



**Summary of Discussions of the Expert Roundtable on
The Weaponization of Outer Space: Ethical and Legal Boundaries**

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This report summarizes presentations and discussions from an expert roundtable hosted by the University of Pennsylvania Law School's Center for Ethics and the Rule of Law (CERL) in Philadelphia. The purpose of the roundtable was to discuss legal and ethical issues concerning the weaponization of outer space and how to reduce the potential for an armed conflict taking place in outer space. The roundtable comprised approximately 40 experts from Canada, the Czech Republic, South Korea, and the United States, with experts from academia (including law, psychology, ethics, and philosophy), defense policymaking, the armed forces, the commercial space industry, legal practice, international diplomacy, and national security.

This summary report provides an overview of the discussions among invited experts over the course of six thematic sessions. The entire two days operated under the Chatham House Rule,¹ meaning that no comment is for attribution to any individual. This rule of anonymity and non-attribution has been applied in this summary report. Every effort has been made to provide a fair representation of the participants' views and opinions, but the ultimate responsibility for accuracy lies with this document's authors.

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<https://www.law.upenn.edu/institutes/cerl/conferences/ethicalgovernancespacesecurity/>

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¹ Chatham House, 'Chatham House Rule' <https://www.chathamhouse.org/chatham-house-rule>

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Contents

SESSION 1: Security, Law and Non-Binding Norms in Space: From Peace to Conflict	4
a) Interpreting the “peaceful purposes” principle.....	4
b) The Role and Impact of the Outer Space Treaty	5
c) The Lawfulness of Targeting Satellites.....	6
d) Legally Binding Norms and Non-Binding Norms	6
e) International Responsibility for all “National Activities in Space”	7
SESSION 2: Strategic and Ethical Space Security	8
a) The “Trolley Problem” and Utilitarianism.....	8
b) The Ethics of “Space Dominance”	9
c) Weighing Values in the Space Domain.....	10
d) Crisis Stability in Space.....	11
SESSION 3: Commercial Actors and Space Security.....	11
b) State Responsibility for Private Actors	13
c) Regulating Commercialization.....	13
d) How a Space-Based Conflict Would Impact Commercial Actors.....	15
SESSION 4: Intelligence and Counter-Space Technologies.....	15
a) Survey of Counter-Space Capabilities by Nation.....	16
b) Cyber and Alternative Capabilities	17
c) Why Are Nations Developing these Capabilities, Other than to Use Them?.....	18
d) The Effect of Space Capabilities on Terrestrial Conflicts.....	18
e) The Legality of Space Military Capabilities	18
f) The PAROS Treaty and Other ASAT Limitation Efforts	19
g) Space Electronic Warfare.....	19
SESSIONS 5 & 6: A Role-Play Scenario Exploring the Use of Force and the Law of Armed Conflict in Outer Space	20

a) Valuable Scenario for Discussion	20
b) Multiple Overlapping Legal Regimes	20
c) The Importance of Geopolitical Context.....	21
d) Escalation to Irreversible Actions and Cross-Domain Responses	21
e) “Keep Out” or Operational Zones	21
f) The Value of Space Situational Awareness (SSA) and Norm Development	22
g) Trust and Transparency	22
h) Dialogue at Multiple Levels is Valuable in Maintaining Communication Channels and Avoiding Misunderstandings	22
SESSION 7: Harnessing International Cooperation	23
a) Diplomacy, Global Leadership, and the Role of the U.S.	23
b) International Transparency and Confidence Building Measures (TCBMs).....	24
CONCLUDING REMARKS	25

SESSION 1: Security, Law and Non-Binding Norms in Space: From Peace to Conflict

At the beginning of the first session, it was noted that the 1967 Outer Space Treaty contains three important principles for the purposes of this conference. Article II spells out the principle of non-appropriation, Article III requires all activities in outer space to conform with international law, and Article IV announces the principle that the Moon and other celestial bodies shall be used for peaceful purposes. The question was posed whether these principles continue to be effective, or whether the principles of non-appropriation and peaceful purposes are under threat.

a) Interpreting the “peaceful purposes” principle

One key issue in raising this question is the relationship between peaceful purposes and war fighting in space. There is an extensive use of space technology in terrestrial warfighting today, from telecommunications to tracking and navigating troop movements and movements at sea and in the air, to operating many weapons systems. This situation creates a high complexity for international humanitarian law because space is already implicated in warfare, even if no conflict has to date taken place in outer space. Moreover, space is already militarized to a certain extent because of this interrelationship. Therefore, it must be asked whether the “peaceful purposes” principle is already defunct.

Some experts took the firm standpoint that no article of the Outer Space Treaty is defunct. Rather, the treaty must be considered as one that brings order to space. The recent Congressional hearing presided over by Senator Cruz was cited, where the general conclusion was also drawn that the treaty is still strong and relevant. Asked whether current activities interfere with the treaty, one expert answered that the treaty does in fact make a difference for restraining behavior in space.

As pointed out by one expert, there is a common misunderstanding that the treaty restricts the use of space to peaceful purposes, when in fact the treaty only contains a restriction to peaceful purposes regarding the Moon and other celestial bodies. Furthermore, when the treaty was negotiated in 1967, the United States, the USSR, and the UK already had militarized space. Therefore, the principle contained in Article IV regarding the Moon and other celestial bodies cannot be expanded to space in general. Moreover, it must be acknowledged that Article IV only prohibits the use of nuclear weapons and other weapons of mass destruction and not the use of conventional weapons. Moreover, it has been argued that weapons of mass destruction, which are mainly nuclear weapons, are only prohibited in orbit. But weapons may be carried through space, for instance by way of long-range missiles.

One expert also pointed out the importance of defining the meaning of “peaceful.” Does it imply simply non-aggressive uses, or does it exclude all military activities? This issue involves the problem of the dual-use nature of space, one example of which is GPS, which had been originally developed for military purposes but is now also used by civilians for navigation, ATMs, cell phones, and more. This example applies to many other space technologies.

Another important distinction raised was the difference between “militarization” and “weaponization.” One expert argued that the line of weaponization, defined as the use of weapons in space, has not been crossed yet. There have been no weaponized attacks in a conflict in space; weapons have only been tested in space so far. But other experts questioned this conclusion and argued that it was debatable whether the line has been crossed or not because there are many ways of attacking or interfering with a satellite other than with a kinetic strike weapon. One of the

attendees emphasized that the near-universal agreement that “peaceful purposes” includes many military activities so long as they are not aggressive can be illustrated by the recent shift in Japan’s approach. For many years, Japan had argued that “peaceful purposes” prohibits all military activities; however, it recently decided not to limit itself more than necessary and expanded its definition and its space capabilities accordingly.

One of the experts also pointed out that the concept of stability might be useful when discussing the weaponization of outer space: we should be looking to develop a stable domain rather than trying to define the limits of weaponization.

b) The Role and Impact of the Outer Space Treaty

A debate arose as to whether the Outer Space Treaty is a treaty of principles, setting only aspirational goals, or whether it is a law-making treaty. There was a majority agreement that the treaty is more than merely aspirational but that there are some obligations that are weaker than others in their formulation. For instance, the Outer Space Treaty does not prohibit the use of anti-satellite weapons. Another expert added that the Vienna Convention tells us how to interpret the treaty, including the need to look to its object and purpose. Given the context in which the treaty was negotiated and the language it contains, even the weaker more “aspirational” terms must be considered to have effect in the sense that the intention was to prevent an armed conflict taking place in space. The experts agreed that as a matter of policy we should continue to prevent this from taking place, even as many countries are preparing for the eventuality.

Another point of discussion was the explicit reference in Article III of the Outer Space Treaty to the UN Charter. According to article 2(4) of the Charter, the use of force is prohibited unless authorized under Chapter VII by the UN Security Council, or unless in lawful self defense under Article 51. The difficulty is defining what constitutes an attack under the Charter when it comes to space activities. This question was left for further discussion in the role play in session 5. The question was also raised whether the Outer Space Treaty is applicable at the same time as the law of armed conflict/international humanitarian law, or whether the latter overrules the treaty as *lex specialis* (according to the rule of international law that a more specialized law overrides a general law). This notion, however, was not agreed upon by most of the experts. Rather, it was pointed out that the Outer Space Treaty is a law-making treaty that stays in effect during armed conflicts. For example, the first Gulf War is often referred to as the first “space war” because technologies played an integral role in military operations for the first time, and the Outer Space Treaty remained in force. The question is merely how to integrate these bodies of law, especially if an armed conflict reaches into the space domain.

Another expert added that according to Article I of the treaty, the use of space shall be carried out for the benefit and in the interests of all countries: it was therefore argued that the kinetic attack of satellites would be counter to the benefit of many nations.

To organize the foregoing arguments, one expert proposed distinguishing between *jus ad bellum*, which concerns the legality of the use of force, and *jus in bello*, which concerns legal rules during an armed conflict (i.e., the law of armed conflict/international humanitarian law). *Jus in bello* rules are neutral on the issues of whether the armed conflict was begun lawfully or who the aggressor was. Because the UN Charter aims to prevent armed conflicts, the “peaceful purposes” principle should play an important role in the prevention of war. But the principle may not be consequential during an armed conflict, when it may become permissible to use space technologies in warfare.

c) The Lawfulness of Targeting Satellites

Regarding the question as to whether satellites can be legitimate targets in war, one expert argued that under international humanitarian law, anything that falls under the definition of a military objective can be targeted, and a satellite providing services for military operations could therefore be targeted. According to another expert, however, this statement is only partly true because there are also other requirements under international humanitarian law, such as the proportionality principle: targeting of a dual-use satellite may have disproportionate collateral damage. Furthermore, the kinetic destruction of a satellite is likely to be disproportionate to any military advantage because the space debris resulting from such destruction would be uncontrollable. The experts agreed that this decision mainly depends on the factual circumstances, however.

One expert expressed the view that states usually have an interest in not attacking satellites. After all, States might be deterred by the thought that their own satellites might be targeted as well. Given the fact that satellites have not been destroyed during any terrestrial armed conflict, although they could have been targeted, it was argued that there is a *de facto* agreement not to attack satellites during armed conflicts. Many experts disagreed with this proposal, at least regarding the development of legal norms. It is important to keep in mind, though, that there are many non-kinetic ways to target a satellite, including cyber, laser, or radio interference with the satellite itself or with the ground station with which it communicates. There might be a political norm not to attack, however.

Asked whether any State has ever been accused of violating the Outer Space Treaty, the experts answered that China had been accused of violating Article IX of the treaty when it undertook what is generally understood to be an anti-satellite weapon test in 2007, destroying one of its own defunct satellites and creating an enormous amount of debris in the process. Moreover, it has been argued that countries do not really want new norms and regulations. Another expert criticized the assertion that there is no appetite for new norms, and argued that there should be one for crystalizing norms. Although it might be difficult to find agreement among all States, one expert argued that it is already helpful to bring together a subset of larger States. There should be collective recommendations, and even the U.S. military would favor more clarity on existing norms, according to the expert. The example was given of the current project to develop the Woomera Manual on the International Law of Military Space Operations. This manual, like manuals before it on international humanitarian law applicable to warfare at sea, in air, and in cyberspace, can reflect existing customary law, based on State practice and *opinio juris* (the belief of States that they are under a legal obligation to behave in a certain way). These Manuals do not represent the development of new norms, but rather the clarification of how existing law applies in new situations, such as in the space domain.

d) Legally Binding Norms and Non-Binding Norms

As one expert pointed out, there is a difference between policy norms and legal norms. It might be that States do not even have to go as far as recognizing new legal norms because policy norms may be sufficient. Accepting policy norms can be understood as a pragmatic standpoint because there is an interest to avoid weaponization and the targeting of satellites. Some experts, however, raised doubts regarding the usefulness of non-binding norms, especially because policy norms are often weak in the security dimension.

It was pointed out that there already are several normative (non-binding) agreements in place, namely three sets of recommendations as well as two guidelines on the Long Term Sustainable Use

of Outer Space, developed by the Working Group of the Committee on Peaceful Uses of Outer Space (COPUOS). Guideline 6 seems to be especially useful because it stipulates that *space* is to be used only/exclusively for peaceful purposes—this goes further than the Outer Space Treaty which only specifies that the Moon and other celestial bodies are to be used for peaceful purposes. Therefore, it is not correct to say that we need to come up with new rules. Rather, we must examine whether and how States have implemented these existing norms. The Outer Space Treaty will not be the last word.

Another concern raised is the changing technological environment in space and the question of whether law has taken these changes into account. When the Outer Space Treaty was developed, there were only 24 satellites in space. Today we are much more dependent on satellites, and there are many more actors in space, both States and commercial actors. We need to think about norms in a different way than the treaty norms of the twentieth century.

e) International Responsibility for all “National Activities in Space”

With this in mind, and in anticipation of the third session about the commercialization of outer space, one participant highlighted Article VI of the Outer Space Treaty, which requires States to “authorize and continually supervise” all national activities in space, including commercial and private activities. It was argued that Article VI is law-making but not self-executing, meaning that the treaty must be implemented into national law. Therefore, domestic law controls the legal boundaries of private enterprises like SpaceX. Another expert argued that at some point we can anticipate private military corporations operating in space, although the Outer Space Treaty does not mention those. The response by most of experts was that Article VI is still important because the State remains liable for private entities in space. A private person may breach the treaty, but the State will be liable.

With regards to prospective commercial activities in outer space, one participant inquired whether there has been a threat to the non-appropriation principle in the Outer Space Treaty. In particular, the question was posed whether it has become easier to appropriate space due to technological changes, and whether there could be a market in satellites. Although satellite space cannot be traded, there still could be a secondary market.

The attendees expressed their agreement with these questions, and one of them pointed to the fact that there already exists a market in satellite rights when it comes to communication satellites and international radio regulation. Moreover, there is a secondary market in radio frequency rights. National rules deal with this issue in two ways: either the frequency rights allotted to a country by the International Telecommunications Union (ITU) are assigned according to a planned spectrum, or there is a “race to the courthouse” phenomenon. Usually, the more technologically advanced the State is, the more rights have been allotted to it. This can be considered as a form of appropriation. It might be said that this system is unfair and that we need a different solution. Another participant noted, however, that orbital rights are not held in fee simple and that one cannot trade rights allotted by the ITU. Rather, there is a licensing administration, and there will be a private law agreement between the competing entities, which allows one entity to use the other’s rights. Moreover, there are agreements to withdraw a competing filing for a particular frequency right, in exchange for a

certain amount of money. To clarify, it was noted that the ITU does not allocate physical space but only the use of an orbital slot and of radio frequencies. It was argued that because there are no property rights, the use of the word “appropriation” does not fit in these circumstances. Also, the long-term use of the same orbit does not constitute appropriation.

According to one of the experts, the ITU legal regime is not much different than the regime allowing deep seabed mining or fishing on the high seas. The fact that the treaty itself does not allow appropriation does not mean that States cannot agree to it under a new legal regime. It was argued that asteroids should be allowed to be mined as fishing is allowed in the seas. Others disagreed with this proposal because of the lessons learned from over-fished oceans. There is currently a debate among international lawyers with respect to property rights regarding the resources obtained in space. The United States passed the “SPACE Act” in 2015, asserting that it would protect exclusive rights on U.S. entities to extract, use, and sell resources in space, and Luxembourg followed suit with a similar yet more expansive law. Some lawyers argue this is not in breach of the Outer Space Treaty; others argue that it is. It was noted that the developing world takes the latter position. In sum, there is no universal agreement on whether one obtains property rights on resources obtained in space.

SESSION 2: Strategic and Ethical Space Security

This session focused on how to apply an ethical analysis to decisions that raise security dilemmas in the space environment. As one speaker noted early on, what is ethical depends on what framework one is using. The domains of cyber and space provide new challenges, and we turn to ethics because it provides a grounding from which to move to policies and laws, and a foundation upon which to make decisions about whether to pursue certain paths.

a) The “Trolley Problem” and Utilitarianism

To provide an illustration, the “trolley problem” was introduced, which is a common thought experiment in applied ethics. Imagine you are the driver of a street trolley (or tram or bus) moving toward five tied-up (or otherwise incapacitated) people lying on the tracks. You have the option to pull a lever, which will redirect the trolley onto a side track, and the five people on the main track will be saved. But there is a single person lying on the side track. You have two options:

1. Do nothing and allow the trolley to kill the five people on the main track.
2. Pull the lever, diverting the trolley onto the side track where it will kill one person.

Which is the more ethical option?

The problem is introduced to illustrate a dilemma such as when a satellite is about to fall to Earth. It might be possible to steer it away from populated areas, but it might also be possible to steer it to take out an enemy target, thus serving a national security interest. Some participants felt that this did not provide a true dilemma and that no moral expertise is needed to decide that the course of action to take is that which prevents civilians being injured or killed. As other participants pointed out, though, it is more difficult when a decision-maker sees no problem in harming a very small number of civilians if the military advantage is sufficient.

One participant suggested that the U.S. Air Force's destruction of defunct satellite USA-193, in response to China's destruction of its own satellite in 2007, was a signal to the Chinese that we, too, have a kinetic anti-satellite capacity. If assuming that this was the purpose of destroying USA-193, what are the ethics of creating a situation that creates further space debris and possibly contributes to an arms race for the purpose of making a statement? Instead of redirecting the trolley, you are creating the trolley.

Some saw the trolley problem as an easy way to walk through the utilitarian approach, which rests upon the belief that the course of action that leads to the greatest good for the greatest number of people is the morally justified thing to do. It is consequentialist. But there are variations on the thought experiment that often prove troubling. For example, it is not often seen as acceptable to harvest the organs from one healthy person to save four others in need of organ transplants. These situations are not as self-evident as they seem, and the ends in our culture do not always justify the means.

Some moral philosophy experts pointed out that utilitarianism is not just about the ends justifying the means. For example, deontologists might say that the trolley driver should kill the one person to save four. The numbers may count when it comes to weighing up the likely effect of an action on civilians.

One expert pointed out that it is difficult to predict the consequences of kinetic attacks in space because it is impossible to limit the effects; therefore, we cannot only look at consequences to determine the ethics of an action. As an alternative, this expert recommended contractarianism, which holds that persons are primarily self-interested and that a rational assessment of the best strategy for maximizing their self-interest will lead them to act morally. Anyone who has signed a contract—or in this case, a treaty—is prepared to have it enforced, and this eliminates abstract questions. If everyone obeys the same rules, then nobody is impacted negatively.

b) The Ethics of "Space Dominance"

There was some agreement that the most pressing matter is to examine the general posture of the United States and its allies in space from an ethical perspective rather than examining specific actions or decisions. Recent U.S. space policy states explicitly that the United States should dominate in space and deny adversaries their use of space. The discussion therefore focused on the ethics of space domination as a bigger policy question. This was also considered useful because of the unintended consequences like escalatory effects. Other countries respond to this posturing by taking a more offensive stance with respect to protecting their space assets and developing technologies to threaten the United States and its allies. There is a high tendency toward escalation and, as has been learned over several years of wargaming a particular space scenario, a rapid leap to nuclear war is likely.

Many experts agreed that the notion of space dominance is a dangerous posture to take on. As one expert explained, "dominance" means no one else acts without your permission, and this is not the most prudent nor feasible rhetoric. A lesson can be learned from the shift in thinking about the air domain. The U.S. Department of Defense used to talk about "air dominance," but in the last decade the shift has been to "air superiority": we can act in our interests and want to deny adversaries the ability to act against us but not deny them ability to act in their own interests. This is how the United States should think about space superiority as well.

It was also pointed out that the Outer Space Treaty guarantees access to and use of space for all. If dominance means denying others access to space or denying them the ability to act without our permission, then it would be in breach of the treaty. Moreover, it would lead to instability in space, which leaves the United States even more vulnerable because of its high dependency on space-based technologies.

It was agreed that precaution should be a key principle. It is important to consider likely international reactions against an attempt by the United States to pursue space dominance.

c) Weighing Values in the Space Domain

One speaker asserted that there are clear values and ethics in conflict, which are reflected in the laws of armed conflict; however, there is no obvious framework for how to weigh these values against each other when they compete. One expert reported that there have been extensive ethical debates in the Schriber wargames, which focus on space scenarios, and that ten years ago President Obama stated that he did not know how to win a war in space without “trashing” space. This demonstrates that the ethical dilemmas weigh heavily and that there is some awareness that impacting the space domain in a kinetic conflict would lead to widespread harm.

One option is to turn to traditional “just war” doctrine, which has three core principles: right authority, right intention, and reasonable prospects for success. Recently, many consider the responsibility to protect to be an added obligation in determining whether an offensive action falls under “just war.” The Tallinn Manual on Cyber Warfare refers to the just war doctrine, and it was suggested it could be useful in space as well. Another participant argued that the problem is always how objective an actor can be when assessing the right authority and right intention, given that there will always be a political interest behind claiming that a war is just.

The question was then raised whether conduct that is below the threshold of hostile activities should be measured by different ethical principles, e.g., conduct with temporary, reversible effects. There was no clear agreement among participants, and some felt that there is a blurred line because it is difficult to predict the consequences of an action in space. If a particular outcome can be predicted, then it is easier to weigh up consequentialist or utilitarian approaches. But if there is a wide range of unpredictability and of unintended consequences, which can be the case in the space domain, then there is a heavier burden.

One technical expert clarified that many temporary, reversible actions aimed at affecting satellites are not space activities. For instance, jamming a GPS signal is an activity that affects ground stations, not satellites. This is classic electronic warfare. Other interferences such as blinding (preventing satellite from performing its imaging functions) or dazzling (disrupting or damaging a satellite sensor) may impact a satellite more directly. Blinding does not happen routinely and dazzling requires a direct aim, however.

More than one expert emphasized that the ethical dilemmas in space-based conflict does not only arise when considering kinetic attacks on satellites. If the GPS network is hacked for a single day, there is collateral damage even though the effect is temporary and reversible.

One participant stated that when it comes to space security the key question is exactly what threats are viewed as central. Countries do not agree on what constitutes the biggest threat, and this impacts their posture and the ways in which they weigh up ethical considerations. The United States and its allies have environmental concerns and concerns about non-kinetic interference. For many other

countries like China, Russia, and Brazil, overt weaponization of outer space is seen as the most destabilizing element. This disconnect contributes to lack of agreement on ethical policies.

d) Crisis Stability in Space

This disconnect was reflected in the discussion on crisis stability as well. One participant stated that space is very asymmetrical because of the range and number of actors. If as a State you believe you are in danger of losing certain capabilities, then you may conclude that you must “use them before you lose them.”

It was asserted that the Russians and Chinese are moving towards information warfare. Both in the space domain and in other domains, there is an organized approach to developing various technological means to interfere with the capabilities of the United States rather than developing kinetic threats. This creates a different challenge when assessing the ethics of their actions and of possible responses. Where is the line between escalatory behavior and acceptable behavior?

One participant argued that the United States’ “Do as I say, not as I do” policy with respect to other countries developing capabilities is not necessarily a bad thing. The United States has taken on vast international security responsibilities and should not be ashamed of the so-called hypocrisy of having a nuclear weapons program and preventing others from having one, or of developing certain capabilities in space and seeking to deny others the same. In opposition to this view, another participant argued that even if the United States sees itself as having larger security concerns than other countries, this is different from how other countries see the role of the United States. Not everyone wants the United States to take on the role of global police—in fact, very few countries would agree that the United States should have a “do as I say, not as I do” policy. It is considered to be wholly unethical and destabilizing in the current return to a multi-polar distribution of power.

As one expert put it, at the core of this difference is the problem that space is “offense dominant” today, and this is exactly what creates crisis instability. The actor who moves first has the immediate advantage, but this is instantly escalatory. We should be aiming to change it to a defense dominant regime, which provides time and the opportunity to de-escalate situations. This shifts the focus to the state of our capabilities rather than upon the domain itself. This is not the approach that the United States is used to, but as a key strategy, creating a defense dominant regime would lead to more stability in space.

SESSION 3: Commercial Actors and Space Security

The expert leading the discussion started the introduction with an overview of the SIA study about the State of the Satellite Industry in 2017. This report has been published annually for 20 years, and according to the expert, it is usually designed to make the data look impressive. This study represents the largest picture of the satellite industry. There was an early period of strong growth in the satellite industry, which correlated with hostilities in international politics.

The study now also includes services like SpaceX and other commercial actors. Important changes in the commercial use of space are, on the one hand, the fact that launches now take place in a lower orbit and, on the other hand, the growing interest in smaller satellites. Furthermore, the focus on space traffic management has started to arise, which is due to a growing number of operators in

space. Finally, in the foreseeable future, there will be more tourists in space and more long-term habitation. Given these tremendous changes, one important question for governments is how these activities should be carried out to comply with the Outer Space Treaty.

The expert also pointed out the marketing term “Mega-Constellation,” which implies that there will be thousands of space vehicles in the future and that companies like Google will use thousands of satellites in constellations to service large areas of the Earth. This scenario will require many launches likely to make space even more congested. Also, the possibility of collisions increases under this scenario

Another important issue gaining more attention is how data about launches and satellites are collected and shared. The Space Data Association (SDA), a non-profit private organization founded in 2009, plays an important role in this respect. SDA’s main purpose is to collect satellite orbital data and to give collision warnings. This mission is similar to the U.S. government’s SSA program. The SDA plays an important role for both commercial and military purposes.

a) Defining “Commercial” Actors and Activities

The question was posed how to define the term “commercial.” Does this term relate to customers, to intentionality, or to market risks? If the latter, many companies that serve the government as their main client would not be commercial because they do not really bear the final risk-- the government does. Another important factor is that commercial actors value technology but can also be personality driven. Moreover, there are different views towards nationality: commercial actors can be global citizens as corporations, but they also can engage in forum shopping and choose the regulatory regimes most favorable to them. Finally, another concern is the pragmatic short-term approach many commercial actors pursue, which can create risks for States because of the States’ liability for private actors. The lack of long-term responsibility on the part of commercial actors might also lead to environmental problems.

One of the experts proposed not to use the term commercial at all because it has different meanings in different countries, and because it might also get confused with the term of commercial sales. However, the expert agreed upon the assertion that commercial actors only have limited risks because they place themselves in a position where the governments will rescue them if they fail.

Experts raised the important distinction between privatization and commercialization because privatization implies that the government had owned the unit before selling it to a private actor. Many space entities started off with a governmental function, but this line might be blurred now because “it is all about the money.” Another expert offered an example that illustrates the distinction—the Landsat Satellite System, which was sold to a private company under heavy restrictions, and which was later returned to a government-owned program. Another example is the French space agency, which could be considered commercial according to one of the participants because of its commercial space launch competitiveness.

It was pointed out that one important problem with commercial actors in space is that they benefit from entering into markets that have been created with public investment because the entire launch infrastructure was governmentally funded.

It was also pointed out that the expectation of profit is usually driving innovation. It must be acknowledged, though, that the incentives in the commercial uses of space are different from other commercial uses. Normally companies invest to create a product, and as soon as it starts selling, the company will get paid. In space business, however, this is different because of governmental contracts stipulating that the company gets paid along the way but ceases to receive returns as soon as the project has finished. The experts acknowledged that this system drives behavioral choices.

b) State Responsibility for Private Actors

One basic issue raised by the experts is the relationship between commercial actors and governments and the government's obligation to implement treaties. As already discussed shortly in session 3, according to Article VI of the Outer Space Treaty, States are liable for private actors in space. There was disagreement among the experts, however, as to the precise scope of Article VI. Governments must authorize and continually supervise private actors for the private sector to be active in space, but it is up to each State how to implement its system of authorization and supervision. In the United States, there is a licensing system. These licenses contain conditions, and the United States is trying to fulfill its obligations.

One of the experts inquired how this State liability relates to other areas of international law and whether there is a general obligation to police commercial actors in international law. The experts agreed that space is special in this respect because Article VI connects State and private actors. One of the experts also cautioned not to confuse Article VI (Responsibility) and Article VII (Liability) of the Outer Space Treaty, especially in the English version as opposed to the French and Spanish versions, which seem to be clearer. Some discussion ensued as to the difference between these terms, because in the Anglo-American legal tradition the distinction may not always exist. According to one expert, in the early days of the treaty any distinction between Article VI and VII was not important because only the United States and the USSR had launching capabilities when the treaty was signed. This has changed, however, and now there are 13 launching States, some of which also launch for other countries.

Another problem raised by one of the attendees is the non-availability of proper insurance. In particular, there is a cap in insurance coverage in the United States, which means that the government has to cover the rest. The availability of insurance policies is therefore another reason for forum shopping.

c) Regulating Commercialization

Although there has been an important dynamic towards the commercialization of space, one expert pointed out that there is also an anti-commercialization taking place. The expert analyzed that the leaders of the U.S. government are highly interested in commercializing space industry, as are the users. But one serious problem is that oftentimes the government lacks the vision for commercial uses of space, and it does not want disruption to their governmental programs.

One of the attendees emphasized the previously mentioned point that many so-called commercial actors have a low risk profile. In particular, the expert argued that although the profit of commercial actors in space is only a small percentage, it still pays off because there is no real investment by the shareholders and, therefore, no real risk situation.

Another essential issue raised was the ethics of commercial actors and how these are linked to the different cultures they come from. One expert pointed out the different constituencies taken into

account in corporate governance: should we only protect the shareholders (like in the United States) or also other stakeholders like employees (as in the EU)? Another expert raised whether there could be a dilemma in communication because these different definitions of terms. Moreover, even basic ethical theories like utilitarian approaches could be measured differently in different populations. One expert proposed to find a solution to this problem on the State level when implementing the treaties' duties into national law. Therefore, implementation of the treaty might vary in different States. Another expert pointed out that even the way in which ethical questions are framed can differ among countries, e.g., ethics in the United States and the EU are different.

Picking up on the issue of business ethics, one expert argued that if the United States adopts new rules to deal with this problem, it is likely that other States will follow the U.S. model. Therefore, the expert suggested that the United States has the opportunity to write the rules and determine what they will be in other places in the world. On the other hand, another expert raised the point that companies in Silicon Valley do not want to be regulated because they have a "free for all attitude." They are also following a "free move rationale." By contrast, governments want safety and want to avoid liability under the treaty.

One of the attendees answered this question with an anecdote by Judge Easterbrook and his scholarship on the "Law of Horse." There are three criteria to make a deliberate decision: 1) make rules clear; 2) create property rights when there are none; and 3) facilitate the formation of bargaining institutions. The expert proposed the following questions: What is needed, what is missing, and how to get there? According to this expert, there should be a private-public partnership because the industry wants to be innovative and the government also benefits.

One important issue raised by the experts is whether the United States is currently in violation of Article VI of the Outer Space Treaty and whether current U.S. law is sufficient to meet the international obligations. Although the United States has regulated the licensing, once the satellite is in orbit, there are no regulations any more. If Congress decided to introduce new regulation, however, it is likely that countries will engage in forum shopping, e.g., in Luxembourg. Another big problem under Article VI might exist for consortium satellites. This issue has not been fully examined, according to one of the experts.

One of the experts disagreed with the assertion that there is currently no court available to decide about conflicts in space liability. The expert pointed out that the Court of International Arbitration adopted optional rules for State activities in 2011 so there already is a mechanism in place, although it is optional. As another expert pointed out, the International Court of Justice (ICJ) remains the primary court for international disputes between States, and as regard the interpretation of treaties.

Altogether, one of the attendees argued, space is not that different from other areas of the law, but we do not have that much experience with it. For example, the liability convention has never been treated in litigation. Rather, it has been cited only once by Canada in a diplomatic letter when Canada asked Russia to pay \$6 million and to give technical information after a crash of a Russian nuclear-powered satellite on Canadian ground in 1978. Russia responded by agreeing to pay \$3 million, but they did not provide the technical information. Another example is the crash landing of parts of the U.S. Skylab in Australia in 1979. The United States, however, has never paid for this incident. These examples show that the political cost of litigation might be too high, especially at the ICJ.

d) How a Space-Based Conflict Would Impact Commercial Actors

One expert raised the question whether there is agreement on the assertion that the commercial industry has a vested interest in avoiding an armed conflict in space, because they are dependent on the sustainable use of space, and whether the Article VI concern is different in this context. One expert argued that commercial actors care about their market acceptance and their brand. Therefore, the companies will not engage in activity that serves business risks. However, the companies probably do not care much about national security risks, which is why the governments still play an important role. As a current example, the expert raised the IP theft occurring in China and the strategic defense strategies. In China, many companies are called commercial, but they really are not because they get a special treatment by the government. This might have an impact on competition law because of its potential long-term effects. Another issue raised is the importance of monitoring M&A transactions because there is no organized way yet to do so.

Another expert raised the question whether private companies would be better left on their own without regulation because there might be a slippery slope into space warfare. The expert pointed out the problem that the uncertainty about who is liable and/or responsible for private actors might lead to more international conflicts, if there is disagreement regarding liability. This theory was met with agreement by some experts, with reference to situations in the past where uncertainty as to liability led to increased tensions. For example, the Russians argued that the United States was responsible for the collision between the U.S. Iridium 33 satellite and the Russian Cosmos 2251 satellite in 2009. But as another expert pointed out, this situation was resolved by increased transparency because after this incident the United States has increased its SSA sharing to avoid these conflicts.

Another expert emphasized that the launching State remains liable for the satellite even if it is subsequently sold. Ultimately, the launching State can be held jointly or severally liable. This is one of the reasons why, for example, the Netherlands does not want to register as a launching State. The experts also raised the issue of space debris and whether States are also liable for the caused damages. In theory, the country who owns the space debris should be liable, according to one expert. The problem with this theory, however, is that attribution of most space debris cannot be traced.

Another expert opined that private entities prefer regulation because as soon as there are three or four actors in space, they believe there will be management problems. The expert pointed out that there is no convenient authority to register yet.

As a final remark, one of the experts raised the theory that space law is not that different from the law applicable to cyber operations and that parallels may be drawn from one to the other. In both areas of the law, the State is liable for private actors.

SESSION 4: Intelligence and Counter-Space Technologies

The session began with the presentation of a graphical modelling of the 2007 Chinese ASAT test. Due to the amount of debris that was created by this test (approx. 3,000 pieces of trackable debris

larger than a golf ball and an estimated 150,000 debris particles²), an international consensus has since arisen that kinetic destruction of satellites is undesirable because it is a lose-lose situation: creating significant new space debris puts all satellites and their ability to operate at risk.

The Shijian 17 (SJ-17) event was also discussed and demonstrated with a visual graphical model. In 2017, SJ-17 (SATCAT 41838), an experimental Chinese geostationary satellite, practiced rendezvous maneuvers with Chinasat 5-A (SATCAT 25354), a commercial GEO satellite. The consensus concluded that China is developing a GEO rendezvous capability.

Following these visual presentations, a briefing was given of the independent report produced by Secure World Foundation on global counter-space technologies.³ It was remarked that increased reliance on space assets necessitates decreased "classification" and open discussion, thus elevating the importance of open sources upon which the report is based.

a) Survey of Counter-Space Capabilities by Nation

According to the Secure World Foundation report, there are five categories of counter-space measures: direct ascent; co-orbital anti-satellite weapons; electronic warfare; directed energy; and cyber. In this survey, current and near-term capabilities were examined. Where possible, budgets and leadership views regarding these assets were also examined. The evidence shows a broad range of kinetic and non-kinetic counter-space developments in multiple countries, although only non-kinetic capabilities are actively being used in current military operations.

China. Evidence indicates China is making a sustained effort to develop a system that could lead to a co-orbital intercept, although such a system has not yet been used. China has mature capability to reach LEO. Capability against deep-space targets is only experimental, not operational in the near future. China's official statements are that space must be for peaceful purposes, but privately, China has designated space as a military domain, including asymmetric warfare. It is not currently using counter-space capabilities in military operations.

Russia. Over the last decade, Russia has embarked on a set of programs to re-gain its Cold War capabilities. It has tested close approach and rendezvous technologies that could lead to co-orbital intercept capabilities. Russia has a multitude of systems to jam GPS at ground level but apparently no capability to jam satellites in-space. It has revived a program with the goal of developing an airborne laser able to target the optical sensors of imaging and reconnaissance satellites. There is no indication that this program is operational, however. Russia is also vying for information dominance. In space, Russia is seeking to mitigate U.S. superiority by fielding a number of ground, air, and space-based defensive capabilities.

United States. For several decades, the United States has established non-public policies. Most administrations since the 1960s have authorized the development, and in some cases deployment, of counter-space capabilities; however, these have been limited in scope. The United States has conducted multiple tests of both GEO and LEO intercepts. It has never acknowledged a program to develop co-orbital capabilities. Some of its anti-missile assets might be used in anti-satellite capacity. The "Counter Communications System" is an operational jamming capability against GEO satellites.

² <http://www.centerforspace.com/asat/> (accessed 7 May 2018).

³ Briand Weedon and Victoria Samson (ed.s) "Global Counterspace Capabilities: An Open Source Assessment", Secure World Foundation, April 2018, <https://swfound.org/counterspace/> (accessed 7 May 2018).

Iran. Currently, Iran has a nascent space program with little military motivations. It is important to note, however, that Iran has strong electronic warfare capacities that can be used in a space context as well.

North Korea. Currently, North Korea has no capability to mount an attack on U.S. assets. It has also never suggested intent and is not currently motivated to do so. Capability against U.S. military GPS is not known. Some participants commented that despite its well-known missile capability, North Korea's counter-space capabilities are not very strong. Beyond a launch capacity, such capabilities demand extra infrastructure, e.g., an equivalent of the Space Surveillance Network.

India. With over five decades of civilian space experience, India recently shifted to military capabilities. Long-range ballistic missiles might represent future ASAT capability. It was remarked that it is possible India may be able to perform a kinetic anti-satellite test, and that, if it perceives the emergence of an international legal ban on such tests, it may do so rapidly to fulfill such a test before deemed illegal.

It was noted that Israel will be included in a future study.

b) Cyber and Alternative Capabilities

Following the presentation of the Secure World Foundation report, discussions ensued on various related capabilities. It was remarked that actual information in the public domain is limited when it comes to cyber capabilities. The United States, Russia, China, North Korea, and Iran have all demonstrated the ability and willingness to engage in offensive cyber attacks against non-space targets. The question is whether this same ability and willingness extends to space targets.

One expert noted that in the case of cyber, and potentially in the case of space, there is clear trend towards lower barriers to access. This trend deserves attention and will likely grow, but there is still a very large difference between State and non-state actors.

Session participants noted alternative capabilities: the kinetic direct method for anti-satellite attack is quite effective, but it generates debris and requires tracking. Co-orbital close approach is a technology previously held by the USSR, which is now used for intelligence, and requires a markedly high level of technology. The temporary lasing or dazzling of satellites is already used by various actors. It should be noted, though, that these technologies can cause permanent damage similar to directed power blinding.

One expert noted that while there might be a "Third and a Half" domain (or exoatmospheric), which encompasses objects that come down from space into the atmosphere, most actors do not currently have such capability.

Participants further noted that the question "are they going to use it?" is more important than "do they have it?". We need to measure the likelihood of a system being used; the information presented in this session might seem misleading otherwise. While intent is difficult to register, the next step is assessing it based on intelligence.

c) Why Are Nations Developing these Capabilities, Other than to Use Them?

Multiple experts emphasized that the United States must work with all nations. One of the reasons nations develop ASAT capabilities is to not get too far behind the United States; another concern is the link between nuclear deterrent and ASAT capabilities. These nations want a deterrent against U.S. strength like naval or air strength, for example. The American quest for superiority drives other nations to catch up as well as a potential ASAT arms race.

Sputnik and Apollo proved that prestige is an important driver of technology and policy, similar to building an artificial island. One participant asserted that China has felt humiliated for the last century and a half, and now it is displaying the impressiveness of its technology. China and other countries cannot compete with the United States in tanks and artillery, so they compete in space. They get greater prestige in space, but what other advantages do they derive from it? This was left as an open question.

d) The Effect of Space Capabilities on Terrestrial Conflicts

As more than one participant noted, the 1991 Gulf War is often designated as the first space war. In fact, it was a conventional battle with *some* intelligence from space. It included very little satellite communications. A decade later in Iraq and Afghanistan, we saw a much more violent war from afar because space capabilities improved significantly. Back in the Second World War, only 560 targets were struck with millions of bombs and thousands of casualties. In contrast, 860 targets were struck on the first *night* of the 2003 Iraq war while using space assets.

One expert spoke about Taiwan as a global flashpoint. Chinese military doctrine calls for defeating the superior with the inferior. The United States has an advantage over China, which is offset through asymmetric warfare. China is not interested in simply attacking the United States. As part of its space operations intelligence, the U.S. military has studied Russian and Chinese doctrine. These countries aim to have layered defenses. China has built their capabilities both to defend and to attack if attacked. The important thing to look at are Chinese and Russian perceptions.

Another expert noted that other nations are building counter-space capabilities so they can defeat even the conventional U.S. capabilities, taking out the eyes and ears of carrier battle groups.

e) The Legality of Space Military Capabilities

The critical question was raised as to the legality of ASAT capabilities. There was a consensus among participants that in principle, ASATs are legal so long as they exclude the placement of nuclear or other weapons of mass destruction in space, according to Article IV of the Outer Space Treaty. In this light, the United States has resisted discussion of space arms control for many years. There was also consensus that even if ASAT capabilities are legal under the Outer Space Treaty, they must still stand the test of the law of armed conflict. For instance, non-discriminatory weapons are illegal, and the use of any weapon must be against a lawful target and must be proportionate, including any collateral effects. When creating a piece of debris, is that creating an indiscriminate weapon? Or is it creating an environmental impact that would be unlawful under the law of armed conflict? And would it have effects on other satellites, in which case it would probably no longer be proportionate? As one expert argued, these questions must be asked on a case by case basis to determine the legality of any given weapon in space.

One expert pointed out that there are also other mechanisms that are not technically considered ASATs, which may breach other legal rights. For instance, under the International Telecommunications Union (ITU) legal regime, one can register a satellite and then have the right not to be interfered with. In 2009, after BBC World broadcast content into Iran to which the Iran government objected. Iran interfered with the broadcast signals using electronic measures, and the BBC successfully argued that Iran's action was illegal under the ITU rules. The ITU is somewhat limited in sanctioning possibilities, but the clear statement that the interference was illegal and the public call on Iran to cease jamming had a strong public shaming effect.

f) The PAROS Treaty and Other ASAT Limitation Efforts

As another expert noted, there are continued efforts to limit the development of ASATs and prevent a space-based arms race. Since 1982, the UN General Assembly has adopted a resolution annually titled Prevention of an Arms Race in Space (PAROS). The resolution is limited in legal weight, though, because the General Assembly has no authority to bind any State to act or cease to act.

Some participants raised the question why the United States has not supported the initiative of China and Russia to introduce a treaty on the Prevention of the Placement of Weapons in Outer Space (PPWT). Is this merely to push back against the political interests of those two States, or is it because it is not in the interest of the United States to seek to limit anti-satellite weapons?

One expert responded that a treaty could limit only very narrow range of hardware because it is very difficult to define what exactly falls under a space weapon or an ASAT. It was pointed out that after its 2007 test, China did not undertake further tests. Rather, it made it clear that it also had missile defense capabilities, as did India. Dual-use technology might disguise ASATs as anti-missile capabilities. The United States will not agree to ban radiofrequency interference (RFI) because they do this themselves.

Instead, the expert suggested, we need to talk about *conduct*. It might be advisable to characterize certain satellites as linked to strategic capabilities—such as infrared early warning satellites—so that if someone interferes with those satellites, they might be exposed to unconventional retaliation. If someone interferes with a non-strategic communications satellite, which is used to control drones, should we have a different outcome?

One participant stated that the Conference on Disarmament does not do anything and is purely academic. In an ideal world, the Conference on Disarmament would negotiate those treaties under General Assembly supervision, but it has been stymied by its consensus procedure and its refusal to undertake this topic for decades.

g) Space Electronic Warfare

There was consensus among all participants that jamming of satellites is lawful and is a useful capability. The United States announced in 2000 that it has an unclassified communications jamming and dazzling program. Many nations do it, and we are "comfortable" with this technology existing and being used.

The question was posed by one participant as to whether it is lawful or acceptable to jam *from space* a satellite that interferes with one's space operations? One participant opined that it is not because the would-be jammer could defend its interests through ITU.

Another expert pointed out that whether something is wise does not depend on its legality. The question of whether such action is wise is crisis-dependent. When the United States performs spoofing, jamming, etc., it may escalate the adversary's strategic position all the way to nuclear war because it denies information to the adversary. One participant referred to Ashton Carter's book *Satellites and Anti-Satellites: The Limits of the Possible* (1986) about the paradox of successful arms control, which creates very good space-to-earth weapons. It is then that one needs ASATs.

SESSIONS 5 & 6: A Role-Play Scenario Exploring the Use of Force and the Law of Armed Conflict in Outer Space

In these two sessions, the participants were split into eight groups, representing four fictional States in a hypothetical scenario during which international tensions escalate into conflict (and ultimately a use of force) in outer space. The scenario discussion was modeled after military tabletop exercises as a capstone to the discussions held over the course of the workshop.

The scenario proceeded in three stages, with groups assessing a series of questions and presenting positions—from their assigned States' perspectives—in a model international forum. Groups were encouraged to embrace their States' legal and policy views, consider the collateral effects of their statements on their future options and those of their allies, and to react to opposing views in a realistic manner. While such an exercise cannot “solve” the legal and policy challenges facing States regarding potential warfighting in or weaponization of outer space, it can reveal essential questions and areas of consensus that can be built upon in future research and analysis to address these issues. After the exercise, a sub-working group of participants were asked to reflect upon the discussions, and they captured the following takeaways (or “lessons learned”) from the exercise.

a) Valuable Scenario for Discussion

This scenario discussion was a valuable exercise, especially given its interdisciplinary nature. The variety of experiences, backgrounds, and opinions led to a wealth of perspectives being shared on myriad issues that extended to military, civil, and commercial space actors. It was interesting to observe the difference between these scenario discussions and similar exercises conducted in the military sphere, as the latter tend to be conducted through a set of objectives and a pre-existing concept of operations to achieve training goals. However, this interdisciplinary exercise allowed participants to play different notional States and bring a variety of perspectives to the fore, sometimes dissimilar to one's own, in a collaborative discussion. The construction of the scenario permitted consideration of many key issues, including the characterization of actions in space and terrestrially, individual and collective self-defense, implications of the interface and integration of commercial assets in national space operations, and the interplay between commercial space actors, their State of registration, and contracts with additional States.

b) Multiple Overlapping Legal Regimes

This scenario illustrated the complexity of applying the multiple overlapping legal regimes that may apply to a situation of tension or conflict in outer space. These legal regimes include, but are not limited to, international space law, international telecommunications law, *jus ad bellum* (the law on the use of force, excluding armed conflict, but including countermeasures, retorsion, or other sub-force options), *jus in bello* (the laws of armed conflict), UN Charter and UN Security

Council Resolutions, domestic legislation, and agreements and arrangements (i.e., Coalition, Regional arrangements). The interpretation of these different legal regimes and their interplay is informed by the legal traditions in each State, which frames whether interpretations are “permissive” or “restrictive/prohibitive,” among other things. Additionally, the discussion illustrated that there was scant agreement on the definition of key concepts within these overlapping legal regimes. For example, it is not clear what constitutes “harmful interference” nor is there a clear definition of what level of activity in space constitutes a “use of force.” As some of these essential terms are not fully developed and agreed upon for other domains, it is hardly surprising that there is a lack of agreement in the space domain. The contemplation of the exercise scenario helped us to consider how those terms might be defined and what the impact of such a definition may be.

c) The Importance of Geopolitical Context

A comprehensive understanding of the geopolitical context of a scenario is critical to discerning the facts and different interpretations of capabilities, policies, and alliances and partnerships that underlie the assessment of actions in a given scenario. This exercise highlighted that to accurately and appropriately analyze a situation, it is important to coordinate at the intradepartmental, interdepartmental, intergovernmental, and international levels, especially in multilateral fora and with commercial actors.

d) Escalation to Irreversible Actions and Cross-Domain Responses

There was general agreement that the jump from cyber intrusion by a non-State actor (NSA) potentially connected to a State, to a State actor using cyber means to permanently disable a ground station within the territory of another State, was a rapid escalation of the situation. While there was no definitive conclusion as to whether this escalation was a “use of force” or “armed attack,” it was clear that at least a policy line, if not a legal one, was crossed with this escalation. The scenario further illustrated the capability and potential willingness of actors to respond to actions in a different domain (i.e., the response to jamming over DCRP of New Scotia satellites was to conduct a cyber action to permanently disable the ground station in DRCP).

e) “Keep Out” or Operational Zones

There appeared to be consensus that the creation of “keep out” or operational zones was worth further analysis and possibly pursuing as a matter of policy or non-binding norm. Certainly, the devil will be in the details of how this type of zone could come to fruition. Depending on how the concept is operationalized and whether it prohibits entry or is merely warning of a high-risk area, it may or may not impinge the prohibition on national appropriation set out in Art II of the *Outer Space Treaty*. To the extent that such a zone was asserted in a congested orbit such as LEO, it could be used to deny access to space to new or emerging players, which could be problematic to the free exploration and use of outer space (Art I of the *Outer Space Treaty*).

In examining the characteristics of such a proposed zone, consideration may be given to Air Defence Identification Zones (ADIZ), and Operational Zones as outlined under the Law of Naval

Warfare,⁴ as well as the practice and use of notices to airmen (NOTAMs)/notices to mariners (NOTMAR). In assessing the appropriate parameters of such a zone, consideration should be given to orbital parameters and maneuverability. Such a zone could merely be an area for warning of higher risk (e.g., prompting commercial operators to avoid them, particularly if their entry altered or voided insurance coverage). There may also be significant challenges if a zone is viewed as a “redline,” as such an interpretation could narrow the options available to respond from the outset and lessen the decision space available to military and national leadership. Using such a zone as a “red line” could also weaken a nation’s position if the zone were entered but without no subsequent response.

f) The Value of Space Situational Awareness (SSA) and Norm Development

Throughout the scenario discussions it became clear that there was strong support for improved fidelity of information through increased and integrated SSA, as it would increase the rapid characterization of activities in space and attribution. It was also clear that the development and implementation of norms was valuable in providing a baseline of acceptable (and unacceptable) activity by which to assess actions; and where those actions are inconsistent with norms, it may be an indicator of hostile behavior.

Furthermore, commercial SSA, as is being done by the Space Data Association, provides precise SSA information that might not otherwise be accessible to space actors. While increased SSA was broadly understood to improve operational safety, technical and practical challenges were noted, including: the quality of the database information, the reputability of the source, the accuracy of the information provided, the entities inputting the information, the cost of obtaining data and analysis, and any future ability to corroborate information using multiple sources.

g) Trust and Transparency

A common thread throughout the discussions was the need to build trust amongst space actors. Lack of trust and transparency undermines understanding, cooperative and positive actions, and can result in nefarious motives being attributed unnecessarily. Building trust is a key challenge in accurately understanding the intentions of other space actors, in furthering information sharing, and in working cooperatively to develop operational norms to promote safe space operations. Where trust and transparency among space actors is lacking, it may increase the risk of miscalculation due to misunderstanding.

h) Dialogue at Multiple Levels is Valuable in Maintaining Communication Channels and Avoiding Misunderstandings

As was seen in the scenario, the discussion of controversial actions at high level international fora can lead to a polarized exchange of views. However, as discussed by the conference participants, there is great value in maintaining military to military leadership channels at the tactical, operational, and strategic levels for liaison and cooperation in all domains. Such relationships provide an opportunity to have dialogue, build trust, assuage concerns of misunderstanding and

⁴ See San Remo Manual on International Law Applicable to Armed Conflicts at Sea, 1995, at p 27-28, 181-83.

discern intentions, which help avoid unnecessary escalation of a situation. In addition, diplomatic dialogue at the bilateral and multilateral level also serves to help build transparency and trust, as well as allow States to better understand opposing views.

SESSION 7: Harnessing International Cooperation

In the final sessions, the moderator began the discussion highlighting the tenets of cooperation, collaboration, and communication, which should be held as paramount by State actors and private actors as we continue to be more dependent on space technologies and space operations. Given the environmental challenges that are unique to the space domain and the exponential increase in the number and different types of actors in space, these tenets are necessary to avoid unwanted escalation of potential conflicts or friction. During this session, it was determined that the need for clarity and transparency in space is paramount to continued access to and use of space.

According to the speaker, increased transparency is something from which we can *all* benefit. Exchange of information, particularly in respect of space situational awareness (SSA) and space traffic management, must be encouraged on a greater scale for basic sustainable use of space. Also, greater transparency regarding both general capabilities and specific intentions with certain maneuver or technologies should be encouraged to reduce the risk of miscalculation or misinterpretation, thus reducing the risk of unnecessary escalation.

Furthermore, if each State actor's capabilities are known, an appropriate and proportional response will always be more likely than if those capabilities are shrouded in uncertainty and secrecy. On the other hand, this transparency may be viewed as a vulnerability. The challenge is how to balance the clear benefits of increased collaboration and communication (increased transparency) with the need to protect one's own space assets and the need to maintain some secrecy with respect to one's own capabilities. There was large agreement from the participants that despite this vulnerability, transparency will lead to better global security and potential for peace, which is ultimately the goal for all parties involved.

a) Diplomacy, Global Leadership, and the Role of the U.S.

As the space domain becomes more relevant in shaping global balances of power and forming alliances, the possibility for non-traditional U.S. alliances has become more viable. Past the traditional "five eye allies," there are other State actors whose alliance would be beneficial for all States' interests and advancement in the space domain. However, there may also be a tension, as numerous participants noted, with the continued increase in the importance of the role of private sector actors in space. Many commercial actors have a broader client base than one State and may have clients who have unclear relationships with the U.S. government.

One participant put forth the idea that diplomacy is the "missing ingredient" in the space domain and that without it, space security faces a serious threat. It was argued that the United States should act as a leader with a "rules-based system" approach to space and in so doing contribute to international security and a global order. Other State actors such as Canada should also "step up" and play a role in creating and maintaining a peaceful space system. The participant remarked, and the group agreed, that passivity will lead to conflict, so it is imperative to take up the responsibility of actively working towards peace in the space domain.

Another participant expanded on the role the United States has already taken in proactively considering the challenges presented by the space domain and attempts at coalescing space initiatives in the Department of State and Department of Defense. As this participant noted and others echoed, however, actions are always driven by what the budget allows, which can at times be constricting. One participant noted a “Make America Great Again” flavor to the latest National Space Strategy, which may make it more difficult to promote transparency and confidence building measures (TCBMs) at a national level such as launch notifications, budget information, and unclassified policy reports.

There was some debate in the group about the impact of the Trump Administration on the progress of space diplomacy. On one hand, some participants felt as though the United States has left a gap in global leadership in space by stepping away from a leadership role and refusing to support efforts such as the proposed International Code of Conduct on Space Activities (ICoC), an EU-led project, and the proposed Treaty on the Prevention of the Placement of Weapons in Outer Space, (PPWT) a joint proposal by China and Russia. The ICoC went through several iterations, culminating in a meeting hosted by the UN in 2015, but it was stymied because of critique of the Euro-centric process and the United States’ refusal to support it based on the code’s perceived restrictiveness. The PPWT has mixed international support, but the United States has long refused to support it because it is argued there is insufficient definition of a “weapon” in the proposed treaty and no verification mechanisms.

One participant commented that the United States may be hesitant to enter discussions over the PPWT for fear of limiting its own behavior. Another participant pointed out that this administration has demonstrated some continuity from policies of the several previous administrations and that it is not dependent on the political leanings at any given time. If anything, Mr. Trump has taken steps to promote a proactive mindset on tackling space challenges. The participant cited Mr. Trump’s “whole of government” approach of providing solutions to space challenges through the re-establishment of the National Space Council in Summer 2017.

A clear consensus arose that whatever reasons the United States may have for not being willing to negotiate a binding treaty like the PPWT or a non-binding instrument like the ICoC, it should propose alternative measures which it *is* willing to support. Rebuffing international attempts to create more collaboration without providing alternatives means that the United States is failing to take a leadership role.

b) International Transparency and Confidence Building Measures (TCBMs)

There was wide agreement among the group that the cooperation and inclusion processes necessary to successfully implement TCBMs internationally should stem from open table discussions led by the UN, an organization that provides an unparalleled legitimacy factor to space diplomacy. COPUOS is a UN body under whose auspices the existing space treaties were negotiated in the 1960s and 1970s. It operates on a consensus basis, however, making it very difficult for any decision-making, let alone advances in space diplomacy. Nonetheless, the UN was generally seen as the appropriate body for the development of TCBMs.

One participant proposed to the group the TCBM of prior notification of specific activities and maneuvers in space. This could be viewed as an expansion upon with Art IX of the Outer Space Treaty, which requires States to notify others when their activities may cause harm. The group began discussing the impact of definitional ambiguities in the space domain. Some participants were starkly divided on the idea that “any satellite can be a weapon” and the resulting uncertainty

in defining what a “weapon” is in space. After hearing from a diverse set of experts, the argument that any satellite could be used as a weapon seemed to gain more traction. One participant highlighted how the dual-use nature of satellites makes it difficult to regulate, understand, evaluate, and define. A possible definition of a weapon in space was proposed as any “transfer of energy with malicious intent.” In response to the question of definitions, one participant suggested that through verification articles and procedures written into future agreements, concerns stemming from definitional ambiguity could be mitigated.

Another participant stressed the distinction between controlling *hardware* in space and controlling *conduct* in space, claiming the second may be easier to police. It was argued that outlawing certain hardware will very quickly become obsolete as technology advances, and furthermore it creates loopholes that actors can abuse to justify unwanted behavior. This prompted a resounding agreement that government bodies are going to move too slowly on regulating norms and a code of conduct in space, both at the national and international levels, and that regulation must therefore come from the international community. One participant pointed out the success of this method, as the Space Debris Mitigation Guidelines came from exactly this type of process, under the collaborative work of the Inter-Agency Space Debris Coordination Committee (IADC). Similarly, the MILAMOS and Woomera Manual projects, which are being drafted by a collective of international independent experts, provide a model for how non-governmental entities can provide much-needed clarification on the application of international law, the law on the use of force, the law of armed conflict, and space law to military activities. There is already a successful track record of similar manuals being developed (the San Remo Manual on Warfare at Sea, the Harvard Manual on Air and Missile Warfare, and the Tallin Manual on Cyber Warfare).

A participant stressed the importance of the role of policymakers alongside government organizations in shaping space policy. This participant highlighted the contradictions that prevent transparency efforts from succeeding, as many claim they want transparency while also hesitating to disclose knowledge for other State actors and private sector firms to use.

One participant proposed that policy makers may face less gridlock if they were to come together with field experts and technical experts, seeking input from a range of disciplines. Given the dynamic and multi-dimensional nature of the space domain, the benefits of “Track 1.5” diplomacy was emphasized, in which the commercial sector, technical experts, national policy makers, and the UN can all have an input in deciding on space norms. Furthermore, this may better allow for the prioritization of safety, decrease in debris, and overall security rather than individual State missions and interests.

CONCLUDING REMARKS

The group highlighted that lack of transparency and lack of clarity can often lead to problems that could have otherwise been avoided. Additionally, the barriers to building trust and promoting transparency can often get in the way of joint international progress. Ending on a hopeful note, the discussion emphasized that space operation coalitions are on the rise and becoming more inclusive, which demonstrates a slow move towards the transparency that this group of experts believes is necessary. There was consensus among all participants that trust, improved understanding of the geopolitical situation, increased SSA, and greater communication at all levels will contribute to a greater likelihood that a potentially escalating situation can be resolved peacefully.