's Ken Hodgkins, Ken.

[applause]

Male Participant: So, perhaps I have directly no answer to your question but it is a political season so let me answer the question that like that.

[laughter]

Male Participant: You're talking about gap. I don't think there's so much gap in the long-term sustainability guideless. I mean it's a great foundation at the very beginning but I think we need to do more but to an extent, it's an academic exercise. It doesn't matter if you don't have to wait to implement this. It didn't miss a thing within the United States.

And we have been talking about this for the better part of two years here domestically and Marcia, your website has done an excellent job of covering the way this debate is going. That Congressman Jim Bridenstine, initially his American Space Renaissance Act proposed a solution.

That is in fine tune with it where we would go through and resolve the enhanced payload review process and that was meant with [inaudible 40:37] by the House, Space, Science, and Technology committee. So we think, hack the rest of the long-term sustainability guidelines. The past guidelines don't last that long but until we actually have a regime in place where I, as private sector entity can buy from a satellite service commission.

The private sector has that. You know my lunar payload and there is an entity within the US government, which leads my opinion, must be the FAA Office of Commercial Space

Transportation. This stage, you know, a whole lot of this is just going to be more required and instead of going back up against the system that has no actual way for implementation.

So, my only caveat to yes, you know there are internal gaps to rate a star is that there's a gap in the implementation phase and we need to do everything we can change that. Uh, it's above the COMSTAC. We'll be meeting next week. Spoilers, we're going to deal with this issue. Ken will be there, Andre, Dick Buenneke.

Um, my hope is what you will see come out of it is industry speak with the unified voice that this issue needs to be addressed, that the FAA AST is the proper host for these authorities and that action must be taken out.

Marcia: Charity?

Charity: I will talk to the contents of the long-term sustainability guidelines but I'll, uh, provide some comment on or some potential ways, uh, to make things, uh, improved in process perhaps how, uh, over the next two years will you bring an industry voice. Uh, is it just a one-way speech? Is it, uh, more than working groups? Uh, is it in the hollow form that will get in-, inserted into, um, the working group? So, maybe that's something to think about.

Marcia: OK, other questions? Vince?

Vince: Yeah. This works at the aerospace corporation and kind of getting to a point where Mike just started the, uh, process earlier talking a little about how the industry actually may or may not be even if a technology are recognizing this LTS is forming in the, in the sense that's we'll make a difference.

I think it originates more about the gap so it may not be a gap and scope of requirements but it's still the gap and the timing. How was industry going to live the fact that obviously, they're still more time for this to mature, come to flourish? When the industry is moving so fast, the reality there are ahead of the game and are they willing to kind of, uh, hear to particular names and the role.

We, we've waited, you know, anticipation of things, and groundwork and you see them kind of basically setting but ultimately we need the framework for all of the behaviors is going to end up for that. Let's hope that they name them down.

Male Participant: Good. So, yeah, forgive me for just creating the sounds of a practical point of view. It's a great question and I think this process surely begins with the insurers that before you launch and even before you're filling your launch application, you're talking to the insurance community and they're going to want to know about what the international norms are. What are the standards that you're dealing with?

So, that's why the UN LTS even now is relevant to the private sector's conversation because when the insurance company is reviewing what are the standards, this is what's going and we have to look and that's why if you know it's valuable even though we still have, you know this Article 6 concern so I think the timing's right now.

Companies are reviewing those, figuring out how to respond and I think by and large, in the community and by the way since [inaudible 44:33] is a Silicon Valley entity. Um, I, I think that they are very respectful of it because we acknowledge we need it. We need some kind of rules of the road here. We're not going to succeed without it and I think the LTS guidelines were brought here and so that I am significant and particularly controversial in there.

And when we get actual recommendation, you know that could happen so I think even today immediately; the private sector is looking at that. There's nothing else in insurance context.

Male Participant: And this I think, uh, at, at the end of the day, we kind of long vital draw point and one vital check valve and that is wherever you're going to put in space, you're not going to launch lesson for and so, you have to think real long and hard about what your project is and, and I think this is where it really depends upon how motivated the company is to do whatever it is you're going to do.

Um, you know, if you're motivated like Bob Richards was to do work upfront and now wait to 'till you get to launch and this is when I tell you, "Well, you got to circle back and spend two years doing this." That so, I think you got a check valve there but I think ultimately, you know, whether we...you know, when we get how fast we can get the FFAST to where it needs to be, uh, it's kind the best.

Male Participant: And then I'll also add, uh, um, since you looked at in terms of the international competitive context as well so the United States is not the only place for some of these activities that could be done. Already, you've seen that it needs to center the satellites or probably communications, all the dimensional idea was first implemented by US companies.

Most of the companies operate overseas that are actually employment census. We've already seen one super with regards to each space mining and resource globalization. A very proactive approach been taken towards putting in regulatory machine and a framework so that companies are more incentivize to go there. I mean, that, that, that, uh, activity.

So, and in terms of the time the industry is having for the national authorities to flush out these guidelines, it's not infinite and, and other people see, uh, slow or something happening in the United States as an opportunity to bring this business centers.

Female Participant: I know because, uh, the basic physics concept as well being active. There's action or reaction, um, with the adoption of the twelve guidelines already, um, that could create a reaction in the industry that some of the best practices. It could, uh, the reaction again, if, uh, potential legislation could come away and some of the action and be the industry, national or international wise.

Marcia: Victoria?

Victoria: It makes a [inaudible 47:20] sense throughout the nation. This question actually builds the whole journey you're just saying um, specifically, one of the things I've been hearing at various conferences in the past few months is that there's one kind of best practice, which is no longer really necessary or not really relevant.

And they'll tell you that satellites needed to be over 25 years. Um, I know, while, while they're saying that they are going to do with an issue, I think this is every four years that they're [inaudible 47:46] to meet in two years. Is this something that the industry is, is interested in doing ahead, getting ahead of what the guidelines are and saying ahead for this? We recognize the best practice may not be what it was right in 25 or 30 years ago.

Male Participant: I don't think industry probably wants to go too far ahead of the process but I think they want to be consulted throughout the process. You consider once you are familiar with what the constellations and they look like another and perform and there are, there are vast differences between the different constellations and we're getting close so I don't think it's the question being out ahead. I think is wanting to be consulted.

Marcia: Anyone else? No, Simonetta?

Simonetta: Yeah. Oh, no. I wanted to comment, uh, on, on the fact that a, on the other office that I was facing this we are trying to involve you in the process and that's the reason why we put together the hollow form and its first attempt, uh, and on this year and we will probably will get some lesson learned so next year would be even better and I hope so I, I'm really in, in line of what all of you have said.

Um, and also we like to, to point out that, um, probably what can I do and I'm coming to COPOUS and make presentations. It's quite important because as I said, the office is fine. We understood and we are, I mean, we are on the right track but is there and also that Member States understand the importance because then I need the support the COPOUS and Member States to do my job properly so, uh, the good point is, I mean you have to support.

I mean, if, if, if you, if you want, it's, it's, it's a vital role to help that I get you, you should help me and I'm asking and I'll try to I mean, to help you in the process I mean at the set because it's the best way to proceed.

Male Participant: I, I couldn't agree more. Uh, if I can paraphrase, "Help me help you."

[laughter]

Male Participant: Help me help you and, and I think a good example of this, uh, scenario is the confusion that existed internationally in UN COPOUS after the passage of commercial space launch compended this act. That, you know, I don't recall the session but, "US is just claiming universe and we're going to be claiming a land here, uh, etc." When exactly the opposite was the case, that there's this COMSTAC in the industry.

What's hard with congress to make sure that not only did we account for outer space treaty international obligations cannot be a legislature but then we were in better compliance with the outer space treaty after that legislation, what's best than it were before yet the perception I think tend to be the opposite and you and your office have got to apply and done that everything that you kind of try and brings it together.

I think the me and industry dropped the ball on that matter and that we were not aggressive enough and come forward to COPOUS and best explaining it because only we can do that, you know, you can't do that for us.

So that's why I really appreciate some of the important words, the world foundation in there and supporting, you know and entities like COMSTAC, like, uh, George Washington's Space Policy Institute, it's the gratefulness of the staff based in making sure that that story is hold internationally because if we don't go, no one is going to represent the industry for us.

Marcia: Anyone else? More questions, comments? Yes, go ahead. Uh, there's a microphone. Oh, there's somebody up in the back. Sorry, I'll get back to you.

Wes Faires: Hi, there.

Marcia: I can't, I can't see you because of the lights so I just... [laughs]

Faires: I'll say I'm going to little...sit down, this is just gonna take me a minute. My name is Wes Faires. Uh, private sector representative in the 2008 COPUOS' Legal Subcommittee, and, uh, to go on further with Mr. Gold's point, um, as we solve the Space, uh, Commercialization Act, there's a bit of vitriol in the international community, and a blow-back, and, and, uh, the attitude pretty much seemed like, "Well, we're gonna have to see what happens with other countries."

Um, but, one common theme throughout, uh, uh, sustainable development, has been the harkening back to the Universal Declaration of Human Rights. Which, Article 17 says that, "Everyone shall have the right to property." So, the handling of property rights, and the, the issue that's, uh, th-, the Article 2 issue is gonna pervade for 50 years, uh, within, uh, uh, within the code books. Um, how would you like to see that handled next?

Uh, what I've been working on for the past 10 years is kinda a soft confirmation on a country-by-country basis, uh, after tracking down the, uh, authority in each country under, uh, Article 6, that would have the ability to confirm or dis-confirm whether, uh, claims to property rights, and, uh, uh, in outer space are in violation of the Outer Space treaty or not.

Um, and, uh, so far, uh, so far, in comp-, in comparison with the law of the sea and the moon treaties, where we see, uh, uh, direct prohibitions of property rights for natural persons.

The Outer Space treaty doesn't contain any of that and so, I've been able to get soft confirmation, uh, from a couple different entities that, uh, that property rights are not patently unlawful under the Outer Space treaty. But, wouldn't it be ideal to have some sort of action on the COPUOS level, where we get a clarification, um, on the terminology, uh, uh, of the Outer Space treaty.

Uh, they get to, uh, uh, draft resolution or something on the, on, on the international level within the COPUOS, uh, uh, to clarify once and for all, that the Outer Space treaty never intended to block private property rights. Where do you want to see that go next? Country-by-country level or international level?

Male Participant: Let me say, how would I like to see that issue handled? I'd like to see it handled later. OK? Uh, really appreciate what you're doing and I would buy you lunch and a beer

to see a breakdown of how each country was handling its Article 6 capabilities. That's something that's not out there that I think would be very helpful to see. Yeah. Now that's a, that's a legal offer I'm in...

[laughter]

Male Participant: As if I work for the government.

Um, the reason I say this and with all due respect to my colleagues in the asteroid mining community, is we are so far and away from those activities. I don't understand why this absorbs so much oxygen from the room and what truly is session priority. As a Star Trek fan, I might quite negotiate treaties with Klingon empire ahead of what we're doing in some of these asteroid issues.

If you talk to the asteroid mining companies, Planetary Resources, Deep Space Industries. Well those are great companies. But they will admit to you that they are tacking towards [inaudible 54:49] applications, because that's their near-term business plan that they need to implement to remain sustainable until 25, 50, 100 years down the road. We actually have the space infrastructure that needs these resources.

'Cause again, if you talk to the asteroid people...will tell you the main business plan isn't, you know, mining platinum and bringing it to earth even though we kinda hear that a little bit in the Redirect, it's supplying this global space community, its operating system in our space, moon, etc. with resources rather than bringing from earth.

Primarily water, actually, is what they're talking about but that's far down the road and they will be the first to admit it and given that we've got such limited time and limited resources at UN COPUOS and UNOOSA and all these sorts of debates, I've been frustrated that this topic of property rights in asteroid mining has, I think, distracted from some very important issues like long-term sustainability guidelines and particularly, like implementing Article 6.

And we can just deal with some of the near-term issues, near-term issues that satellite servicing and Moon Express, uh, etc. are bringing up.

So, you know, I think it would be a valuable activity, you know, what you're proposing. I encourage you, but I just wanna throw in a caveat that I do not view this as a near-term issue that should have priority over other more important topics.

Marcia: Anybody else? Elliott?

Elliot: No.

[laughter]

Marcia: All right. We have question down here. If you wait for...step in to bring you the mic. Right here. Second row.

Audience Member: Thank you. I was, uh, trying to intervene because of the first comment by Mike Gold about reaction with, uh, the legal, uh, within the COPUOS on The Space

Competitiveness Act of 2015 of United States of America, saying that, in reality, it was not so strong reaction. There were no strong reactions against this piece of legislation.

You had some states expressing their concern, expressing the idea that, uh, such kind of unilateral legislation can be interpreted as contrary to the roots of the space and all and of the intending, uh, opinions of the finding values of the treaties, etc.

But, in the end, any people accepting the idea to discuss such issue and that is why we have in the agenda of the Legal Space Committee and they should single out this discussion, which is about the, uh, moments for the exploration, uh, for the exploitation of the mineral resources of the outer space. So, we, we, the reaction was not so strong, uh, and the...just to conclude the, uh, my intervention.

I think that, uh, uh, this reaction, uh, is the evidence that the international space community, mainly the Legal Space community, uh, uh, begins to, to understand that treaties are not set in stone.

They are not the ancient, the ancient texts coming to something like that, because you are talking about guidelines, how they, uh, can, uh, dynamically follow the, uh, ongoing processes of, uh, evolution of technology, etc. But, the issue that understand that the treaties are there and nobody wants to really engage in the discussion of what they mean, what is their interpretation.

They have, uh...they can have something that is there, huh? And, uh, of course, there are some points, you mentioned the Article 6, concern and if you can elaborate a little bit about this, I would be grateful because this is an important issue.

Uh, I, I, I do not want, wanted to understand that when the private sector speaks about, uh, the, uh, treaties, uh, the main concern is the, uh, what is said by Article, uh, 6, uh, please to say that responsibility, even for private activities, is under the States and, uh, this COPUOS.

Male Participant: So, thank you. Let me begin with Article 6, again, grace of all the articles. Uh, I, I think the concern that industry has there is that we execute the Outer Space treaty and then, fail to implement a means to execute many of the responsibilities, largely because at the time we executed it, there was no commercial space factor to worry about.

And, I think, as we saw in the case of Moon Express, what we would like to see at certain, is a defined process to eliminate the risk and uncertainty that everyone on this panel has said is the antithesis to investment and expeditious processes.

And, we don't have that right now. You know, you send in your payload review or your combined payload review or your combine payload review on launch license at ASC and it's a roll of the dice. And, just because Moon Express got a "yes," no one in this audience should think that that set a precedent for Moon Express or for anyone else in the industry.

And, I can assure you, that if action is not taken, a "no" is coming for some. Someone's going to get a "no." And, that's why we need to move forward before that "no" comes out of the system. Uh, and I can go into more if you have more question but that's, basically, the issue. We just want the process to implement by continuous supervision.

And, we want one that's benign. One that enables and encourages industry rather than discourages it. And, I think that everyone in the government, per what we saw from the administration, mis-authorization of what we see in the congress, well, pretty close. It's just a matter of getting congress to move on it. Uh, if I could address your other two points, quickly.

You know, Frank and I had both spoken about American leadership and while, you know, maybe, the brouhaha over, you know, the asteroid mine claims kinda blew over, it was a missed opportunity because The, The Commercial Space Launch Competitiveness Act, that could have been the template and that's what we should be doing.

This is a template for other countries to follow and, I think, because of the controversy that arose, that got lost, that this is a bad thing. This is a good thing. This is the US trying to implement its obligations. Other countries should look at it and, potentially, repeat it and that's not a narrative that I saw discussed, internationally. So, uh, that's a concern. And, what was your third issue?

Audience Member: Uh, that's enough.

Male Participant: All right, it's enough. Thank you. Glad you got that.

[laughter]

Marcia: Frank? Did you want to add anything?

Frank: Yeah, I, I, I, totally agree with what Mike said and I still...The one thing I, I, I think that we need to always be, be careful of is that government can, can regulate in ways that encourages activity. They can, also, be overly prescriptive and limiting our technologies and limiting, um, what new business opportunities might be created.

A-, and so, I, I think that Act was a, was a good thing. It was a very proactive thing and encourage more countries to do the same, as you say, and, and for our government, to implement sustainability guidelines, very proactively, as well, as a way to facilitate more activity.

Marcia: More questions? And, I should, uh, warn you, I'm blinded by the lights in the back so, the part of you up in the upper echelons up there, that I can't see so, if there's someone up there with a question, shout out. No more questions?

[audience speaking]

Marcia: OK.

Audrey Schaeffer: Thanks. I'm Audrey Schaeffer, again, and, uh...so, first of all, I want to thank all the participants from industry who've been with us on this very long road for the past six years, in developing the LTS guidelines.

Marcia, you'd asked, um, at some point, about how we, in the US, have engaged industry and we have, as many of you mentioned, very diligently, been reaching out to the private sector, at, you know, sort of every opportunity, not only to those who are participants in the del-, delegation, but also those who are here in the country to seek industry's views.

And, it's been interesting for me to see, over the time that we've developed these guidelines, I, I, from my perspective, it seems like industry has, actually, self-organized quite a bit in the six years that we've been working on this to develop industry views on what some of the best practices is, or, are for the long-term sustainability.

I know SIA has a paper that they released, uh, about a year or so ago, with some of that, and I know some of the other organizations represented, um, work in this area. Um, Charity, in your remarks, you mentioned several things that industry is already doing that, actually, go above and beyond many of the things that are either, holes in the draft guidelines or that we're contemplating today.

So, um, looking beyond, uh, 2018, because I don't wanna reopen, sort of, the issues set that we had in front of us within the committee, but, I guess, looking beyond 2018, as industry really develops, um, best practices that, we, in government, can learn from, how would you like to see us take your ideas of what industry, who really is a leader in responsible and predictable space operations.

How would you like to see us, as government, be informed by, kind of, uh, coalescing views in industry, and take those, either, domestically, in our own regulatory structures, as Mike has talked about or internationally, through bodies like COPUOS, and other places where we can level the playing field for industry around the world and set up a more safe and responsible space environment for all? Thank you.

Charity: Well, thanks, Audrey. I, I have to commend the US State Department and other departments and agencies of the US government for being very open, uh, and, uh, willing to talk to industry. I think, they do realize, you know, 700 plus of those satellites are commercial and for commercial uses, and therefore, a big player i-, in all of this.

So, I do see, currently, a really good rapport, a good dialogue, uh, good interaction, uh, obviously, there could be more. And, I believe that there's gonna be more interest from, uh, commercial industry coming to you, coming to the State Department to say how can we be more involved?

Uh, what can, you know, self-organizing, as you said, and, uh, when we come up with a more concrete best practices, bringing those forward. So, we're gonna want to, uh, communicate those with pretty much everyone so, things are going fairly well, right now. Thanks.

Marcia: Frank.

Frank: I just, I'll give an observation how industry can sometimes, with other organizations up here, uh, really help this process. It wasn't that many decades ago, what the record...US on [inaudible 66:39] with, uh, had this nasty habit of having over-staged tanks explode and, and create a little debris instead.

Uh, and, and, you know, industry in the late '90s, actually, facilitated our Technical Committee, they had a double whammy, helped develop standards for, you know, launch vehicles not to have these types of debri-, deb-, debris creating problems, uh, as they are doing their business of putting spacecraft in orbit and, and, coming back.

And, and so, I think, I, and, and you're starting to see something similar now. I know, one company, I know, in particular, OneWeb, is already putting, uh, a, a grappling attachment on it, so that in the future, uh, systems out there, recover satellites and bring them back or, you know, move them to a safer location in space.

Uh, they will have, uh, uh, a standardized interface of those, of future systems, which have not, yet, been created, can easily a-, attach to. So, I think industry has, historically, and will in the future and is already starting to play a role and that's, uh, that's where very, uh, one way we can help those to solve this whole process along.

Marcia: Was that the Delta?

Frank: Exactly.

Marcia: [laughs]

Male Participant: Uh, I think OES, in particular, does a fantastic job of engaging with, uh, organizations like ours. Um, in the, in the diplomatic parliaments, we are, we are able to engage in unofficial, informal diplomacy, uh, on your behalf.

An-, and, uh, uh, increasingly, uh, I'm, I'm seeing that happen with, uh, more and more engagement of industry i-, in various activities so, I would just say that, that, uh, you know, continue consultants and keep us in the loop and, uh, and, uh, also let us know if we're straying a little far from, from the guidelines, uh, 'cause, some of us, uh, we'll get out there and, and get proactive and, and, and try to make things happen very quickly.

But, uh, I think, because of the initiative that OES has shown over the past dozen or so years, you've got more industry involved, uh, probably than a-, a-, at any time and, and I think we'll see that continue to increase.

Male Participant: And, let me just, uh, echo my fellow panelists' compliments of OES. Uh, I think, I talk to state more than I do commerce, so, uh, I don't know what that says. Um, you know, let me also say, relative to the satellite world, we are, I think, going into a fewer transformation brought on by satellite servicing.

Uh, no longer are we just going to deploy the satellite, wait 10 years, throw it away. That we are looking at a ground swell of, I think, robotic activity that is going to be refueling, refurbishing, satellite systems. I know that's a great new capability. I think it presents a variety of different regulatory, legal and international challenges.

And, unlike Commercial Space Launch Competitiveness Act, this is an issue I'd like to see the private sector get out in front of [inaudible 69:32] . Because, not only do we want to create a regime that enables industry to proceed and for everyone to move forward, we want to invo-, to avoid conflict and I think some of the satellite servicing technologies might be right for that.

So, I think, again, it's incumbent upon us, in the private sector, to work with [inaudible 69:51] and OES and everyone else and take the opportunities they're offering, to explain what the technologies are, what we're doing and then, to build a degree of confidence and security in some

of these new technologies that the world can be comfortable with. And, I'm eager and look forward to having that conversation.

Female Participant: Just to piggy-back on that a little bit, um, I think Mike even mentioned earlier, um, just the implementation of some of the guidelines, um. I think post the 2018 time frame, that could be one way in which, kind of, the, the communication channel works both ways to enable, um, efficient implementation on our end, um, domestically, for the guidelines that do get passed and, and adopted.

Marcia: Other comments? Other questions? Like I said, if you're in the top rows up there, I can't see you, so shout out, if you haven't. Theresa?

Theresa Hitchens: I'm Theresa Hitchens with The Center for International Securities Studies at the University of Maryland and I kinda like right around the corner from me.

[laughter]

Theresa: And, you brought up the issue of conflict so, I'm gonna jump on that with both feet. Um, we seem to be seeing in the international arena, despite the progress that we've been able to make, um, on the guidelines, uh, and up to, at least, in rhetoric, if not, in reality, of the development of satellite attacking capabilities.

This goes hands-in-hand with what you were talking about servicing, as we all know, do we use. I don't have to go into all that, we all know that. But, it does create, not only, regulatory and legal issues, it creates risks to stability and to international security at large. And, I would like to see more industry discussion of that issue because I never see that in an industry panel.

I never see anybody talking about conflict or prospect for conflict. It's kinda like you ask the question and people just slide around it. [laughs] And, an-, an-, an-, and, you know, in the national security community, their concerns are, are very big right now.

So, I, I would like to have some opinion from you all a-, about how industry thinks about that and what you can do to help prevent things from going off the rail.

Male Participant: I-, i-, it's a great point and, I think, one of the unfortunate aspects of our legislative process here in the US, is we created these artificial barriers, both in reality and in our head, that when we talk about space, we talk about commercial space, we talk about scientific space measures and then, we talk about military.

And, we tend to keep them separately, I think, partially, because you've got the National Defense Authorization Act. That's when we're talking about the feds. You've got NASA re-authorization. That's when we're talking about NASA.

One of the things that I love about Congressman Bridenstine's American Space Renaissance Act, was that it was one of the first pieces of legislation that dealt with space holistically. That looked at the commercial aspects and how that complemented national security aspects and how that dealt with science because I believe that's the only true way to look at the industry.

At the extent, you ignored an aspect of that three-legged stool, you do a disservice and you'll come up with bad policy. Relative to the specific issue of satellite service and national security, uh, again, recommend coming to the COMSTAC. We've got Winston Beauchamp, who's, actually, going to speak at our dinner. Doug Loverro has addressed us.

We're gonna be talking about that national security issue because I agree, it's an extraordinarily important point. But, it's Friday. I gotta be optimistic. So, let me tell you this.

Um, my hope is that with satellite servicing, with the new commercial constellations of satellites, with even, potentially, orbital manufacturing of satellites and deployment, that you'll see such a proliferation of satellite capability that ASATs, to an extent, will become moot.

That if you knock out a couple, even a dozen, or even a hundred satellites, that the private sector and/or the military, will be able to deploy just a bunch more.

So, my hope is that the technology progresses so quickly and so robustly that even the American...and this is one of the ways where the American private sector has such an important role to play in national security, that we could provide such robust support, that an attack on a military system, I don't want to say would be, immaterial, but the impact would be diluted.

Because if you knocked out a couple of the big military COMSTACs, and then, just move over to the commercial capability. So, that's why I'm optimistic about the future of national security space due to the benefits of new technologies and capabilities.

Male Participant: Yeah, I, I think a little overview of what he's saying is, is an issue of, of communication and, and, uh, you know, setting par for expectations for how things are gonna behave. I mean, up until 9/11, we really didn't think that, uh, silly air-, airliner was a weapon. Uh, you know, until recently, we probably never thought of our cell phones as triggers but, they're triggers.

And, so, the ability to characterize something appropriately and understand what its behavior is, uh, really, in a space environment, gets back to excellent space situational awareness, which gets back to these very guidelines that give us our rules of the road so that we can tell when an object is behaving as it was intended and when it's behaving in some other fashion.

Marcia: Charity.

Charity: OK. This is, uh, an area where industry-wide best practices might be a good, uh, thing to have. And, broad reviewing as to many operations have to work around that, making it transparent, uh, as it, you know, an-, and make sure those are shareable. Um, uh, best practices as, as we move forward by using on-earth servicing to better the space environment.

Male Participant: The only thing I might add is just I, I worry sometimes a little bit about, uh, accidental commingling. I, I could hear Mike's point about, you know, the proliferation of new capabilities and the ability to offset dedicated military systems which would also, but also, potentially, seeing the future of more hybrid systems, whether it's a hosted halo type of an environment.

Uh, we'r-, potential those civilian and those commercial tr-, o-, objects become targets, uh, which, which causes a complete, you know, negative impact on, on the, uh, on, on the commercial world, as well as the various nations that gets involved.

The other thought that occurs to me is that I, I, it's just a complete, uh, again, corollary thing we need to worry about, need to think about in the future, 'cause we have a lot of objects reentering, what if you have, uh, uh, a nation-state that misinterprets a reentering object for a, you know, uh, attacking, uh, warhead coming in?

Or, what if you develop a laser system for, uh, ship, uh, or land-air defense and that laser doesn't hit a target, it keeps going on into space and damages the space, uh, uh...whether dazzling a, a satellite or taking out uh, uh, you know, uh, a communications satellite.

Th-, th-, there...separating too much into compartments is, is not a good idea, which gets back, gets back on Mike's point, as well. W-, we need to make sure we look at the whole, which is why, another reason why we need sustainability guidelines an-, an-, an-, an-, and best practices, really can be helpful because they're, you know, potentially adopted across the world and implemented equally.

Marcia: Last call? Anyone else? All right. Well, let's thank our panelists for a very interesting discussion and thanks to all of you, too.

[applause]