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### SELF-DEFENSE IN SPACE: PERSPECTIVES, ANALOGIES, AND PROSPECTS

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Self-defense in space has become a sticking point in international discussions affecting space stability and security. Some countries have argued that those initiatives cannot move forward until self-defense has been successfully defined by the international community, while there are others who would prefer it remain undefined. Still others argue that there can be no self-defense in space because it violates the principle of peaceful purposes. Current international initiatives intended to help make the space environment a stable and predictable one, like the UN Committee for the Peaceful Uses of Outer Space's working group on long-term sustainable use of space and the draft International Code of Conduct for Space Activities, are in danger of being slowed or even halted by the disagreement over the definition and role of self-defense in space. The issue is also likely to impact future initiatives as well. Because this issue is in its infancy, there is a significant amount of background work that needs to be done before it is possible to have a chance of resolving it. This paper examines the current dispute over self-defense in space, maps out various viewpoints in order to determine where major stakeholders stand on this issue, looks at how the issue has been dealt with in other domains, and strives to find commonalities so that discussions on international norms of behavior can continue to evolve.

#### I. INTRODUCTION

Concerns about space as a domain for potential conflict are increasing. Issues such as the use of force, armed attack, resiliency, and self-defense in outer space are being discussed with greater frequency and urgency in various fora. Conversations on the national and international level, including in regularly-held committees like the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and in *ad hoc* sessions and conferences where disarmament and the military uses of space are discussed, all demonstrate the increasing salience of this topic.

The debate on these issues reveals a divergence of views and a paucity of open discussions of the complicated and interlinked concepts of space security, sustainability, and the potential for conflict in space. Some States see outer space as a sanctuary, where the use and exploration of outer space is the province of all humankind, and where space activities can only be conducted for peaceful purposes and thus the notion of conflict or war in space is an anathema. Other States are increasingly using space for national security purposes and are concerned that those capabilities could come under attack as part of future conflicts on Earth. Many other States are concerned about the impact of conflict in space on the long-term sustainability of the space environment.

The ambiguity regarding what constitutes self-defense in space has become a sticking point in

international discussions affecting space stability and security, like those over the draft International Code of Conduct (ICoC) or the COPUOS Long-Term Sustainability initiative. The LTS initiative formally began in 2010, and its purpose is to develop voluntary guidelines based on best practices for enhancing the long-term sustainable use of space. [1] Although UNCOPUOS has traditionally focused solely on peaceful uses of space and avoided discussion of security topics, some of the recent discussions on the LTS issue have included statements and concerns from delegations about self-defense. States from Latin America and the Middle East have voiced concerns about the need to keep space free of weapons and to avoid militarization, with some States worried that the right to self-defense in space would lead to militarization of space. The Russian delegation also submitted to the UNCOPUOS Science and Technical Subcommittee in February 2015 a conference room paper on the issue of self-defense, and argued that developing a consensus definition of self-defense in space was a prerequisite to further progress on the LTS guidelines. [2]

Beyond UNCOPUOS, the issue of self-defense in space also arose during the latest round of the European Union (EU)-convened ICoC multilateral negotiations held in July 2015. The ICoC is a voluntary agreement that seeks to spell out norms of behavior for activity in space. The ICoC began with a draft text developed by the EU in 2010, which has been modified following a series of EU-led

consultations in different regions of the world. Self-defense in space was the most significant content-related issue raised by delegations during the July ICoC discussions. Several States raised objections to the inclusion of the term in the Code, the latest version having been released in May 2015, believing the language may leave the door open to the possibility of conflict in space. [3] Others pointed out that the right of self-defense was inherent to States, and was not contingent on specific inclusion in the text.

From these discussions and others, international opinion on self-defense can be broadly divided into three perspectives. The first perspective is that there can be no self-defense in space because it violates the principle of peaceful purposes enshrined in the Outer Space Treaty, which in their definition does not include military activities in space. The second perspective is that States have an inherent right to defend their satellites against potential attacks, but the limits and boundaries on that right should avoid being defined so as to preserve the maximum freedom of action for national policies and activities. The third perspective agrees that States have the right of self-defense, but is unwilling to agree to including it in international agreements until some of the ambiguity in what self-defense entails is resolved.

Because this issue is in its infancy, there is a significant amount of background work that needs to be done before it is possible to have a chance of resolving it. This involves raising awareness about the issue, figuring out where the various countries stand, and determining how the issue has been dealt with in other domains. To explore these issues, the Secure World Foundation (SWF), a private organization that promotes cooperative solutions for space sustainability, convened a series of events to explore various aspects of self-defense in space. The first was held in Washington, DC, co-hosted with the George Washington Military Law Society, where a panel of experts of various domains discussed how other domains have handled this issue and developed their own definitions and norms. The second was in Geneva, Switzerland, co-hosted with the United Nations Institute for Disarmament Research (UNIDIR), where delegates to the Conference on Disarmament (CD) were given the opportunity to state their positions on self-defense in space, with the goal of mapping out perspectives of key stakeholders. The third event, co-hosted with the George Washington University's Space Policy Institute (SPI), invited experts from various disciplines to explore the legal, policy, and operational issues of the right to self-defense in space via a series of scenarios.

## II. MEETINGS ON SELF-DEFENSE IN SPACE

### Panel discussion on international law and military activities in space

Although some may consider the two to be at odds with each other, international law has a direct impact on military activities in both peacetime and during conflict. International law defines what constitutes an armed attack, the right to national self-defense, and the limits on use of force during an armed conflict consistent with the United Nations Charter and the Geneva Conventions. Over the last several decades, legal scholars and military practitioners have clarified the rules of international law applicable to military activities in several domains. This includes the San Remo Manual on International Law Applicable to Armed Conflicts at Sea, the Harvard Manual on International Law Applicable to Air and Missile Warfare, and most recently the Tallinn Manual on the International Law Applicable to Cyber Warfare. However, to date, there have not been any significant attempts to clarify how international law applies to military activities in space.

On March 23, 2015, SWF held a panel discussion at George Washington University (GWU) in co-sponsorship with the George Washington Military Law Society in Washington, DC. [4] The event was open to the public and was intended to provide an overview of international law as it applies to military activities, including conflicts and warfare, and examples of how it has been clarified in certain domains, such as air and cyber, or for certain types of weapons, such as autonomous systems. It also examined the current status of international law as applied to military activities in the space domain, and discussed potential benefits of further clarifying the existing norms and interpretations.

The first speaker, Wing Commander Duncan Blake, Royal Australian Air Force, gave a detailed overview of the law that applies to military activities and conflict, alternatively called International Humanitarian Law (IHL), Law of Armed Conflict (LOAC), or "war law," going over the spectrum of activities within international law that go from peace to conflict. [5] He specifically talked about the valuable role that "manuals" created by international experts and practitioners play in the actual decisions made by military commanders. The second speaker was Mr. Gary Brown, who was formerly an Army lawyer with U.S. Cyber Command (USCYBERCOM) and currently works for the International Committee of the Red Cross (ICRC) in Washington, DC. He

focused on the challenges with international law in the cyber domain, and talked about the process of creating the Tallinn Manual on cyber war (which he participated in). [6] He specifically said that they focused the Tallinn Manual on trying to define armed attack and actual cyber war because they felt that was a much easier task than trying to tackle international law and cyber activities beneath the level of actual conflict. The third speaker was Dr. Cassandra Steer, Executive Director, Centre of Research in Air and Space Law, McGill University, in Montreal, Canada. She gave an overview of the current status of international law and space, and also talked about how the Manual on International Law and Military Activities in Space (MILAMOS) being proposed by McGill could be a useful step forward. The last speaker was Dr. Peter Hays, an adjunct professor at GWU. He examined what some of the real-world challenges are in advancing international law and military activities in space, and why clarifying some of the legal principles and norms would help improve stability. However, he was fairly pessimistic in the prospect of doing so for the near future, largely because of the Russian “hybrid war” activities in Ukraine that are deliberately blurring the lines between peace and war. As a potential way forward, Dr. Hays made an explicit reference between what is going on in space security right now and the “two-track” approach the United States took on intermediate range ballistic missiles, where it worked on developing a weapon system while simultaneously negotiating a binding treaty to ban that type of weapon system.

Workshop on principles of self-defense in space:  
National perspectives and critical issues

SWF and UNIDIR held a small meeting on March 31, 2015, on the topic of self-defense in outer space in Geneva, Switzerland. [7] The meeting gathered diplomats from the Conference on Disarmament and representatives from International Telecommunications Union (ITU) and the ICRC to discuss the principle of self-defense in space and key issues related to the right of self-defense from their national perspectives. The discussion focused on four issues arising from security in outer space: the concept of an armed attack for outer space, proportional responses, the principle of distinction in outer space, and frequency interference. This workshop was held under Chatham House Rule and was not for attribution.

The discussion began by raising several questions related to international security in outer space. Considering that outer space is a highly globalized

domain, the challenges faced are distinct from those in the terrestrial domain. This is particularly the case in situations of armed attacks, where the threshold for a definition remains an issue for states, especially as regards how they consider the question within their national doctrines. As an increasing number of countries are using space as a socio-economic resource, a vast majority of space services are civilian, while most of the space assets themselves are dual use, making the linkages between civil and military activities more complex. In this context, can jamming, hacking, or spoofing a satellite be defined as an armed attack or a threat to international peace and security? What is the threshold for the use of force in this situation? In regards to proportional responses within the international security community, the question lies in what constitutes a proportionate response to an attack against space assets, especially with third parties involved, and what might be considered an appropriate target for response. The question was also posed of how states evaluate the impact of damages or the loss of space assets to other domains due to downstream effects or loss of function.

Next was a discussion of the issues of dual use of outer space systems and responsible behavior for space actors. The question was asked of what might trigger the use of self-defense in outer space and how a state’s sovereignty extends in the sphere of space. Attribution is a major concern in self-defense and in terms of frequency interference, and the question arose as to what level of interference would be considered too much to lead to a response. It was suggested that norms of behavior in outer space would allow states to share common agreements and understandings on how to address the security issues which would ultimately be beneficial.

On the matter of use of force in self-defense, one participant explained that their country has a universal understanding of self-defense in terms of legal basics, but the principle is not yet defined and detailed enough for appropriate use and has different interpretations. One solution to this was seen to be the establishment of guidelines for space activities in self-defense. Although article 51 of the UN Charter authorizes the use of force for self-defense, there are considered to be limits in terms of how force can be used in space. This was seen as the rationale for Russia and China drafting a treaty on the “Prevention of the Deployment of Weapons in Outer Space, [and of] the Threat or Use of Force Against Outer Space Objects” in an attempt to create a clear definition of the use of force. The treaty calls for the definition of the use of force or threat as intended military actions,

and the distinction with other actions of use of force that are results of agreements amongst states. The key phrase is “intended action to inflict damage.” [8] This requires certain criteria to differentiate between intended and non-intended military actions in space, and this distinction would allow for some basis to define the proportionality of actions. It was also underlined that the issue of self-defense should be raised in both the UN 1<sup>st</sup> and 4<sup>th</sup> Committees.

With regards to frequency interference, it was noted that the ITU never qualifies interference as intentional or unintentional. The ITU considers frequencies in satellite orbits as a limited common resource of humanity, and as such it has to be used efficiently and equally. The way to secure frequencies was seen to be recording them through a master international frequency register. It was suggested that there be the creation of a registry for frequencies, and to apply “naming and shaming,” if necessary. In practical terms, this would mean states that have signed the ITU convention and have registered their assets or/and their frequencies would be protected by the ITU community, and violations would be resolved within it.

On the issue of armed attack and international law, it was noted that there is a shared view among scholars that cyber operations that lead to the loss of functionality of an object constitute an attack, as per article 49 of Additional Protocol 1 of the Geneva Convention. In an outer space context, jamming electromagnetic communication has never been considered an attack. Therefore, the article would call for the differentiation between jamming and the loss of functionality of a civilian asset in defining an attack. It was made clear that the question of how force might be used in conflict (*in bello*) and the application of articles 2 and 3 of the Geneva Convention (which define the scope of application in a conflict) is independent from the question of definition of aggression/use of force in the *ad bellum* law.

One representative noted their national space policy considers that all states have the right to explore space, and that both international law and the right to self-defense do apply, with no distinction, to every state’s dimensions, including outer space. Whether or not an action constitutes a sufficient armed attack in space has to be examined on a case by case basis, as states have not defined what an armed attack is in other domains. The question of what amounts to a proportional response to an attack is also not clearly understood at this time. With regards to jamming, the purposeful interference of a

system was seen as an infringement to a nation’s rights.

Another perspective put forward was that while there are similarities between cyber and outer space, the legal framework in outer space is much more advanced, with several treaties implemented and principles defined, such as the peaceful use of outer space. The threshold of what amounts force in space is seen as an important concept, and this participant’s perspective was that jamming does not equal an armed attack, given that countries do have legitimate reasons to jam some signals. It was underlined once again that IHL does apply to outer space, and the principle of proportional response goes along with the recognition of self-defense.

The issue was raised of discriminate and indiscriminate attacks, environmental modification, and space activities under the outer space treaty and their attribution to states, such as the licensing of commercial satellites. One participant suggested that timing is critical, as very soon there may be too many types of satellites, and defining what is an attack would become impossible. Another participant stated that their country has no clear position on self-defense, but believes IHL applies to outer space and other domains. The country considers that armed attack has to be defined with a scale and criteria for outer space, and that self-defense is only allowed as part of an on-going operation.

Looking at other initiatives to tackle the challenges of self-defense concepts in outer space, it was noted that international discussions on the outer space issue have not yielded end results thus far due to the different levels of players in space. Indeed, smaller states may want a safe space environment, but they do not consider themselves part of the problem. A thought-provoking question posed during discussions was whether there could be value in merging the draft ICoC with the draft PPWT. If a proposed ICoC draft included the principle of self-defense from the draft treaty, it was suggested it could have the potential to create a new single instrument that would combine both civilian and military aspects of outer space, while also potentially reinvigorating discussions within the Conference on Disarmament. Some responses to this suggestion were that the combined instrument would be too large to find common ground for negotiation. However, it was reiterated that the EU does aim to have a global instrument on outer space issues, not an instrument only for Europeans.

One representative stressed that the main concern for their country is the idea of including self-defense in some documents related to the peaceful use of outer space. It was argued that this would be moving in the wrong direction and that states should instead be creating mechanisms to avoid self-defense and the military use of space. Another participant concluded the discussions by urging all states to increase transparency, trust, and security in outer space, and to be mindful of the necessity for proportionality when exercising the right to self-defense.

#### Scenario workshop on issues related to self-defense in space

SWF, in collaboration with George Washington University's Space Policy Institute (SPI), convened a workshop on Sept. 9, 2015, in Washington, D.C., comprised of experts from academia, international organizations, non-governmental organizations, and the public sector to consider and discuss three hypothetical yet plausible scenarios exploring issues of self-defense and conflict in outer space. [9] This workshop was held under Chatham House Rule and was not for attribution.

The first scenario looked at the role commercial operators can play in national security considerations, how hosted payloads are factored into decisions about actions, and if/when pre-emption can be justified.\* It included uplink jamming of a commercial satellite that prevented command and control and degraded military capability; consideration of political, legal, and use of force options that commercial operators or States have to respond to intentional jamming; and what, if any, role does the ITU play in this type of situation. It went on to examine what the legal standards were for preemptive attacks on satellites in self-defense, and what constitutes proportionate responses.

Assuming that ground-based uplink jamming was intentional, participants argued that it could fall within a spectrum of impermissible actions which violate international law. At the general level of international state responsibility, the violation of an international obligation which is attributable to a state is said to constitute an internationally wrongful act. An internationally wrongful act entails the international responsibility of the attributable state, requiring cessation, non-repetition, and full reparation

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\* For more information on this and other scenarios, please go to: [http://swfound.org/media/204665/SDS\\_Scenario\\_Agenda\\_10Sept2015.pdf](http://swfound.org/media/204665/SDS_Scenario_Agenda_10Sept2015.pdf)

for injuries caused from the act. However, there are considerations concerning proportionality and related issues, and it does not give the suffering state permission to perpetrate any retaliatory internationally wrongful acts. Countries can invoke countermeasures or appropriate actions to seek redress. Distinctions between the merely illegal "use of force" and an "armed attack" have been discussed by international jurisprudence, where "armed attack" is thought to be of a graver nature. Participants noted that absent additional aggravating circumstances, uplink jamming may constitute merely an inconvenience or irritation, rather than a use of force (and much less an armed attack as envisaged under Article 51 of the UN Charter). However, as it was part of preparation of the battlefield for an imminent attack, it might then be considered an armed attack.

It was noted that the jamming incident could be brought to the ITU, whose regime defines harmful interference, but does not subdivide into intentional or unintentional interference. However, while the ITU does have dispute mechanisms as part of its constitution, participants agreed that it lacks enforcement power. There was also a significant point made about the challenge in making an effective decision. There will be differences between the intended effects, the actual effects, and the resulting impact. Each country likely has different information about the situation, which impacts their understanding and perception. In addition, each country's own history, culture, and ideology also creates a context that likely impacts their understanding in a different way from other countries.

From a policy perspective, participants admitted that there is a reticence by states to clearly and definitively define which acts are clearly legitimate uses of force, as clear distinctions can be seen as potentially limiting their future range of options. Further exploring a pragmatic approach to the operational route that scenarios such as this would create, the view was expressed that operational lawyers within military hierarchies will be asked to justify actions that their commanders see as operationally advantageous. As such, a lack of definitions can lead to more options, and it was noted that just because there is a particular threshold of a response a state *would* be justified to use, that does not mean that they *must* use that response. One participant commented that the grey area created by the various options is a lawyer's friend, and states can choose to respond at a lower level, or not respond at all.

The second scenario discussed the threshold for armed attack and cross-domain proportionality. In it, one country's satellites in Low Earth Orbit (LEO) started to experience anomalies after passing over a suspected ground-based laser weapons installation in another country. In this scenario, participants looked at what the burden of proof would be to determine if one country was indeed responsible for damage to another country's satellites; what legal remedies would be available to the country suffering the satellite damage; whether a purported laser attack on satellites constituted an armed attack; and what a proportionate response would be to such an attack.

The discussion began with a review of legal characterization of the satellite interference, especially what constitutes an internationally wrongful act. An internationally wrongful act is an act that is 1) attributable to a state under international law, and 2) constitutes a breach of an international obligation of that state. A breach by one state creates international legal consequences for that state, and permits countermeasures by the injured state. In debating the more aggressive response options, several participants noted that a proportional response does not necessarily mean one in-kind. If the incident was determined to be an attack on a satellite, it is not necessary to limit the responses to an action against the other country's satellites.

The discussion then moved on to *jus in bello* IHL issues. Participants noted that the two main considerations in targeting were distinction and proportionality. One participant explained that distinction is the requirement to distinguish between military objectives and civilian objects, and it is permissible to target and attack civilian leadership only if they are in the chain of command or otherwise taking a direct part in hostilities. Political leaders outside the chain of command and who do not so participate are considered protected civilians. Meanwhile, proportionality depends on whether expected civilian casualties are excessive in relation to military advantage. Commanders need to choose proportionate means and methods that will cause the least civilian damage. If there are multiple target options yielding similar advantage, commanders need to choose the one(s) that will yield the least civilian casualties. The decision is made by the commander before the attack based on expected benefit and loss. The requirement to base proportionality on expected outcomes means you need to take any surprising or unintended results from previous decisions and factor them into future ones, including resolving erroneous targeting. This led to a discussion about whether different states are held to different legal standards.

Some participants argued that states are held to the legal standard to which they are capable of rising to, and that countries with more capabilities are held to a higher standard, but others disagreed.

Another significant discussion topic was on the issue of the proportionality of military actions destroying robotic satellites instead of humans on the ground. Several participants made the point that while satellites have historically been seen as the more logical military option compared to attacks on the ground that might mean killing humans, that belief may be changing. One reason may be that attacks on satellites which have significant civil uses could lead to civilian casualties. Others suggested that the increased concern over the long-term sustainability of space due to long-lived space debris could lead to greater restraint on using kinetic weapons against satellites. Participants noted that the main difference between space and other domains of military activity is that the space world does not have the infrastructure, experience, and tactics, techniques, and procedures (TTPs) to make these sorts of targeting decisions. Other domains, particularly the air domain, have integrated military lawyers with operators and commanders to be able to include the law of war in their decision-making and targeting. At the moment, the military space world has none of that, and could potentially learn quite a bit from how the other domains approach the issue.

The third scenario dealt with hybrid warfare and collective self-defense. In the scenario, one country allowed a second to have access to some of its space capabilities. The second country was involved in a dispute over a border region with a third country. As tensions rose, jamming from the disputed border region interfered with a space-based satellite navigation system. As the situation in the scenario devolved, a ballistic missile coming from the territory of one of the hostile countries launched a payload at LEO, creating a significant debris field and disabling several satellites. The group was asked to discuss whether the creation of a debris field constituted an armed attack, and how the Liability Convention plays into the discussion of self-defense and international law.

The first part of the discussion focused on the topic of "hybrid warfare," which has recently emerged as a topic within the international community. Hybrid warfare may refer to a blurring of the lines between the peacetime, where *jus ad bellum* law determines the lawfulness of a state's military actions, and openly acknowledged conflict where *jus in bello* IHL rules apply. Hybrid warfare can involve

the use of covert actions, proxies, and undeclared combatants.

Several participants noted that state attribution is an issue in determining whether the action(s) constitute an internationally wrongful act. Under space law, the actions on non-governmental entities are directly attributable to the internationally responsible government as its national space activities. If the action is proscribed by one or more agreements or treaties, then it is potentially an internationally wrongful act. However, some participants noted that states may take a sovereign exception for doing something different in its own territory. Others noted that exception is fairly toothless for space systems because it is rare their activity occurs only within the jurisdiction of one country.

The participants agreed that there are few legal options for resolving the type of intentional jamming described in this scenario. Participants once again noted that while the ITU agreement prohibits deliberate interference, the ITU has no enforcement mechanisms and can only call for consultations between member states to resolve the interference. One participant wondered if there was any precedence for liability under the ITU or other treaties due to interference. Another participant asked if the Permanent Court of Arbitration, which recently adopted a protocol for space cases, could be a venue for resolving the issue. Others pointed out that the PCA is a vehicle for offering arbitration services, but it is only available by consent: it does not have compulsory jurisdiction. Both parties need to agree to use it to resolve a situation, which is unlikely during periods of tension or hostilities.

There was also a discussion about the recent effort to create a legal standard by which a state can act in self-defense in response to non-state actors when another state with jurisdiction over those actors is “unwilling or unable” to do so. This is a standard that has been pushed by the United States as part of its counterterrorism efforts, but is currently not accepted by more than a handful of states. Some participants argued that because Article 51 of the United Nations Charter recognizes that self-defense is an inherent right of sovereign states, it does not *create* that right (emphasis added). Thus, even if a state suffered a fairly minor armed attack, it would still have some rights to engage in self-defense. In this case, a lot of states would be able to claim they are subject to an armed attack, although some participants argued they would not be required to and need not invoke Article 51 to justify their response. One participant noted that

it is a big leap to label something an armed attack when it is actually the result of collateral damage.

On the question of the Liability Convention, most participants said that it probably does not apply between the belligerents. However, it may apply between a belligerent and a neutral state. Commercial satellite operators that suffered damage would need to appeal to their state of Registry. It was also pointed out that liability is very difficult to determine.

A significant part of the discussion asked whether or not the creation of a debris field has similarities to actions in other domains. Specifically, the question was whether it would be legally similar to mining a strait or establishing a blockade in the maritime domain, or creating minefields in the land domain. Participants agreed that while there are some similarities, none of these analogies are complete. Mining and blockades are declared methods of warfare, each of which has at least some legal and operational precedence. Several participants commented that it is possible to avoid going through minefields in the land and maritime domains, but not so with space where satellites largely move on fixed trajectories. Others pointed out that while it is one thing to deny an adversary use of a domain during a conflict, it is another thing entirely to contaminate it for everyone. Some raised the question of whether or not “space mines” meet the test of being able to discriminate, as required under international law.

There were a few general conclusions that could be derived from the discussion. The first was that there was an overall lack of legal and political governance mechanisms to deal with many of the situations in the scenarios, especially radiofrequency interference. This left few options for countries to respond to intentional RFI or other intentional acts, outside of military action, political rhetoric, or sanctions. From that, there was a discussion about whether or not there should be a push to develop more governance tools to provide alternative paths for resolving such situations. The second major conclusion was that while many of the legal and policy issues with conflict in space were no different from that in other domains, the space world in general has zero experience, expertise, or capacity for making the kinds of decisions that their air, land, and maritime counterparts do in determining distinction, proportionality, necessity, and other legal requirements under IHL. The third big conclusion was that many countries lack the institutional capacity to engage meaningfully on international negotiations involving self-defense in space. This indicates there is a need for significant international consultations,

engagement, and information sharing before the space community should consider broad international negotiations over political or legal agreements involving potential self-defense in space. Several participants pointed out that we needed to be realistic about what law can bring to these problems. International law on use of force and armed conflict is underdeveloped in general, meaning there is a lack of concluded cases and precedence, and particularly so in space. Others pointed out that the group of experts' struggle to answer many of the issues raised by these scenarios highlights how challenging the issue of self-defense is.

#### IV. CONCLUSION

It is not the intent of the authors of this paper to argue definitively one way or the other on the principle of self-defense in space. However, it is clear that this issue, while relatively new in the international community, is already having effects on how discussions on multilateral approaches to space security and sustainability are progressing, so it is important to start to map out various perspectives and beliefs. Simply mentioning the topic does not lead to the de facto weaponization of space. Along those lines, open discussions of the issues surrounding self-defense in space could help national governments, militaries, and space agencies think through various aspects and ripple effects of potential conflict in space and how they could help/harm international security and stability. As more nations depend increasingly on space assets for their national security and socioeconomic development, the loss of these space assets – whether real or just theoretical – could lead to crisis situations that could escalate very quickly. Because of this, it is crucial that the space community start grappling with a lot of the same questions about what the consequences are of certain warfare techniques. That then leads to a question of what can be done to slow down or de-escalate crises that have a space component, and whether or not there are techniques of war in space that should be off limits. If space is going to be a stable, predictable domain over the long-term, this issue will have to be dealt with.

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