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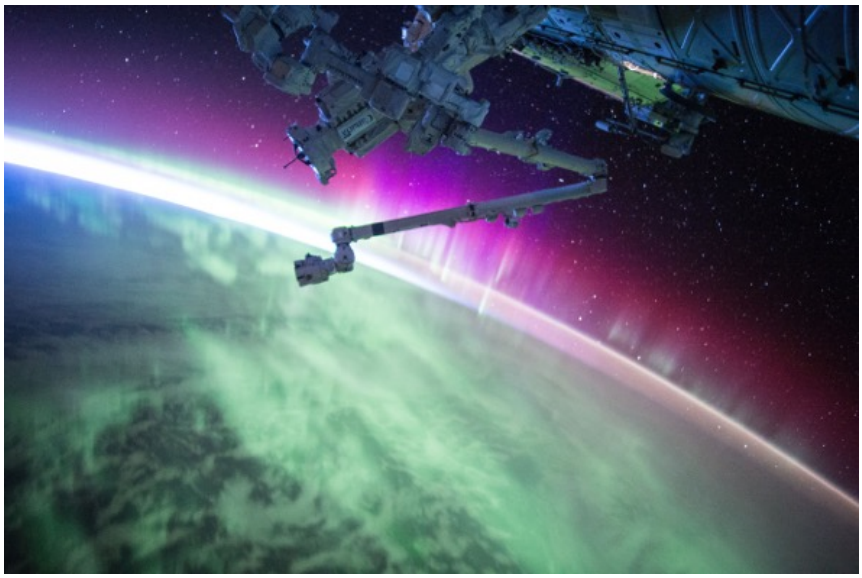
Effectiveness of International Agreements in Space

A Virtual Think Tank (ViTTa)® Report



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What is ViTTa®?

NSI's **Virtual Think Tank (ViTTa®)** provides rapid response to critical information needs by pulsing our global network of subject matter experts (SMEs) to generate a wide range of expert insight. For this SMA Contested Space Operations project, ViTTa was used to address 23 unclassified questions submitted by the Joint Staff and US Air Force project sponsors. The ViTTa team received written and verbal input from over 111 experts from National Security Space, as well as civil, commercial, legal, think tank, and academic communities working space and space policy. Each Space ViTTa report contains two sections: 1) a summary response to the question asked and 2) the full written and/or transcribed interview input received from each expert contributor organized alphabetically. Biographies for all expert contributors have been collated in a companion document.

[1] For access to the complete corpus of interview transcripts and written subject matter expert responses hosted on our NSI SharePoint site, please contact gpopp@nsiteam.com.

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Question of Focus

[Q22] Can international agreements effectively protect high-value space assets in time of crisis and/or conflict? How could such a treaty be sufficiently verified? How would it be enforced? How would dual-use technologies be treated?

Expert Contributors

Major General (USAF ret.) James Armor[2] (Orbital ATK); **Marc Berkowitz** (Lockheed Martin); **Faulconer Consulting Group**; **Dr. Nancy Gallagher** (Center for International and Security Studies at Maryland); **Lieutenant Colonel Peter Garretson** (United States Air Force Air Command and Staff College); **Gilmour Space Technologies**, Australia; **Dr. Peter L. Hays** (George Washington University); **Theresa Hitchens** (Center for International and Security Studies at Maryland); **Dr. Moriba Jah** (University of Texas at Austin); **Christopher Johnson** (Secure World Foundation); **Tanja Masson-Zwaan** (Leiden University, Netherlands); **Dr. George Nield** (Federal Aviation Administration); **Michiru Nishida** (Ministry of Foreign Affairs of Japan, Japan); **Dr. Xavier Pasco** (Fondation pour la Recherche Stratégique, France); **Massimo Pellegrino** (Space and Security Policy Advisor, Geneva); **Dr. Luca Rossettini** (D-Orbit, Italy); **Matthew Schaefer and Jack M. Beard** (University of Nebraska College of Law); **Dr. Michael K. Simpson** (Secure World Foundation); **Michael Spies** (United Nations Office of the High Representative for Disarmament Affairs); **Dr. Cassandra Steer** (Women in International Security-Canada, Canada); **Dr. Mark J. Sundahl** (Cleveland-Marshall College of Law); **ViaSat, Inc.**; **Dr. Frans von der Dunk** (University of Nebraska College of Law); **Joanne Wheeler** (Bird & Bird, UK)

Summary Response

The expert contributors divided nearly evenly on whether international space agreements can provide protection to space assets. While all contributors agreed that international agreements create *norms* of behavior, they disagreed on whether these norms create restraints on state behavior that will hold in a crisis. The contributors who did believe that international agreements could provide protection also maintained that focusing on prohibited *activities*, such as the generation of space debris, rather than prohibited *technologies*, increased the enforceability and verification of effective international space agreements as well as mitigated the dual-use problem. In short, their argument was that with regard to dual-use technology, ultimately it does not matter what states build, it really only matters how they use what they put into space.

Do Non-Institutionalized International Agreements Provide Asset Protection in Crisis?

The expert contributors were nearly evenly split on whether international agreements can effectively protect high-value space assets in time of crisis or conflict. Twelve experts affirmed the effectiveness of these agreements, whereas the eleven other experts dissented from this view.

[2] The subject matter expert's personal views, and not those of his organization, are represented in his contributions to this work.

Agreements *can* protect high-value assets

The expert contributors with more sanguine views of the effectiveness of international agreements in protecting space assets grounded their optimism in what they defended as the efficacy of existing space law. For example, Dr. Nancy Gallagher of the Center for International and Security Studies at Maryland describes the existing Outer Space Treaty (OST) as an effective agreement that is likely the best possible international agreement that could arise in the space domain. She avers that "it would be hard to get international agreement on any set of principles that would be better than what is currently laid out." Buttressing Dr. Gallagher's view that the OST's centering common principles makes the agreement quite effective despite low institutionalization, Massimo Pellegrino, a Space and Security Policy Advisor in Geneva, maintains that widely-shared principles increase the enforceability of international space agreements, which helps to prevent and shape crisis behavior. Pellegrino states that, while states can disregard international law, doing so imposes sufficient costs, and these costs are factored into their strategies of compliance and non-compliance: There is enough of a "price to pay" for non-compliance that when "high enough [may] force nation states to restrain themselves" from attacking high-valued assets.

To the extent that international space agreements create and sustain these conditions of restraint by imposing costs, they would be effective in protecting high-value space assets in crisis or conflict. These collectively imposed costs can occur both domestically and internationally, even in the absence of institutionalization. On the domestic front, as Dr. Frans von der Dunk of the University of Nebraska College of Law observes, "it becomes very tricky for governments to be seen as violating [widely-shared] rules because it undercuts their own legitimacy." With respect to international mechanisms of restraint, Dr. Xavier Pasco of the Fondation pour la Recherche Stratégique Paris argues that collective space dependence creates a restraining self-enforcing interdependence functionally regulating state behavior. Pasco suspects that each country possessing space systems likely wants its "own space system to work properly," creating a condition of "constrained interdependency" concerning "collective behaviors and rules as references for military actions."

Agreements *cannot* protect high-value assets

In contrast, the remaining experts were clear that based on their interpretations of norms during historical crises, they believed agreements to be insufficient. For example, Marc Berkowitz of Lockheed Martin categorically posits that "neither norms nor formal treaty obligations can be expected to protect high-value space assets in the event of crisis or conflict," indicating that international space agreements, irrespective of the degree of formalization and institutionalization, provide few protections in crises. Similarly, Dr. George Nield of the Federal Aviation Administration shared that "it's clear to me that international agreements cannot guarantee the protection of space assets," but did not appear to embrace Berkowitz's more expansive claim about norms.

For some of the experts in the 'yes' camp, the ability to impose costs was sufficient to conclude that international space agreements are effective in protecting high-value assets. In contrast, the 'no' camp adopts a stricter level of scrutiny, wanting something closer to 100% effectiveness to be able to reasonably conclude in favor of the proposition. The experts that viewed international agreements as ineffective in protecting high-value assets seem united in suggesting crisis-resilient protection is likely beyond the capacity of any agreement to obtain. Christopher Johnson of the Secure World Foundation observed that the inability of agreements to provide security in crisis "is not a defect of international agreements, merely a reality of the international political system." Theresa Hitchens of the Center for International and Security Studies at Maryland provides a contrasting view, arguing that it is intellectually unfair to require that international space agreements are 100% effective to be considered useful. She challenges

proponents of views that unequivocally dismiss international space agreements to identify "a weapon system that is 100% effective" because there are "no doubt legal agreements (i.e., a ban on use of debris creating weapons; or "protection zones" regarding close approach of satellites on orbit) that could actively protect assets in crisis/conflicts and be verified, but need to be explored more thoroughly."

Unlike many in the 'no' camp, Dr. Mark J. Sundahl of Cleveland-Marshall College of Law grounded his pessimism about the effectiveness of international agreements in space in the design of the Outer Space Treaty. He laments that, as currently designed, the OST permits a wide range of state behaviors, including actions that some states may consider aggression. Moreover, the treaty forbids only non-consultation with other governments in the event of potential interference with national activity in space. He states that

> I don't think anyone believes that all weapons are banned from space…[what is banned is] nuclear weapons, [and] you can't be aggressive, and you have to avoid harmful interference with the activities of other countries and their nationals. That is a rather soft prohibition on interference because all it really requires is that if you are going to harmfully interfere with the operations of others, then the governments have to consult with each other. It doesn't say that interference is outright prohibited.

For Sundahl, the OST's focus on principles, rather than institutionalization and monitoring, creates a weakness in the treaty. He believes that the OST cannot protect high-value space assets in time of crisis or conflict because the remedies for violation are mere consultation, rather than any form of imposed punishment or monitoring.

Enforcement and Verification Concerns as International Space Agreements Evolve

The contributors offered that enforcement issues surrounding international space agreements might be thought of as a specialized subset of those that arise in international arms control agreements. Effective arms control regimes exist in other areas of law plagued by dual-use issues, such as "universal prohibitions on biological and chemical weapons," notes Michael Spies of the United Nations Office of the High Representative for Disarmament Affairs. Therefore, he believes the general mantra of arms control agreements was also true for international space agreements: *Verification is enforcement*.

A "good set of rules" creates guaranteed penalties "in the case of non-observance," Dr. Luca Rossettini of D-Orbit avers. Well-designed international space agreements "can provide one layer of protection," according to Nield, via "peer pressure, in terms of expectations of behavior that are held by the international community." These behavioral expectations, Johnson observes, "establish what is internationally permissible to do." This provides security benefits to states insofar as the "resources to be spent protecting against" impermissible activities "can be lessened."

Drawing inspiration from international arms control agreements, the experts suggested three ways that international space agreements could be enforced and verified in the context of dual-use challenges. First, as space agreements evolve, continue to center them on widely-held norms. According to Dr. Moriba Jah of the University of Texas at Austin, these norms should be "things that promote transparency and are things that are measurable, and not measurable just by one entity but measurable by the community at large." In the context of arms control agreements, codes of norms function in this way because epistemic

communities can achieve verification by "corroborat[ing] or refut[ing] any given event" and then "quantify[ing]…the harmfulness of that event" to determine how to enforce the treaty violation.

Second, as an agreement evolves, participants should seek to regulate *activities, not technology*. Pellegrino plainly forwards that, "it would be beneficial if international agreements would focus more on the degree of care with which space activities and operations are conducted and communicated, rather than on which kind of orbital system/spacecraft is actually deployed in outer space." Lieutenant Colonel Peter Garretson of the United States Air Force Air Command and Staff College agrees: "Since *all* space technology is dual-use, and every satellite can be a weapon…you cannot regulate technology, only specify what might be an illegal action." Hitchens posits that an "Incidents at Sea/Dangerous Military Practices type agreement for space" is an excellent model for international space agreements.

Finally, even if agreements do not allow for institutionalization, detailing mechanisms and practices of transparency can overcome dual-use concerns. Pasco states that the question of dual-use technologies is "additional motivation for extended transparency mechanisms." Pasco's views dovetail with Spies' thoughts on the function of transparency in mitigating dual-use concerns: "transparency and confidence-building measures can contribute to the development of verification measures for arms control agreements and regimes." These mechanisms should cover three state practices in particular: "major outer space research and space applications programs, major military outer space expenditure, and other national security space activities."

Conclusion

There was a bifurcation among the expert contributors on whether international space agreements can provide protection of critical space assets in a crisis, with half of the experts arguing 'yes,' and the other half arguing 'no.' The most effective international agreements, according to the experts, would require continued flexibility as well as clear verification to be enforceable and designed for the long haul. As such, agreements that focus on prohibited activities, such as the generation of space debris, rather than prohibited technologies, both increase the enforceability and verification of effective international space agreements, as well as mitigate the dual-use feature that almost all space technologies evince. To enforce is to verify: Ultimately, from the point of an effective agreement, it does not matter what states build, it really only matters how they use what they put into space and how easily other states can confirm that what a state says it is doing is what it is in fact doing.

Subject Matter Expert Contributions

Major General (USAF ret.) James B. Armor, Jr.[3]

Staff Vice President, Washington Operations (Orbital ATK)
4 August 2017

WRITTEN RESPONSE

No, they cannot. Virtually impossible to verify or enforce an ASAT-like treaty. Dual-use technologies would be just as vulnerable, but offer a degree of resilience.

Marc Berkowitz

Vice President, Space Security (Lockheed Martin)
25 August 2017

WRITTEN RESPONSE

Can international agreements effectively protect high-value space assets in time of crisis and/or conflict?

No. Neither norms nor formal treaty obligations can be expected to protect high-value space assets in the event of crisis or conflict. The empirical, historical evidence demonstrates that norms quickly evanesce in the event of crisis and conflict. Consequently, prudent national security planners should be focused on preparedness for the eventuality of diplomatic and deterrence failures. As noted above, no past US administration has concluded that space arms control measures were not verifiable, equitable, effective, or compatible with US security interests. Given the lack of feasibility as well as our potential adversaries past record or treaty noncompliance and legal warfare practices, such arms control negotiations would not be in the nation's interest.

How could such a treaty be sufficiently verified?

Such a treaty could not be effectively verified because there is no practicable way to define a space weapon, deal with dual-use technology, or mitigate the security risks of information sharing and intrusive inspections.

How would it be enforced?

Setting aside the infeasibility of devising a Treaty that would be in our national interest or negotiating it on a multilateral basis, much less a mutually agreed upon enforcement mechanism, the only conceivable means of enforcement is the resort to self-help through individual or collective self-defense.

How would dual-use technologies be treated?

The commonality between civilian and military technology is one of the fundamental problems that has led the successive US Government's to determine that space arms control measures are not verifiable, equitable, effective, or compatible with US security interests.

[3] The responses here represent the sole views of Major General (USAF ret.) James Armor, and are not intended to represent the position of Orbital ATK.

Faulconer Consulting Group

Walt Faulconer
President

Mike Bowker
Associate

Mark Bitterman
Associate

Dan Dumbacher
Associate

15 August 2017

WRITTEN RESPONSE

Not as currently developed and implemented. Enforcement should come from treaties and recognize the cost of actual conflict.

Dr. Nancy Gallagher

Director (Center for International and Security Studies at Maryland)
10 August 2017

INTERVIEW TRANSCRIPT EXCERPT

Interviewer: Okay. So, do you think the international agreement and treaties that are currently in place for the space domain are well-suited to handle some of these new types of threats and aggressions that we may face given some of the advancements in technology and new actors that are more and more likely to be operating in space?

N. Gallagher: Part of what I actually like about the Outer Space Treaty was that it was written at a time when there already was a lot of technological change going on, and people didn't know exactly what the technological developments were going to be and exactly who was going to be using space for what purposes, but they knew that there was going to be a lot of change, so what they were primarily trying to do was to come up with a set of principles that could be adapted and applied as circumstances changed over time. So, I actually think the Outer Space Treaty framework and the principles of the treaty and the specific obligations of the treaty are still quite valid, and I think it would be hard to get international agreement on any set of principles that would be better than what is currently laid out.

I definitely don't think we should try to amend the treaty or replace it, because both of those are sort of potential recipes for losing this foundational agreement altogether. I do think there needs to be a lot more work to figure out what these principles actually mean in the practice under the current circumstances, and how we should apply them to new technologies and new situations. For example, how do we apply these principles in a situation where space is increasingly being used for support for the war fighter as opposed to straight-up deterrence? How do we apply these principles when you have many companies that are operating in space that don't really have a clear-cut country that's responsible for their activities? But, ultimately, I think those are all questions that we should be talking about, and figuring out how to elaborate the basic agreement, not replace it.

Lieutenant Colonel Peter Garretson

Lead, Space Horizons Research Group; Instructor of Joint Warfighting, Department of Research
(United States Air Force Air Command and Staff College)
10 August 2017

WRITTEN RESPONSE

Likely not. Like in submarine warfare where merchant marine ships who had engineering design plans for a self-defense gun were targeted, it is likely very easy to make a case that all US satellites are dual use and legitimate military targets. Moreover, they constitute both lucrative military targets and effective targets of coercion.

A sole exception might be if we disaggregated our nuclear C2 and warning, and pursued a specific no-touch, no-first use treaty with other nuclear powers.

Even though protection in a time of conflict might not work, such agreements could still be quite valuable in managing crisis, and in making it more difficult to field or test capabilities. A no-first use policy or agreement could be valuable. Codes of conduct / safety zones agreements for interactions in space could be valuable. A new treaty on active space debris remediation will be necessary. New bilateral or multilateral agreements will be required to prevent crisis with regard to conflicting space property claims (where to mine, what is the safety zone).

Since *all* space technology is dual use, and every satellite can be a weapon, I think you cannot regulate technology, only specify what might be an illegal action.

Gilmour Space Technologies

Adam Gilmour
Chief Executive Officer

James Gilmour
Director

13 July 2017

WRITTEN RESPONSE

Tricky, I think an attack on multiple communication or GPS satellites is equivalent to a direct attack on the country.

Dr. Peter L. Hays

Adjunct Professor of Space Policy and International Affairs, Space Policy Institute
(George Washington University)
19 July 2017

WRITTEN RESPONSE

Agreements and treaties can be very helpful in structuring international relations but they cannot guarantee security in the anarchic international environment. Potential efficacy of verification, enforcement, and dual-use provisions would depend on the specifics of the agreements and the state of international relations.

Theresa Hitchens

Senior Research Associate (Center for International and Security Studies at Maryland)
19 July 2017

WRITTEN RESPONSE

This depends on the agreement, and on the political will of signatories. This question seems to me to be biased regarding the role of diplomacy and law. We all know that pretty much ANY treaty can be legally thrown out of the window in a conflict. We all know that no treaty is 100% guaranteed to do what it says, and protect what it is designed to protect. On the other hand, I challenge anyone to show me a weapon system that is 100% effective. There are no doubt legal agreements (i.e., a ban on use of debris creating weapons; or "protection zones" re close approach of satellites on orbit) that could actively protect assets in crisis/conflicts and be verified, but need to be explored more thoroughly. STM rules, eventually legally binding that include debris practices, also could protect in both peacetime and crisis because such a regime will help prevent collisions and misunderstanding that might erupt from them. The creation of norms of behavior for both peacetime and wartime activities also creates some protection, in that it allows the identification of "bad actors" who are not playing by those rules, or are building systems to break them. I do not see – nor does anyone I know in the business of space security – that any ONE treaty can achieve all the necessary pieces to better protect the space environment, commercial providers and military assets. It is true that the dual-use nature of space technology is a huge obstacle to traditional arms control treaties – and thus many experts believe that a better approach is to regulate space activities, not technologies. One approach that I personally like is that of an "Incidents at Sea/Dangerous Military Practices" type agreement for space – Stimson Center wrote something on this a long time ago, see: https://www.stimson.org/content/space-code-conduct

This is NOT a black and white question; it is complex and nuanced. It is natural that militaries do not like agreements that limit their options. But keeping all your options open also comes with consequences, some of them negative (be careful what you wish for). Neither national security nor international security especially is a zero-sum game; deterrence isn't only about "sticks," it's also about "carrots."

Dr. Moriba Jah

Associate Professor, Department of Aerospace Engineering and Engineering Mechanics
(University of Texas at Austin)
3 October 2017

INTERVIEW TRANSCRIPT EXCERPT

Interviewer: Okay. So, the idea of reinforcing space as global commons actually transitions nicely into the next question that I was hoping to ask you. Do you think international agreements can effectively protect high value space assets in a time of crisis and/or conflict? And, additionally, what are the principles upon which international policy makers should develop response options for aggression in space?

M. Jah: We have UN treaties and the Outer Space Treaty and those kinds of things, which provide the only framework existent with regards to space. I'd say that we should build upon those things that are currently in place.

With respect to the question of, can international agreements effectively protect things, I think the more relevant question is, "What's enforceable?" When you ask, "What's enforceable?", that leads into "What's known?" One of the things that my research group makes as a foundation is, if

you want to know it, you have to measure it, and if you want to understand it, you have to predict it. So, there are a lot of people talking about norms of behavior in space, and that we should just create these things, but that just leads me to wonder, "Okay, what are you going to create?" If what you're going to create is not based on empirical data or is not evidence based, then it doesn't make sense. The norms of behavior have to be things that promote transparency and are things that are measurable, and not measurable just by one entity but measurable by the community at large. If these norms are measurable and quantifiable by a global community, then that becomes the thing that allows for enforcement because it's something that there is actually measurable evidence for—it's not a "he said, she said" situation, but, rather, it's a community that can corroborate or refute any given event and then quantify to some level the harmfulness of that event. So, I think that the way in which we protect ourselves is by knowledge and by making that as ubiquitous as possible.

Christopher Johnson

Space Law Advisor (Secure World Foundation)
11 September 2017

WRITTEN RESPONSE

No mere agreement is sufficient to protect an asset, in space or otherwise. This is not a defect of international agreements, merely a reality of the international political system. However, agreements between states, mutually negotiated between them, which meet both their present goals and their long-term interests and values, while *not sufficient, are a necessary* part of protecting assets in times of crisis and of conflict.

A long-standing and foundational principle of the law of nations is *pacta sunt servanda* ('agreements must be kept'). The intention of states in entering into agreements with other states is that each warrants that its commitments are certain and that it will abide by these commitments. A state which does not keep its word, as enshrined in a treaty, may become distrusted, suffer from a poor reputation as a partner in agreements, and might eventually never be negotiated with or have other state concluding treaties with them.

A security treaty, or treaty negotiated to preserve space assets, establishes what the law of nations is for a certain domain of activity. It mutually establishes what is internationally permissible to do, and what is formally legally prohibited. Established in times of peace, knowing beforehand what the law applicable to the activity is, increases the security of all parties by formally outlawing certain activities. When certain activities are impermissible, the resources to be spent protecting against their use can be lessened—especially if parties can be trusted, and/or their actions are observable, and if (borrowing from game theory) the actors play the 'game' repeatedly or continuously, and their observance or defection from the rules leads to other actors responding accordingly. As the 'game' is played continuously, enforcement of violations through the normal means is more likely than in 'prisoner's dilemma' scenarios where the game is not repeated.

Tanja Masson-Zwaan

Assistant Professor and Deputy Director
(International Institute of Air and Space Law at Leiden University)
13 July 2017

INTERVIEW TRANSCRIPT EXCERPT

Interviewer: Okay. As you said, when it comes to national laws, it doesn't really seem like any of these countries or commercial actors would really want to break any of these laws, even if they're not legally binding, official laws just because it seems breaking everyone's interest, right?

There are all of these different laws, and if they're not laws, they are agreed upon principles, and it's not looking like anyone would really want to break any of these non-legally binding principles because they benefit everyone, correct?

Masson-Zwaan: I get your question, and that is of course always the question of international law. States are sovereign, and states agree together to do certain things or to not do certain things by agreeing on rules, whether its soft law or hard law, and of course if a state is not complying with international law, it is very hard to do anything against that. You cannot put a state in prison, but you can of course to go to the International Court of Justice or other International Dispute Settlement Mechanism. The experience is that outer space has remained free of war for the last 60 years. Even if it's hard to enforce and to make sure that everybody agrees, there is also the moral force of such agreements.

When China exploded its weather satellite back in 2007, there was a lot of criticism in the United Nations and in the press. China would like to be seen as a responsible state actor, and so I don't think that that is something that would be repeated very quickly. Of course, now we also have issues with North Korea, which is launching satellites, and you're never really sure whether it's a missile or indeed a satellite. It's difficult, and there are tensions, but this is generally an issue with all international law, and I'm rather confident that overall it works, but there's never a guarantee that some states will not do something that other states don't like. I think I prefer to answer the second part of this question, which is whether there are specific limitations and constraints on state operations. I think there are, of course, because the Space Treaty for instance states that you cannot put a weapon of mass destruction in outer space, and outer space has to be used for the benefit and in the interest of all countries, and you should not contaminate outer space through your activities, and you should agree to consultation if there is a risk of harmful interference. It's hard to summarize that in a few words, but the states that adhere to the principles and rules of space law benefit from the protection that it brings, but they also agree to limit their behavior in certain ways so as not to violate the principles of peaceful uses of outer space.

Dr. George Nield

Associate Administrator, Office of Commercial Space Transportation (Federal Aviation Administration)
1 August 2017

INTERVIEW TRANSCRIPT EXCERPT

Interviewer: Can international agreements effectively protect high value space assets in time of crises and or conflict and how could such a treaty be sufficiently verified and enforced? This is a particularly

important question because this comes from a skepticism that surrounds such international agreements and, you know, the utility of it. Maybe you can speak to that a little more.

G. Nield: It's clear to me that international agreements cannot guarantee the protection of space assets but they can provide one layer of protection if you will, in terms of peer pressure, in terms of expectations of behavior that are held by the international community and so forth. So verification would be enabled by having a much more transparent sharing of orbital safety data. Something that, for example, could be accomplished by a civil space traffic management system, which is something that FAA is working with DOD on developing right now. Enforcement options could range from public disclosure, essentially naming and shaming if you will, pointing out folks that are not adhering to the guidelines, to levying of fines or damage payments or, escalating it, economic sanctions, or even military actions, depending on the nature of the infraction. Enforcement could be either taken by an individual state like the US or by a group of likeminded nations, or by the United Nations or some other international organization. Again, I'm trying to be very general in my response here. If you're trying to protect high value assets and somebody is bumping into them or dazzling them or disabling them in some way then, hopefully, that type of behavior would not be consistent with the norms and guidelines that we have agreed to and as long as there was information about what was happening that we've shared in a transparent way without compromising national security information, then you can talk about some of those steps that I identified.

Interviewer: Okay. Well yeah, thank you so much, George. You spoke, after all these questions, you spoke very broadly on them and you also provided some very useful specifics so it was extremely informative and I want to thank you so much for taking the time to speak with us today. Before I open up the floor here to my other colleagues on the line to see if they have any questions, I just want to end the interview by asking if there is any question that you think we should have asked you but that we did not, or a question or issue on here on these lists of questions that you'd like to address and maybe emphasize or think it's particularly important.

G. Nield: I think you've done a good job of hitting some of the important topics here. If I were to try to identify them, the most significant ones in terms of the importance of making a change one would be encouraging the government to really change how we do business and take advantage of commercial capabilities across the board. That goes from organization to policy to acquisition and all the rest as we talked about in the early questions.

The other has to do with the whole subject of space traffic management and how are we working with other nations in both sharing safety data and working with them to develop norms and behavior and rules of the road. Again, that is something that the FAA is eager to work with the DOD and other agencies on, but to be most effective it would need to be a whole-of-government decision and commitment that this is what the US wants to do and here are the folks that we want to task with doing that. That is going to need congressional action, like having the ability to share space situational awareness data, just like DOD has today. It is going to need things like immunity from lawsuits if somebody is unhappy with the collision avoidance info you gave them, and it is going to take resources to do the job if we're going to take that on, for example, at the FAA. I view this really as a whole of government discussion that the National Space Council can take up as it is called into being.

Michiru Nishida

Special Advisor for Arms Control, Disarmament, and Non-Proliferation Policy
(Ministry of Foreign Affairs of Japan)
3 October 2017

WRITTEN RESPONSE

At least, international codes or norms that prohibit generation of space debris would be relatively easily verifiable and thus enforceable. Since many satellites are maneuverable, they can be used for both peaceful and offensive purposes. International codes or norms that attempt to prohibit certain types of weapons would thus not work because they are neither effectively verifiable nor enforceable ("weapons-oriented approach"). PPWT proposed by China and Russia in the CD would not effectively work. Therefore, I would argue that international codes or norms that regulate "behavior" ("behavior-oriented approach") should be pursued with urgency.

Dr. Xavier Pasco

Director (Fondation pour la Recherche Stratégique Paris)
31 August 2017

WRITTEN RESPONSE

Space can be defined as one of the most severely constrained environment. The laws of physics have been imposing very specific uses that imply each operator to abide by strict collective rules in order to fully benefit from them. Any breach into this collective-oriented approach from the part of one user could lead to a collective disaster and mean denying access to space for all (including for oneself).

As a consequence, it appears that national security policies in space end up being best supported by collective security policies, involving some degree of active cooperation and transparency.

In case of conflict, while defining a specific situation in which space systems can become targets, some level of interdependency remains, and none of the protagonists, if they both possess space systems may have interest in creating a collective chaos in orbit, only because each needs its own space system to work properly. In this respect, it is fair to assume that in this case again, this constrained interdependency will contribute to retain collective behaviors and rules as references for military actions. Escalade in space is not an option, even (especially?) in times of crisis.

This can lead to think that well-thought collective rule, whether under the form of a treaty or of another instrument, clearly adopted by countries, can provide a good level of protection to space assets even if it cannot guarantee a full-fledged protection.

The efficiency of such a regulating mechanism would be first conditioned by the existence of shared SSA relying on data sharing and exchanges when possible. The existence and confrontation of national sources would be a condition for such a mechanism to ensure trusted transparency, especially in times of conflicts. This means that any international agreement would work only if several national systems can have their results shared and compared so mutual trust can develop.

Dual-use technologies shall be considered as an additional motivation for extended transparency mechanisms (such as on-orbit servicing systems for example that will have to be governed by clear international rules of law).

Massimo Pellegrino

Space and Security Policy Advisor
Former Space Security Researcher (United Nations Office at Geneva)
31 August 2017

WRITTEN RESPONSE

When vital national interests are threatened, a nation might actually choose to disregard international law and agreements. However, the price to pay for this non-compliance may be high enough to force nation states to restrain themselves.

Generally speaking, space treaties can be "sufficiently" verified by using space technologies themselves—notably space situational awareness (SSA) capabilities to monitor the evolution of the space environment and what is happing in outer space. The viability of any future international instrument to regulate space activities, indeed, will require SSA information to verify violations and attribute irresponsible behavior in outer space.

Regarding enforcement mechanisms, it should be noted that international relations usually proceed in a manner consistent with the law and that instances of non-compliance are identified as such—states, for example, condemn attacks made by chemical weapons, and even though the international community argues about who is responsible, it is by virtue of that reaction that the norm against the use of chemical weapons is fortified. While critics often point to instances of non-compliance with the law as evidence that the law is not effective, effectiveness of international law in the context of space security should not be measured by typical legal outcomes: no one has been imprisoned for instances of non-compliance with space law, showing that, if the measure of effectiveness is based on purely legal outcomes, policy makers and legislators would have missed the point. International law applicable to outer space will need to play a strategic role in global space security, not just a typical, familiar legal role. There would be great value if effectiveness of international law in relation to space security would be measured by the extent to which it reduces or eliminates the danger or threat to the advantages that accrue to humanity from the use of space.[4]

For how dual-use technology can be treated in the framework of space regulation, it would be beneficial if international agreements would focus more on the degree of care with which space activities and operations are conducted and communicated, rather than on which kind of orbital system or spacecraft is actually deployed in outer space.

Dr. Luca Rossettini

CEO and Founder (D-Orbit)

WRITTEN RESPONSE

As a former parachutist officer, I am aware of the 1949 Geneva convention… however, I will never doubt that in a real war scenario a group of parachutists slowly descending from the sky will become immediately a perfect target for the enemy.

That said, a good set of rules could be stated in a way to guarantee a penalty in case of non-observance. To be able to properly verify such treaties we would need to increase the capability of observing space and understanding who is doing what to whom. Current SSA and SST investments in infrastructure will partially help.

[4] See Duncan Blake's presentation and statement at the UNIDIR Space Security Conference, 2017.

Regarding dual use technologies: we are still using the definition we use for Earth use. However, from a lateral thinking perspective, the whole space is a dual use technology. Whatever you launch in space, even a satellite full of ice cream, could be used as a weapon. We cannot avoid the use of space but we can limit the use of space as "dual-use."

Matthew Schaefer and Jack M. Beard

University of Nebraska College of Law

Matthew Schaefer
Professor of International Trade Law and Co-Director of Space, Cyber, and Telecom Law Program

Jack M. Beard
Associate Professor of Law

16 August 2017

INTERVIEW TRANSCRIPT EXCERPT

Interviewer: So, moving on to the next question, what international legal codes or norms are needed to govern the increasingly crowded space domain?

J. Beard: Okay, so, I'd like to answer that question in conjunction with another question from your list. The two particular questions are, "what international legal codes or norms are needed to govern the increasingly crowded space domain?" and "what can the US do to best facilitate development of verifiable norms that maintain a peaceful space domain?"

So, what legal codes or norms are needed to govern the increasingly crowded space demand? Matt has just spoken to real efforts to try to reduce the space debris, which could eventually make it impossible to use space.

So, to move on to the security world, what can the US do to best facilitate the development of verifiable norms that maintain a peaceful space domain? Again, I'd like you to look at my article because these are sort of arms control issues. I practiced for 15 years in the Office of General Counsel at DoD, and I was an expert on arms control. As you start talking about what you can do here to create conventions, treaties, or norms to limit or constrain space operations, I have one key principle for you to bear in mind: it is almost impossible to regulate technology in space because it is almost all dual use. In fact, anything that moves in space can hit another object, and thus represent a potential weapon. For example, our space station has always been viewed by the Russians as an evil weapon, a space maneuverable vehicle (SMV). Anything that can maneuver and crash into something else is a weapon. Our other space law professor here, Frans von der Dunk, writes in his space law handbook that just about everything in space has a military application.

So, regulating technology is elusive in space—you can't go up and verify it, and no one is going to let you verify it before it takes off. Seeing what's up there and arguing whether it's a weapon or not, gets to the issue of intent, and there's no defensive or offensive capabilities that can't be merged or confused. So, if you're going to try and regulate space, weapons in space, and military activities in space, then your best bet is going to be regulating conduct, and not technology—you can regulate conduct and verify some conduct, but technology is elusive.

The Russians and Chinese have tabled a proposal right now there called the Prevention of the Placement of Weapons in Space, and it's the only arms control proposal for space that is currently

out. It's dead on arrival for the United States because it would regulate space activities in a way that can't be verified—as the Russians say, "Well we'll work that out later." It completely neglects all sorts of terrestrial-based and satellite weapons system.

Anyways, I think the key on this is that you're going to have an incredibly hard time regulating technology, and I speak to that in my article that I'll send to you.

So, to go back to the question of, what international legal codes or norms are needed to govern the increasingly crowded space demand? A norm, again, if you're going to have a legally binding norm in space, you're going to have to work out a very difficult international agreement regulating conduct in the military sphere. The Chinese are completely uninterested in doing that, so you're left with joining in regimes that don't include our adversaries, which is a loser of the first order.

So, for your question of verifiable norms, I need for you to distinguish between a truly international agreement that is legally binding and includes all these countries, which is so unlikely. Since 1979, and the ill-fated Moon Law Treaty, there have been no legally binding international agreements for outer space.

M. Schaefer: There are some people that say you're never going to be able to prohibit ASAT weaponry because the incentives for certain countries to create them are always going to be there, but Jack was talking about maybe actions. So, in other words, you might have a ban on testing ASATs but you can't ban the development of ASAT because you wouldn't ever be able to verify that.

The other thing that creeps in, I guess, that I've heard a little bit of discussion about is, as this gets more into kind of controlling technology—although it leaps into actions as well as technology—it is indiscriminate. So, when you're developing an ASAT, you shouldn't do ones that are going to cause indiscriminate harm—in other words, like the Chinese ASAT test, the kinetic device in 2007, because it created thousands of pieces of debris that are going to last there for decades. Though, that might be captured by test ban anyway, because that's what they were doing—testing an ASAT.

J. Beard: Those are really good points, and I'd like to build on those points Matt's making about ASAT tests. It is probably very much in the interest of the United States of America to agree to some sort of ASAT test ban, at least for destructive ASAT tests that generate debris, because we have no interest in doing that—our weapon systems are developing to disable satellites without creating a debris field. We have no interest in Israel, or Japan, or France, or India conducting any satellite tests that create more debris. It is an area where we could cooperate with the Russians and Chinese if they could agree—we could pick the sort of tests that would be prohibited and the altitudes and so forth. So, that's a possibility. But, here's the problem, right now, no ASAT tests are legal. The ASAT test by the Chinese in 2007 was an extraordinarily bad and unhappy development for everyone in space because of the debris field it generated. Yet, except for Japan, there was no country on Earth that condemned that test as illegal, because they're still preserving their options. So, you have to be careful about what is law and what is not.

So, moving to your question of, what are the principles (e.g., flexible v. controlled response; proportionality, etc.) upon which international policy makers should develop response options for aggression in space? A disproportionate attack is a type of indiscriminate attack that causes incidental loss of civilian life or damage to civilian objects which is excessive in relation to the concrete and direct military advantage anticipated. And there is a debate right now about whether actions generating huge debris fields that threaten many satellites in space is a disproportionate attack. Lawyers generally focus on the loss of human life in determining whether an attack qualifies as a disproportionate attack. But, I think that the more you study space and the importance of

things like GPS satellites, the more that you are able to make an argument that an attack generating huge debris fields might violate the Law of Armed Conflict, but it's a debated issue.

Dr. Michael K. Simpson

Executive Director (Secure World Foundation)
23 August 2017

WRITTEN RESPONSE

All these questions revolve around creating a community of interest in the use of space and its technologies. History has shown ample examples of situations where the text of treaties alone was insufficient to protect anything in time of war. Strong arguments can be made that Pearl Harbor, Bataan, Hiroshima, and Nagasaki all violated one treaty or another. What we need in space is something more akin to the European Schumann Plan that effectively made an attack on another country's asset the economic equivalent of an attack on one's own. This certainly need not involve the creation of integrated economic communities as the Schumann Plan did, but it should be based on accelerating the participation of the world's countries in the economic benefits of space. In such a case the creation of debris fields from kinetic attacks or the encumbering of critical orbits with blinded or otherwise crippled space craft would damage the attacker at the same time as it damaged the attacked.

Michael Spies

Political Affairs Officer, Strategic Planning Unit
(United Nations Office of the High Representative for Disarmament Affairs)
15 August 2017

WRITTEN RESPONSE

Measures for disarmament and the regulation of arms have been pursued for decades as a means for preventing conflict, promoting international and regional stability, reducing tensions and mitigating the undesirable consequences resulting from the use of particular types of weapons.

It is important to acknowledge existing international law applicable to the use of force in outer space. The 1967 Outer Space Treaty prohibits the placement of nuclear weapons or any other kinds of weapons of mass destruction in orbit around the earth, the installation of such weapons on celestial bodies, or any other stationing of such weapons in outer space. It also prohibits on celestial bodies for the establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers.

Customary international law also applies to any possible use of force in outer space in the context of armed conflict. The legal implications for any attack in outer space have yet to be fully considered in a multilateral setting, and different States may maintain more permissive or more restrictive postures with respect to any conceivable use of force in outer space, depending on their national interpretation of their international legal obligations.

The further codification of principles and rules of international law applicable in armed conflict, including restrictions on weapons deemed to be incapable of use in outer space in conformity with customary or agreed principles and rules, could bestow greater protection on military and civilian outer space objects, clarify any uncertainties regarding the application of existing international law and limit the use of weapons that can be expected to result in the widespread disruption or destruction of assets with civil applications. International agreements can also reduce incentives for any State to develop or deploy weapons whose use in outer space would be problematic or destabilizing.

Verification

There continue to be a number of unresolved concerns regarding the verification of arms control measures in outer space. The goal of assessing the verifiability of possible arms control measures would benefit from substantive multilateral deliberations, including as necessary at the expert level.

In the meantime, transparency and confidence-building measures can contribute to the development of verification measures for arms control agreements and regimes. The implementation of measures for exchange of information on major outer space research and space applications programs, major military outer space expenditure and other national security space activities, as agreed in the report of the group of governmental experts on transparency and confidence-building measures in outer space activities (A/68/189), can also build a climate of trust and increase predictability.

Enforcement

Various international disarmament and non-proliferation treaties provide for referral to the Security Council of situations relating to non-compliance, grave breaches or related matters affecting international peace and security, including in cases where urgent action is deemed necessary. Some treaties provide for the imposition of sanctions or other punitive measures in instances of non-compliance.

Regulation of dual-use items

The pervasive nature of dual-use technology in certain fields has not constituted a barrier to the development and implementation of effective arms control regimes, including universal prohibitions on biological and chemical weapons. These regimes have sought to balance risk reduction measures against the need to avoid undue burdens on legitimate civilian and military activities.

With respect to military weapon systems with applications in multiple domains, risk mitigation may be possible by addressing inter-related areas of strategic arms control, including the achievement of further reductions and the elimination of nuclear weapons worldwide and by addressing issues relating to missile and anti-missile systems in all their aspects.

With respect to the means of launching or delivering weapons capable of striking objects in outer space, existing non-binding multilateral codes and regimes have constrained the proliferation of dual-use technology and equipment. However, given the widespread diffusion of ballistic missile-related technology, there may be no substitute for universal agreement on adequate controls for dual-use items and for broader measures of arms control and disarmament.

Cassandra Steer

Executive Director (Women in International Security Canada Inc.)
Interim Executive Director, Center for Ethics and Rule of Law (University of Pennsylvania)
1 September 2017

WRITTEN RESPONSE

Treaties are only ever as successful as States allow them to be by adhering to them. States adhere to treaties when there is sufficient self-interest to do so, and sufficient international pressure to do so. The lessons learned from the weapons tests conducted in space by both the Soviet Union and the U.S. during the Cold War are that nuclear and EMP detonations threaten all satellite users, and it is impossible to control their effects. Thus, there is a great deal of self-interest for the States who are most dependent on space-based services, the U.S. currently being the most dependent of all States, to prevent the weaponization of outer space. There may also be sufficient international

pressure for States to adhere to an international binding treaty regime prohibiting the placement of weapons in outer space, given the increased concerns for an arms race in outer space.

The U.S. has not been supportive of the proposed Treaty for the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects (PPWT), presented by China and Russia to the UN Conference on Disarmament, as neither the Bush nor the Obama administrations viewed it favorably. The PPWT has mixed support from various other States, although the annual UN General Assembly Resolution on the Prevention of an Arms Race in Outer Space has near universal support every year, with the U.S. and Israel abstaining. Generally there is a lack of political will to negotiate new binding treaties for the governance of space, with the exception of a treaty along the lines of the PPWT, where it would seem that there is an international desire to move towards negotiations on an international instrument. The time may be ripe for the U.S. to take the lead on such negotiations rather than pushing back against it, given that other States are moving forward in their technological and arms capacities.

It is true that the current draft treaty is problematic. In Article I the definition of a weapon in outer space is:

> "any outer space object or component thereof which has been produced or converted to destroy, damage or disrupt the normal functioning of objects in outer space, on the Earth's surface or in its atmosphere, or to eliminate human beings or components of the biosphere which are important to human existence, or to inflict damage on them by using any principles of physics."

As has been pointed out in official U.S. commentaries criticizing the draft (Foust, 2014; Rose 2014), this definition excludes ground-based anti-satellite weapons (ASATs). However, it may be that ground-based ASATs are not the greatest threat to space-based assets. International consent exists that the debris caused by kinetic ASATs is destructive to all users of space, and a threat to space security in general, as evidenced by the Chinese destruction of its own Fengyun FY-1C weather satellite, widely understood to be an ASAT test, which created debris which is likely to remain in orbit for at least 50 years (Grego, 2012; Moltz, 2014, p. 30), and the smaller yet equally instructive amount of debris caused by the U.S.'s destruction of its own satellite in 2008 (Grego, 2012, p. 4). It is also easy to trace the launch of ground-based ASATs, meaning that response is possible and attribution is certain. More covert ASATs are more likely to be the greatest threat, such as cyber attacks, on-orbit interference by way of proximity manoeuvers, and temporary measures such as dazzling, jamming and spoofing. These kinds of weapons could be included in a treaty.

While the current definition in the PPWT does include a space object whose purpose has been "converted" from benign to aggressive, it does not cover the question of dual-use technologies. This is more difficult to cover in a treaty, although it would be possible to consider language regarding the purpose of an operation at any given time.

Another criticism of the PPWT is that it does not contain any regime for verification. However the latest draft does include provision for the development of a protocol to this effect, allowing for a framework to be agreed upon as a first step. The problem of verification is better answered by someone with technical expertise rather than legal expertise, since it could include ground-based inspection bodies as well as the use of other remote sensing satellites as "national technical means of verification", which has existed for decades. While problematic, verification should not be a reason to reject the notion of a space weapons treaty altogether.

The fact that the PPWT is a project of China and Russia means that there are political forces at play which work against U.S. collaboration. However, if the U.S. were to take the lead on a binding treaty, it could protect its interests better, by ensuring no other State were to gain the upper hand in space weaponization, and working against an arms race in space which would have exactly the escalating effect that the U.S. aims to avoid. We are at a crossroads technologically and in terms of the shift in balance of power not dissimilar to the Cold War dynamics which led to the OST. There must be an emphasis on strategic restraint in order to protect the highly complex space environment, which is used by and must be managed by a wide range of international players (Hitchens & Johnson-Freese, 2016). It is incumbent on the U.S to take a lead in working towards a binding agreement in this.

Dr. Mark J. Sundahl

Charles R. Emrick Jr.- Calfee, Halter & Griswold Professor of Law; Director, Global Space Law Center
(Cleveland-Marshall College of Law, Cleveland State University)
19 July 2017

INTERVIEW TRANSCRIPT EXCERPT

Interviewer: So, now let's jump in to some of the more specific space law and norms questions. There's a lot of them, so first I will ask, what are the current international agreements, treaties, conventions, etc. governing the use of space, and what specific limitations and constraints are placed on space operations?

M. Sundahl: There are five UN treaties: 1) the Outer Space Treaty, 2) the Rescue and Return Treaty, 3) the Liability Convention, 4) the Registration Convention, and 5) the Moon Agreement.

The Moon Agreement, the fifth one, has not been ratified by any major space powers. For those 13 states that have signed the agreement are subject to some different rules about exploitation of natural resources. That's the core issue there.

But setting the Moon Agreement aside, the Rescue and Return Agreement elaborates on Article V of the Outer Space Treaty regarding the duty to rescue astronauts and return space objects, I think that's not worthy of a lot of discussion from a military perspective, except to say that governments should recognize that these duties apply even in time of war.

The Liability Convention focuses on who is liable if something happens, either on the ground, in the air, or in space. The basic rule regarding liability is that you're strictly liable if your spacecraft destroys anything on the Earth or in air space, and if your spacecraft hits anything in space, then it's a question of fault. That's a big question, what does "fault" mean? I think that's an interesting question. Like when the Chinese blew up their own weather satellite, which created massive clouds of debris that are going to be in orbit for 500 years and may destroy untold numbers of satellites over the 500-year span, are the Chinese at fault? No one has really answered that question. I'd venture to say no even though it was an intentional act.

The Registration Convention is maybe the most used and successful space law convention because it's all about registering your space objects and describing where they're going to be and what they are so that the world can have some kind of space traffic management and be aware of what people are doing at space. On this issue, I would encourage the US government to continue to encourage others to comply with the Registration Convention and provide accurate information about what they're putting into orbit, because this really helps with transparency.

But the big one, the big convention is the Outer Space Treaty. You asked about the constraints on countries. So, the starting point is the free use—that we're allowed to use space freely, and we see that when we fly over other countries with no restrictions. So, what are the restrictions? Well, you can't put weapons of mass destruction in orbit. You can't be militarily aggressive in orbit—you've got to be peaceful, although that includes operations for self-defense. I don't think anyone believes that all weapons are banned from space, but no nuclear weapons, you can't be aggressive, and you have to avoid harmful interference with the activities of other countries and their nationals. That is a rather soft prohibition on interference because all it really requires is that if you are going to harmfully interfere with the operations of others, then the governments have to consult with each other. It doesn't say that interference is outright prohibited, only that there have to be consultations. You have to operate with due regard for the activities of others, and this kind of goes hand-in-hand with avoiding harmful interference. You also have to avoid harmful

contamination of outer space and back contamination of the Earth—that's why we clean and sanitize the spacecraft before they are sent anywhere. That's good too so that we don't introduce Earth bodies and Earth organisms to other celestial bodies. Another restriction is the prohibition of appropriation—you cant go to the moon and plant a flag on it and claim it as the territory of the United States. We did plant a flag there, but we did so explicitly that it was not for any purpose of appropriation, but instead it was just a symbol of peace on our arrival on the moon. So, you can't claim the moon, but can you occupy it? Are there any rights that a private entity or a government can assert over part of a celestial body that is short of appropriation? Could you issue temporary licenses to mining companies to use for part of the celestial body or for the government to mine a celestial body, and therefore exclude others from that mine because it would constitute harmful interference or a lack of due regard? So, is there something short of appropriation that would allow the permanent use of a celestial body? That's kind of an open question. I believe, yes, we can do that, otherwise we should all just pack it and go home if we can't establish a base on the moon.

Another limitation on space activity that comes to mind concerns telecommunications, particularly regarding the use of a certain orbits, geo-synchronous orbits. You need to go through the ITU and FCC to get one of those orbits, which are limited in number to 180 due to a requirement of two degrees of separation between every satellite. The use of frequencies is also regulated by the FCC and the ITU.

ViaSat, Inc.

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21 August 2017

WRITTEN RESPONSE

International agreements have not protected assets, when aggression occurs. This discussion may center on the "Defended Asset List", if and when commercial or private sector space ecosystems become a significant portion of the military/government networks. This could be an interesting topic for a thoughtful discussion.

INTERVIEW TRANSCRIPT EXCERPT

Interviewer: Thank you for that clarification. The last question which is the one I just read, so apologize for the mix up here. Second to last sentence of the last paragraph on page 18. I'll read again, the commercial space industry has adopted certain norms of behavior most conducive to successful operations. I would like to ask do you think further guidance is needed, or has the industry by and large been able to achieve this on their own and government should stay out of the way in terms of norms? Or institutions like the SIA are very effective and need more support.

F. Taylor: I was going to say that industry has done a very good job in establishing these norms. While they're not written down, there is some expectation that from an industry standpoint all these satellite operators are operating their satellite servicing a broadset of customers. Their expectation is they will be able to operate and pursue their business interest without interference. If another commercial provider is interfering with their revenue or their business it is the same as if you do things on the ground as if you block access to my business and put a sign up in front of it, that's a reason in which you should be able to respond to that.

That response would be move it, or if you don't move it, then you need to pay me damages. All these type of things could be put in place. I think those are pretty well established because they are commonly shared goals. The commonly shared goals in space are to operate freely and operate without interference in order to pursue the mission objectives on the commercial side to pursue their business plan as described. Do you want to add to that Ric?

VanderMeulen: No, I think that was pretty well said. I'm going to go back to ViaSat investing in billions, Inmarsat is investing in billions. Okay, so now go to some of new space. One-Web needs $4 to $5 billion to have a global constellation of somewhere between 600 and 4,000 satellites. Space X would need the same kind of money. You could even look in the rearview mirror and see that Iridium invested $6 billion, they didn't succeed in generating enough revenue to pay their debt and went through a bankruptcy cycle. With these large investments being made by the private sector, we are going to do whats needed to establish norms so that their businesses can continue from an operational standpoint which is Fred's point.

Should the government be involved in that? Yes, absolutely. I think the biggest problem the government has right now...we all watch the same news every night…For some reason countries are less cooperative today, even people I went to the University of Virginia and I'm embarrassed by what's going on in Charlottesville. To establish the laws of the sea in 2017/2018/2019/2020 seems to be a much more difficult task than when the laws of the sea were established back in 1800s and 1900s.

I think there is a role for government...we believe there's a role for government to help encourage it. It's going to be driven by the fact that people are making significant investments in space and they're going to want those investments protected. Which is why we have laws. People make investments in businesses in Phoenix and they don't want those... hey want a legal system which allows their investments to be protected, they don't want the Wild Wild West.

Dr. Frans von der Dunk

Professor (University of Nebraska College of Law)
25 July 2017

INTERVIEW TRANSCRIPT EXCERPT

Interviewer: Yeah, that makes sense. So, I'm wondering, if a situation where maybe a crisis or even potential conflict started to arise in space, how do you think the current international agreements, treaties, and laws that are in place would do in response? Do you think they'd be able to effectively protect high-value space assets that are currently up in space?

F. von der Dunk: Well, to a limited extent. But that is not something that is limited to space—it applies everywhere in the international environment—because obviously we don't have a global legislature, a global judiciary, and a global police force, which can enforce sanctions on wrong behaviors.

This is the imperfection of the international world. It means that by just having a legal rule, it doesn't mean that you can actually enforce it in the normal manner that a state can enforce national law in its own territory. But that is not to say that it doesn't have an effect, and certainly, in democracies, it becomes very tricky for governments to be seen as violating the rules because it undercuts their own legitimacy. That even applies in non-democratic states. Even when North Korea says, "Yes, we violated the Security Council resolution, but so what?", They are trying to come up with a kind of legal argument that the Security Council resolutions in themselves are not lawful and are in violation of all the rules. If you go back to Saddam Hussein, he tried to defend what he was doing, not by ignoring the rules but by trying to hide what he was actually doing. So, even in those contexts, there's always some political value for even those rogue states to try and not be seen as a violator or as simply ignoring international rules out of arrogance, because there might not be legal punishment but there will be political punishment somewhere along the road.

So, if you talk about high-value space assets, well, the fact that you're not allowed to shoot them down may not keep one or the other from actually shooting them down in some case, but it will certainly limit the cases where someone is likely interested in doing so, and if it does happen, then it may still lead to consequences in the political realm. Another thing that we should realize is that what happens up in space can inflict damage on anyone, and in particular the other space faring nations. So, even though China and Russia may, in the current political climate, be tempted to do things against US interests in space, even in the military realm, the more they are entrenched in that realm themselves and the more that they have at stake there as well, the more careful they will be in not destroying that environment either, which includes physical destruction with respect to highly-valuable space assets. Though, the more hacking-like and technical approaches or electronic-type attacks, which is not actually physically destroying a satellite but instead just taking it out of operation, may be more difficult to prevent.

But, in general, I think that the lack of verification and the lack of enforcement possibilities is not all decisive. There's more to it, I would say.

Joanne Wheeler

Partner, Technology and Communications Group (Bird & Bird)
19 July 2017

WRITTEN RESPONSE

To answer very briefly - international collaboration and partnership agreements between states, including for the sharing of complimentary resources could be important to protect high-value space assets and the data that they may be able to supply. It is not just the assets that must be protected but actually the data that they provide.

Access to allies' capabilities or commercial sources is vital for certain states such as the UK, for example.

Dual-use technologies, due to export control requirements, is an issue which I will not expand on now but state to state actors will find this easier, as we are seeing.