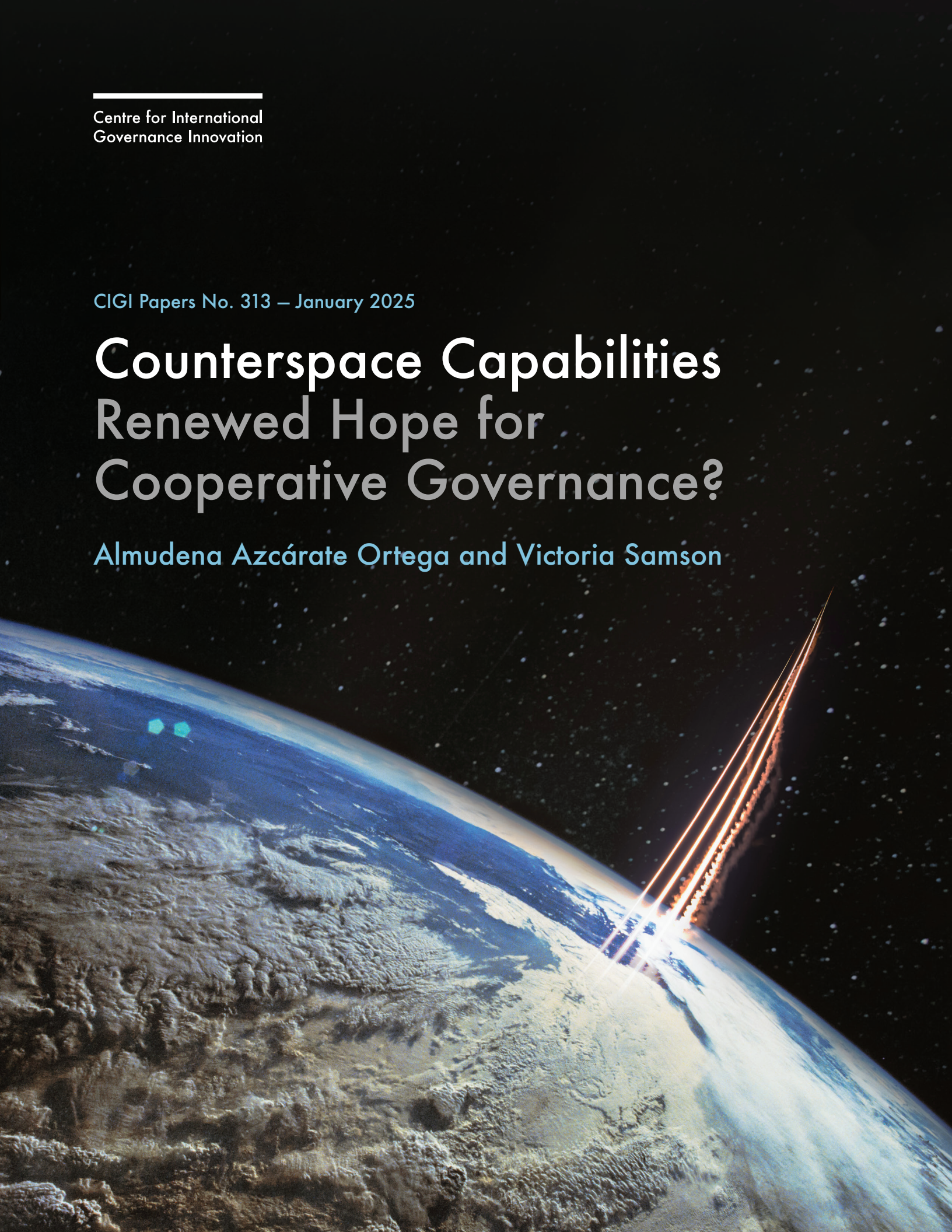
Centre for International
Governance Innovation

CIGI Papers No. 313 — January 2025

Counterspace Capabilities
Renewed Hope for Cooperative Governance?

Almudena Azcárate Ortega and Victoria Samson



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Victoria Samson is the chief director of space security and stability for Secure World Foundation (SWF) and has more than 25 years of experience in military space and security issues. Before joining SWF, Victoria served as a senior analyst for the Center for Defense Information (CDI), where she leveraged her expertise in missile defence, nuclear reductions and space security issues to conduct in-depth analysis and media commentary. Prior to her time at CDI, Victoria was the senior policy associate at the Coalition to Reduce Nuclear Dangers, a consortium of arms control groups in Washington, DC, where she worked with congressional staffers, members of the media, embassy officials, citizens and think tanks on issues related to national missile defence and nuclear weapons reductions. Before that, she was a researcher at Riverside Research Institute, where she worked on war-gaming scenarios for the Missile Defense Agency's Directorate of Intelligence. She is also the head of the International Astronautical Federation's Security Task Force and a member of the Committee on Space Security and the Space Security Working Group of the National Academies of Sciences, Engineering, and Medicine Committee on International Security and Arms Control. She has a bachelor of arts degree in political science with a specialization in international relations from the University of California, Los Angeles, and a master of arts degree in international relations from the Johns Hopkins School of Advanced International Studies.

Acronyms and Abbreviations

ASAT	anti-satellite
CONFERS	Consortium for Execution of Rendezvous and Servicing Operations
CTBT	Comprehensive Nuclear-Test-Ban Treaty
EMPs	electromagnetic pulses
ENMOD	Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques
GGE	Group of Governmental Experts
GNSS	global navigation satellite systems
HPMs	high-powered microwaves
ICBM	intercontinental ballistic missile
IHL	international humanitarian law
LTBT	Limited Test Ban Treaty
OEWG	open-ended working group
OST	Outer Space Treaty
PAROS	Prevention of an Arms Race in Outer Space
TCBMs	Transparency and Confidence-Building Measures
UNGA	UN General Assembly
WMDs	weapons of mass destruction

Executive Summary

In this paper, the authors contextualize counterspace capabilities: what they are (and are not); how they emerged; the current state of the space security international legal and policy frameworks; and how that, in turn, affects the planned use of these counterspace capabilities. Furthermore, the paper discusses the current state of multilateral efforts for space security and how they shape counterspace capabilities. It finishes by looking at how concerns about these technologies can be addressed, focusing on what future regulating mechanisms could be used to ensure that space is peaceful, safe and sustainable for all.

Introduction

Counterspace capabilities, also sometimes called "space weapons," are not new. Humankind's first forays into outer space were accompanied by research into how to disrupt or interfere with space objects and activities (Weeden and Samson 2024). However, as space has become increasingly important to humanity, both for civilian and military functions and services, counterspace capabilities have also evolved, becoming more sophisticated and, in some instances, more accessible and their use harder to attribute. Consequently, they are now a prime concern of the international community, commonly highlighted as a pressing threat to space security in multilateral debates.[1]

There are several different types of counterspace capabilities, some of which cause irreversible damage, and others whose effects are reversible. Although there is no unique, uniform way of categorizing these capabilities, the international community acknowledges that depending on the type of counterspace capability, the threat it poses can differ. These differences have been discussed at length by states and other stakeholders, both at the national and international levels, even as several states continue to develop and sometimes use these capabilities.

The current legal framework applicable to outer space and activities conducted therewith establishes limitations regarding the use of counterspace capabilities; however, many feel these are not enough, which has also been a key topic of debate in multilateral fora, with some states advocating for the need for new mechanisms that specifically address the issue of counterspace capabilities.

In order to address the challenges that counterspace capabilities pose to space security, it is essential to understand them and how they threaten outer space systems, as well as the legal and policy frameworks that they are subject to — including their strengths and limitations. This paper contextualizes counterspace capabilities by clarifying what they are, as well as what they are not; how their emergence was made possible within the currently applicable international legal framework; and why the international community has not yet managed to successfully mitigate the threat that these capabilities pose, and what it could do to achieve this goal.

The broad takeaways from this paper are that there is no "one size fits all" for regulating counterspace capabilities, and there are going to be many different ways in which to do so; addressing the threat posed by counterspace capabilities is relevant for everyone, not just the geopolitical superpowers or those developing counterspace capabilities; and there is no need to reinvent the wheel, as efforts to address counterspace threats have a rich selection of feasible and effective options based on existing mechanisms and previously proposed initiatives.

1 Open-ended working group on reducing space threats through norms, rules and principles of responsible behaviours, *Chairperson's Summary*, UNGAOR, 2023, UN Doc A/AC.294/2023/WP.22 [*Chairperson's Summary*].

Counterspace Capabilities in Context

How Did Counterspace Capabilities Emerge? A Brief History

Outer space is undoubtedly a militarized domain: the first steps into space exploration had a decidedly military intent behind them, with states recognizing the value of the space environment for military ends, particularly for intelligence, surveillance and reconnaissance. Humankind's first successful satellite launch, Sputnik I in 1957, served to demonstrate the capability of intercontinental ballistic missile (ICBM) technology for the first time (Bush 1949) and opened the door to the possibility of testing counterspace technology for certain states (Azcárate Ortega and Lagos Koller 2023, 19, 20). Two years after the launch of Sputnik, the United States carried out the first anti-satellite (ASAT) test,[2] with the Soviet Union becoming the second country to conduct these tests in 1963.[3] These developments were part of the space race and larger geopolitical competition of the Cold War, and there was the distinct possibility that this new environment — space — would either be immediately weaponized and rendered unusable or become the instigating pathway toward nuclear war.

The international community sought to establish measures to prevent outer space from becoming a new theatre for geopolitical rivalries and, potentially, eventual conflict, with the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty [OST]) establishing that the use of space is reserved for "peaceful purposes."[4] Yet humankind's reliance on space for military ends continued to increase, being generally interpreted to be compatible with non-aggressive military uses (Wolff 2003). This military nature of space is distinct from space being a weaponized environment. The weaponization of outer space generally refers to the proliferation, testing, deployment and use of weapons or counterspace capabilities located in or directed toward space or space systems (Azcárate Ortega and Samson 2023).[5] This contributes to arms racing and increases tensions among the different actors, particularly states, which is why — as is explained in more detail below — the international community actively works toward the Prevention of an Arms Race in Outer Space (PAROS),[6] the key agenda item under which space security concerns, and particularly the proliferation of counterspace capabilities, are discussed within the framework of the United Nations.

Despite the international community's efforts through the years, counterspace capabilities have been developed, deployed and used (both in the context of testing as well as against other states). This situation has been made possible partly due to the open-ended and permissive language of the existing legal frameworks, as is explained in more detail below. As space programs become more widespread and space technologies become more incorporated in how militaries, economies and daily lives function, there is an increased incentive for countries to develop ways in which to interrupt, interfere with, deny or degrade access to and use of those technologies. The proliferation of counterspace programs could eventually lead to the use of those capabilities in ways that could be so escalatory as to lead to conflict in space or even on Earth. With the space environment becoming more complicated with new users, new satellite operators and new activities in orbit, and becoming more cluttered due to space debris and the rise of very large satellite constellations, the use of counterspace capabilities, and even concerns about their potential development and use, could result in hostile activities. This is an increasingly pressing threat that only gets more

2 The US Bold Orion program sought to test the feasibility of air-launched ballistic missiles. The program included a flight test in which a point in space very close to the US Explorer I satellite was targeted, demonstrating the ability of ballistic missiles to intercept satellites: "Eight tests of this version were conducted between May 26, 1958, and June 19, 1959, during which the missiles reached apogees near 100 kilometers (62 miles) during their flights" (Weeden 2014, 20).

3 This test involved a co-orbital ASAT system, designed to approach a satellite target from orbit. See Grego (2012).

4 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 18 UST 2410, 610 UNTS 205, 6 ILM 386 (entered into force 10 October 1967) [OST].

5 "The term itself is also not universally accepted, as it does not readily translate into all languages. Moreover, in some instances the word 'militarization' is used to refer to both military activities in space and to weaponization of space" (Azcárate Ortega and Samson 2023, 41).

6 *Draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects*, 9 June 2014 [*PAROS Treaty*], online: <www.reachingcriticalwill.org/images/documents/Disarmament-fora/cd/2014/documents/PPWT2014.pdf>.

challenging as there are more entrants into space and more dependence on those capabilities (Blancafort, Erickson and Azcárate Ortega 2023).

While destructive counterspace capabilities have been tested — and these tests from the Cold War through the present day have created 6,863 pieces of trackable debris in total, of which 3,133 pieces are still in orbit — only non-destructive counterspace capabilities have been used against other countries' space systems (Secure World Foundation 2024). These actions have also had consequences for civilians due to the dual-use nature of these technologies. For example, global navigation satellite systems (GNSS) have been jammed in various conflict zones in an effort to disrupt combatants' communications. This tactic has had the secondary effect of interrupting GNSS needed for civil aviation flight safety in those regions (Waterman 2024; Gebrekidan 2024). Satellite ground stations have also experienced cyberattacks in an effort to hamper the communication of the satellite network's military users, which also interrupted tens of thousands of civilians' internet access (Burgess 2022).

What Are Counterspace Capabilities?

There is no universal definition of counterspace capabilities; however, the term generally refers to "capabilities, techniques, or assets that can be used against another space object or a component of a space system in order to deliberately deny, disrupt, degrade, damage or destroy it reversibly or irreversibly, so as to gain advantage over an adversary" (Azcárate Ortega and Samson 2023, 28). As this definition highlights, counterspace capabilities do not necessarily need to be located in space, and, in fact, they often are not. There are multiple vectors through which space systems can be harmed or threatened — commonly known as "threat vectors" — and while some might be more common than others, there are counterspace assets for all of them. These vectors are Earth-to-space, space-to-space, space-to-Earth and Earth-to-Earth.[7]

Similarly, it is important to note the complexity of space systems themselves. In this sense, a space system refers to all the devices, components and infrastructure that work together to perform a task involving the space environment, thus not necessarily needing to be located in space — this is the characteristic that sets a space system apart from a space object (ibid.). The different components of space systems are generally classified into three groups:[8]

- The **space segment** refers to space objects, that is to say, any object launched into orbit from Earth, the Moon or other celestial bodies to travel to, in or through outer space. The term "space object" includes component parts of a space object as well as its launch vehicle and parts thereof.[9] Examples of space segment components are satellites and space launch vehicles.
- The **ground segment** refers to the terrestrial part of a space system, which includes all the facilities and elements needed to operate a space object and deliver services to users. Examples of ground segment components are satellite dishes and receiving stations.
- The **data links** refer to the connection between the space and ground segments. This includes the uplinks and downlinks, as well as services provided to the end users.

Any of these components can potentially be targeted by counterspace capabilities.

There is no universally accepted classification of counterspace capabilities, but they are often classed by their effects (irreversible or reversible, as well as hard kill or soft kill), or by their nature (kinetic physical, non-kinetic physical, electronic or cyber) (ibid.) (see Table 1).

Kinetic Capabilities

These capabilities can be used to strike a space system component directly — and thus are sometimes called "kinetic impactors" — or to detonate a warhead near it. While many consider "kinetic" and "hard kill" to be synonyms, there are some who deem the former to refer solely to

7 *Chairperson's Summary, supra* note 1; PAROS, *Report of the Secretary-General*, UNGAOR, 76th Sess, UN Doc A/76/77 (2021).

8 Open-ended working group on reducing space threats through norms, rules and principles of responsible behaviours, *Threats to the security of space activities and systems*, UNGAOR, 2022, UN Doc A/AC.294/2022/WP.16 [text bolded in original], online: <https://documents.unoda.org/wp-content/uploads/2022/08/20220817_A_AC294_2022_WP16_E_UNIDIR.pdf>; see also Azcárate Ortega and Samson (2023, 25).

9 *Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, 24 UST 2389, TIAS 7762, 961 UNTS 187 art I.d. (entered into force 1 September 1972).

Table 1: Summary of Counterspace Capability Types

<table>
<tr><th>Kinetic/Hard Kill</th><th>Non-kinetic/Soft Kill</th></tr>
<tr><td rowspan="3">Used to strike a space system component directly or to detonate a warhead near it; likely to cause irreversible damage; easy to attribute. These include:
→ direct-ascent ASATs;
→ co-orbital ASATs; and
→ ground station attacks.</td><td>Non-kinetic physical: cause physical effects on satellites or ground systems without making physical contact; can be reversible or irreversible and can be hard to attribute. These include:
→ lasers;
→ HPMs; and
→ EMPs.</td></tr>
<tr><td>Electronic/electromagnetic: target the electromagnetic spectrum used by space systems to transmit and receive data, causing harmful interference; generally reversible and difficult to attribute. These include:
→ jamming; and
→ spoofing.</td></tr>
<tr><td>Cyber: targets the data and the systems that use, transmit and control the flow of data; can target satellites as well as ground stations or end-user components, such as modems, with the objective of interfering with services, such as internet coverage, to intercept information or to insert false or corrupted data into a system; generally reversible and difficult to attribute.</td></tr>
</table>

Source: Authors.

those capabilities dependent on the destructive power generated by the motion and interception trajectory of the counterspace capability, which results in the destruction of the target upon impact, thus not necessarily needing a detonation. Hard kill, on the other hand, is a broader term that comprises kinetic physical capabilities, but also includes the use of explosive payloads, thus impact against the target is not necessarily required, with destruction of the target being possible through a detonation near it (ibid., 29).

The acronym "ASAT" (which stands for "anti-satellite" capability) is sometimes used as a synonym for kinetic or hard-kill counterspace capabilities; however, ASATs are a subset of counterspace technology that focuses on targeting one component of space systems (the satellite). In this sense, ASATs can be kinetic physical, but they can also be non-kinetic (ibid.).

A kinetic physical or hard-kill hostile act can be carried out in different manners (ibid.):

- **Direct-ascent ASATs** are launched from the Earth (ground, sea or air) to place a kinetic kill vehicle on a ballistic trajectory through space. After having separated from its launch vehicle, the kinetic kill vehicle tracks the targeted space object to strike it in a hypervelocity collision.
- **Co-orbital ASATs** place an interceptor into orbit, which is then manoeuvred using a proximity operation to situate it close to its target. The co-orbital ASAT does not necessarily carry out its counterspace operation immediately after its placement in orbit and can remain dormant for some time. A kinetic co-orbital ASAT can damage or destroy its target through a direct collision, detonation near the target to create shrapnel, the release of fragments that would collide with the target, or the use of a robotic

arm to damage or disable the target. Certain concepts for co-orbital ASATs may employ various means or methods including, but not limited to, explosive fragmentation, harpoons, nets, chemical sprayers or adhesives. It should be noted that co-orbital ASATs, as seen below, can also be used in a non-kinetic manner through jamming, intelligence gathering, and so forth. It is important to highlight that a satellite repurposed as a weapon due to its capabilities — examples include manoeuvrability to cause it to collide with another satellite or a robotic arm that can be used to harm — are also considered co-orbital ASATs when utilized thus, even if prior to their repurposing they only fulfilled benign and non-weapons-related applications.

- **Ground station hostile actions** consist of the targeting of sites located on Earth that are charged with the command and control of a satellite, or the relay of satellite data.

Kinetic counterspace technologies are likely to cause irreversible damage to the target in a manner that is relatively easy to attribute. If the target is in orbit, the use of these technologies produces space debris, which can be dangerous to other space objects as well, and can remain in orbit for weeks, months or even years, depending on the altitude of the strike and the mass of the target.[10]

It should be noted that some missile defence interceptors have a latent (and, in some cases, demonstrated) ASAT capability. Specifically, a missile defence interceptor with the capability of doing an exo-atmospheric intercept — that is to say, the ability to hit a ballistic missile target while it is traversing through space — theoretically also has the ability to target satellites. This concept has been demonstrated several times as well. For example, both the United States and India have used missile defence interceptors to conduct destructive ASAT tests. The United States used a modified version of its sea-based missile defence interceptor, the SM-3, to intercept satellite USA-193 in 2008's Burnt Frost operation (Blount 2009), while India used its PDV MK-II missile defence interceptor in 2019's Mission Shakti to shoot down its Microsat-R (Roy 2019). As well, China used its SC-19 interceptor to intercept its FY-1C satellite in 2007 (Weeden and Samson 2024), then shifted to using that same interceptor in at least one explicit missile defence test (in 2010, against a CSS-X-11 ballistic missile) (ibid.) and possibly a second missile defence test (in 2013) (ibid.). Of course, merely having a missile defence interceptor with an exo-atmospheric reach does not automatically mean that a country intends to use it in an ASAT capacity, but it cannot be overlooked as a consideration.

Non-kinetic Physical

Non-kinetic physical counterspace capabilities have physical effects on satellites or ground segments, but they do not require making physical contact with their target in order to do so. These technologies can blind or dazzle sensors or cause damage to electrical circuits and processors in a satellite. Hostile acts that use these counterspace capabilities operate at the speed of light and, in some cases, can be less visible to third-party observers and more difficult to attribute. These acts can be reversible or irreversible (Azcárate Ortega and Samson 2023, 30). Examples of non-kinetic physical counterspace capabilities include lasers, high-powered microwaves (HPMs) and electromagnetic pulses (EMPs).

Electronic

Electronic counterspace technologies, sometimes also known as electromagnetic technologies, can target the electromagnetic spectrum used by space systems to transmit and receive data (in both uplink and downlink directions), causing harmful interference (ibid., 28).

- **Jammers** generate noise on the same radio frequency band as a space system to block or interfere with the signal travelling from Earth to a satellite (uplink) or from a satellite to Earth (downlink) (ibid.).

- **Spoofing** tricks a space system into considering a fake signal produced by a hostile party as true, thus enabling the hostile party to insert false information into the system, including, but not limited to, false data or false commands that can disrupt operations or cause any of the components of a space system to act in a way other than how it was intended (ibid.).

Cyber

Cyber counterspace capabilities can target data and the systems that use, transmit and control the flow of data. Information and communication technologies can target the space segment, but they

10 See https://orbitaldebris.jsc.nasa.gov/faq/.

are particularly effective when used against the ground segment, including stations or even end-user components such as modems. Hostile actions using cyber counterspace capabilities seek to interfere with services (such as internet coverage), intercept information, or insert false or corrupt data into a system. The effects on the target resulting from cyber counterspace actions are generally reversible; however, a malicious or hostile operation that targets the command-and-control system of a satellite could render it inoperable in an irreversible way, as the hostile party could permanently stop the satellite from functioning and cause it to waste fuel or damage its sensors. This could have a large impact radius and potentially affect critical infrastructure. Cyber counterspace capabilities can be cheaper and more accessible than other types of counterspace technologies. Additionally, they can be difficult to predict, detect and attribute (ibid.).

What Are Not Counterspace Capabilities? The Issue of Dual-Purpose Objects

The capabilities outlined in the subsection above are designed for the purpose of counterspace missions; however, these are not the sole objects that could potentially be used to harm or damage a space system. Particularly in recent years, states have been expressing concerns regarding the threat that dual-purpose space objects — not to be confused with dual-use systems,[11] although many use the term "dual-use" to encompass both types of dual-natured objects — can pose to space security.[12]

Dual-purpose space objects are generally designed to fulfill a benign objective that is non-weapons related. Examples of such functions include debris removal or on-orbit servicing. To perform these tasks, they are equipped with certain capabilities (such as robotic arms, for example) that could potentially be repurposed to harm other space objects. Dual-purpose objects are usually operated by civilian entities, as well as commercial actors, and generally are not intended to carry out military functions (except, perhaps, in an indirect manner, such as by supporting military satellites through on-orbit servicing, for example). Moreover, dual-purpose objects are not intended to perform aggressive or hostile actions against other satellites, and the developers and operators of these objects have traditionally strived for transparency regarding their non-aggressive intended functions (Consortium for Execution of Rendezvous and Servicing Operations [CONFERS] 2024).[13] Nevertheless, these characteristics or capabilities — such as the possession of a robotic arm or their manoeuvrability, for example — have raised concerns that these objects could be repurposed to be utilized against another space system, showcasing that even objects that are not developed with the initial intent to be used for counterspace could nonetheless be potentially used for this end (Azcárate Ortega 2023).

It should be noted, however, that the repurposable capabilities themselves are not the reason these objects are perceived as a threat. In this sense, the term "capability neutral" has been used by some states to highlight that the capabilities of dual-purpose objects alone pose no danger to space actors.[14] The challenge of ascertaining how an operator aims to utilize these assets — their intent — is what has led many to perceive the assets themselves as a threat, even when they are used in a relatively transparent manner (ibid.). As well, often what shapes perceptions about whether countries would repurpose capabilities into counterspace options are the perceptions about those countries in general; that is to say, countries that are allies or partners are seen as using the capabilities as intended, while rival countries are deemed to be open to repurposing these assets (or actively doing so). Geopolitical concerns can do much to affect how these capabilities are perceived.

11 "Dual use" refers to those space objects that can have military and security applications, as well as civilian and commercial functions (such as, for example, GNSS). These uses can be carried out either simultaneously or alternately (the latter is sometimes known as "dual capable"). Dual-use objects combine military and civilian functions in one single object. See Azcárate Ortega and Samson (2023, 38); see also Azcárate Ortega (2023).

12 *Report of the Secretary-General, supra* note 7.

13 An example of this is CONFERS, which has sought to "develop industry-led recommendations for standards and guide international policies for servicing that contribute to a sustainable, safe, and diverse space economy" (CONFERS 2024, 2).

14 Open-ended working group on reducing space threats through norms, rules and principles of responsible behaviours, *Australian Statement, Topic 1: Nature and uses of the outer space environment and space systems in relation to current and future threats by States to space systems*, UNODAOR, 2022, online: <https://documents.unoda.org/wp-content/uploads/2022/09/OEWG-Australian-Statement-Topic-1-Sep12.pdf>.

The Space Security Legal and Policy Framework and Counterspace Capabilities

International Law and Space Security

While it is true that there is no treaty specifically on counterspace capabilities, it should be noted that counterspace capabilities do not exist in a legal vacuum. There is an existing robust legal framework that applies to space and space activities, shaping how security in the space environment is carried out.[15] Moreover, over the years, states have brought forth multiple initiatives for legally binding as well as non-legally binding mechanisms specifically for space security, which need to be considered when looking at how best to mitigate the threat from counterspace capabilities. To begin, there are five international treaties relating to outer space matters, as well as several principles and resolutions adopted by the United Nations General Assembly (UNGA). The most relevant to space security is the 1967 OST,[16] which emerged with a key goal of serving as an arms control mechanism (West and Azcárate Ortega 2022; Lyall and Larsen 2018).[17]

While space security is not the main focus of the OST, the principles enshrined therein — such as, for example, due regard or states' responsibility for national activities — are relevant to, and affect, space security. Of particular relevance to space security are the following articles:

- **Article IV** is the only article that explicitly addresses space security concerns by establishing that states shall "undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner."[18] It also forbids "the establishment of military bases,...the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies."[19] The OST does not provide further clarification regarding the placement of conventional weapons in space. Nor does it explicitly prohibit the launching of weapons from Earth to target an asset in outer space or the use of outer space for certain hostile purposes directed at targets on Earth.

- **Article III** stipulates that "States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding."[20]

- **Article I** also highlights the applicability of international law to the space environment by stating that the use and exploration of outer space shall be carried out "in accordance with international law"[21] and "without discrimination of any kind, on a basis of equality."[22]

When it comes to general international law, multiple areas and instruments are relevant to space security and stability, in particular the following:

- **The Charter of the United Nations** applies in its entirety to outer space, as explicitly referenced in article III of the OST. Of particular relevance in this context is the prohibition of the use or the threat of use of force enshrined in article 2(4) of the UN Charter.[23]

- **Arms control treaties** and international laws applicable to military operations or security-related matters are of particular relevance for the regulation of space security activities and for the pursuit of PAROS, even when they do not solely concern space. These include the 1963 Limited Test Ban Treaty (LTBT),[24] the 1996 Comprehensive Nuclear-Test-Ban Treaty

15 Open-ended working group on reducing space threats through norms, rules and principles of responsible behaviours, *Existing Legal and Regulatory Frameworks concerning threats arising from State behaviours with respect to outer space*, UNGAOR, 2022, UN Doc A/AC.294/2022/WP.1.

16 *OST, supra* note 4.

17 US President Lyndon B. Johnson called the OST "the most important arms control development since the Limited Test Ban Treaty of 1963." See www.presidency.ucsb.edu/documents/statement-the-president-announcing-the-reaching-agreement-outer-space-treaty.

18 *OST, supra* note 4, art iv.

19 *Ibid*.

20 *Ibid*, art iii.

21 *Ibid*, art i.

22 *Ibid*.

23 *Charter of the United Nations*, 26 June 1945, Can TS 1945 No 7, art 2(4).

24 *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water*, 5 August 1963, 14 UST 1313, 480 UNTS 6964 (entered into force 10 October 1963) [*LTBT*].

(CTBT)[25] and the 1978 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD Convention).[26]

- **The LTBT** explicitly mentions outer space in its article I 1(a), which prohibits the testing of nuclear weapons "in the atmosphere; beyond its limits, including outer space; or under water, including territorial waters or high seas."[27]
- **The CTBT** states in its article I that "each State Party undertakes not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control."[28] While it supersedes the LTBT, states that have not signed or have withdrawn from the CTBT are still subject to the LTBT.
- **The ENMOD Convention** prohibits state parties in its article I from "[engaging] in military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party."[29] This prohibition is extended to outer space in article II.

Even when it does not explicitly refer to outer space, international law remains applicable. For example:

- **The law applicable to air space and the law of the sea** can serve as useful guidance for outer space. In fact, these domains are often compared to outer space, and their respective legal regimes have served to inform the interpretation of outer space law (Azcárate Ortega 2022b). The concept of "due regard" is an example of this. While mentioned in the OST (article IX), it is not defined therein. The law of the sea jurisprudence from the International Court of Justice, as well as arbitral awards from the Tribunal constituted under Annex VII of the UN Convention on the Law of the Sea, have provided the international community with guidance regarding the meaning of the term.[30] Thanks to these frameworks, the international community generally understands that under the due regard principle, states are bound to refrain from any acts that might adversely affect the use of a domain by other stakeholders prior to and while conducting activities in that domain.
- **Environmental law** serves to inform the OST principle of the prohibition of harmful contamination established in article IX. In this sense, the 1972 Stockholm Declaration[31] highlights in its Principle 21 that states have "the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction."[32]
- **International humanitarian law** (IHL) applies in the context of an armed conflict on Earth involving space systems. Moreover, IHL would also become relevant should an armed conflict break out in outer space. As noted by numerous legal experts, including the International Committee of the Red Cross, IHL's applicability to an armed conflict in outer space does not, in any way, signify the legitimization of war in space.[33] Some of IHL's precepts are also

25 *Comprehensive Nuclear Test Ban Treaty*, 24 September 1996, 35 ILM 1439, S Treaty Doc No 105-28 (1997) (not yet entered into force) [*CTBT*]. It should be noted that this treaty has not yet entered into force, as it needs to be ratified by all 44 states listed in Annex 2, as per its article XIV. These 44 states participated in the negotiations of the treaty in 1996 and possessed nuclear power or research reactors at the time. See www.ctbto.org/our-mission/the-organization/ctbto-after-entry-into-force.

26 *Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques*, 18 May 1977, 31 UST 333, 1108 UNTS 151 (entered into force 5 October 1978) [*ENMOD*].

27 *LTBT, supra* note 26, art I 1(a).

28 *CTBT, supra* note 27, art I.

29 *ENMOD, supra* note 28, art I.

30 In its award on the merits in the *Chagos Marine Protected Area Arbitration (Mauritius v United Kingdom)*, the Tribunal stated that "the ordinary meaning of 'due regard' calls for the United Kingdom to have such regard for the rights of Mauritius as is called for by the circumstances and by the nature of those rights." See *Chagos Marine Protected Area Arbitration (Mauritius v United Kingdom)* (2015), Final Award, PCA No 2011-03, ICGJ 486 at para 519, online: <www.pcacases.com/pcadocs/MU-UK%2020150318%20Award.pdf>. The Annex VII Tribunal agreed with this interpretation in the *South China Sea Arbitration (Philippines v China)*. See *South China Sea Arbitration (Philippines v China)* (2016), Award, PCA No 2013-19, ICGJ 495, online: <www.pcacases.com/pcadocs/PH-CN%20-%2020160712%20-%20Award.pdf>.

31 *Declaration of the United Nations Conference on the Human Environment*, 16 June 1972, UN Doc A/RES/2994(XXVII).

32 *Ibid*, principle 21.

33 Open-ended working group on reducing space threats through norms, rules and principles of responsible behaviours, *Constraints under International Law on Military Operations in, or in Relation to, Outer Space during Armed Conflicts*, UNGAOR, 2022, UN Doc A/AC.294/2022/WP.4.

relevant during peacetime when it comes to the development of counterspace technologies, as IHL limits both the choice of weapons and the means and methods of warfare. When developing or acquiring new weapons, states should determine whether they comply with these rules.[34]

In addition to hard law, non-legally binding mechanisms also address space security concerns relevant to the development and use of counterspace capabilities. One such example would be export control guidelines such as the Missile Technology Control Regime,[35] which aims to limit the proliferation of such technology by controlling exports of goods and technologies that could contribute to delivery systems (other than crewed aircraft) for weapons of mass destruction (WMDs) (US Government 2024). Similarly, the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies calls on states to disclose information regarding their export activities related to weapons and items appearing on the arrangement's two control lists: the List of Dual-Use Goods and Technologies and the Munitions List.[36] Space technology is included in the agreed-upon control list, with an emphasis on launch vehicles, which can be repurposed as ICBMs (Wassenaar Arrangement Secretariat 2018).

At the United Nations, multiple non-binding initiatives have been proposed to address the concerns posed by counterspace capabilities, such as the commitment not to test destructive direct-ascent ASAT missiles[37] or the commitment not to be the first to place weapons in outer space.[38]

34 *Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I)*, 8 June 1977, 1125 UNTS 3, art 36.

35 See www.mtcr.info/en.

36 See www.armscontrol.org/factsheets/wassenaar.

37 GA Res 77/41, UNGAOR, 77th Sess, UN Doc A/RES/77/41, online: <https://undocs.org/A/RES/77/41>.

38 GA Res 78/21, UNGAOR, 78th Sess, UN Doc A/RES/78/21, online: <https://undocs.org/A/RES/78/21>.

Multilateral Efforts for Space Security and How They Impact Counterspace Capabilities

The Emergence of PAROS

The international space treaties do not establish many limitations on the potential weaponization of space. The language of the OST is open enough to allow for the development of counterspace capabilities, facilitating the increase of tensions in space (Azcárate Ortega 2022a, 133, 136). This has been an issue of concern for the international community for many years, and in 1978, it prompted the emergence of the notion of PAROS during the tenth special session of the UNGA (that special session being the first devoted to disarmament).[39]

PAROS sought, as the Cold War went on, to provide support to the OST and the rest of the legal framework applicable to space on the matter of space security, and the maintenance of peace in this environment, which was becoming increasingly relevant to humankind.

In an effort to carry out more specific efforts to keep the space environment peaceful and free of conflict, the UNGA adopted its first two resolutions on PAROS in 1981: one of these resolutions focused on negotiating a treaty aimed at banning the placement of any type of space weapons (particularly those that could target objectives on Earth) in order to "prevent the spread of the arms race to outer space,"[40] sponsored by the Eastern bloc. The other resolution, sponsored by the Western European and Others Group, called for the Conference on Disarmament to work toward "an effective and verifiable agreement to prohibit anti-satellite systems."[41] These contrasting approaches created a schism in how countries perceived the biggest threats to space security and stability, and hindered political discussions on PAROS over the years.

39 GA Res S-10/2, UNGAOR, 10th Sess, Final Document, UN Doc A/RES/S-10/2 at para 80, online: <https://undocs.org/A/RES/S-10/2>.

40 GA Res 36/99, UNGAOR, 36th Sess, UN Doc A/RES/36/99, online: <https://digitallibrary.un.org/record/27062?ln=en&v=pdf>.

41 GA Res 36/97, UNGAOR, 36th Sess, UN Doc A/RES/36/97, art C(4), online: <https://undocs.org/en/A/RES/36/97>.

These different visions of the end goal for these PAROS discussions continue to this day (West and Azcárate Ortega 2022; Silverstein, Porras and Borrie 2020). Although PAROS has continued to be a key agenda item of the Conference on Disarmament since 1982, progress has been further hampered by the stagnation of the conference, which must reach consensus on its agenda and has not been able to do so for three decades. The inability to come together on a work plan is further complicated by the other contentious security issues the Conference on Disarmament is working on — including a fissile material cutoff treaty, nuclear disarmament and negative security assurances[42] — which, in turn, feed into and strengthen the lack of consensus.

Proposals of Legally Binding Instruments

There have been some efforts within the Conference on Disarmament to discuss legally binding approaches to PAROS. In 2008, Russia and China introduced the draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects (PAROS Treaty).[43] This treaty's article II states that "States Parties undertake not to place in orbit around the Earth any objects carrying any kinds of weapons, not to install such weapons on celestial bodies and not to place such weapons in outer space in any other manner; not to resort to the threat or use of force against outer space objects."[44] Criticized at the time for not having verification mechanisms, Russia and China released an updated version in 2014 that attempted to address those criticisms.[45] While there were several amendments to the original text,[46] the key topic of verification had not been included, with Russia and China stating that it could be negotiated as an additional protocol or some other type of verification mechanism after the treaty entered into force.[47] However, other states did not find that option an appealing one, stating that they could not engage in a treaty when verification of compliance could not be ascertained; in addition, they were still concerned about the nebulousness of defining what a weapon in space would actually entail, as well as the possibility of stockpiling and breakout capabilities (US Department of State 2014; Pasco 2021, 117).

Proposals of Non-legally Binding Instruments

There have been some efforts to use unilateral, non-legally binding mechanisms to make some progress in space security discussions and to possibly pave the path toward legally binding initiatives. It should be pointed out that the former is not always intertwined with the latter; as well, there is growing consensus that the international community does not have to choose between legally binding or non-legally binding, but that both approaches can be worked on in parallel.[48]

- **No first placement:** One example of this is Russia's announcement in October 2004 that it would pledge that it would not be the first to place weapons in space, and called for other countries to join it in this no-first-placement pledge[49] (Ministry of Foreign Affairs of the Russian Federation 2017). Thirty-one countries have made this same non-legally binding pledge. This unilateral commitment has been multilateralized: in December 2014, UNGA

42 The different agenda items of the Conference on Disarmament can be found at https://disarmament.unoda.org/conference-on-disarmament/.

43 Russian Federation and China, *Letter dated 2008/02/12 from the Permanent Representative of the Russian Federation and the Permanent Representative of China to the Conference on Disarmament addressed to the Secretary-General of the Conference transmitting the Russian and Chinese texts of the draft "Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT)" introduced by the Russian Federation and China*, UN Doc CD/1839 (2008), online: <https://digitallibrary.un.org/record/633470?ln=en&v=pdf>.

44 *Ibid*, art II.

45 *PAROS Treaty*, *supra* note 6.

46 Russian Federation and China, *Explanatory note on the updated draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects*, 10 June 2014, online: <https://docs-library.unoda.org/Conference_on_Disarmament_(2014)/1319%2BRussian%2BFederation%2BExplanatory%2Bnote%2Bupdated%2Bdraft%2BPPWT.pdf>.

47 Russian Federation and China, *Comments by the Russian Federation and the People's Republic of China on the updated draft "Treaty on the prevention of the placement of weapons in Outer Space, the threat or use of force against Outer Space objects" (CD/1985) with respect to the United States "Analyses of the 2014 Russian-Chinese draft treaty on the prevention of the placement of weapons in Outer Space, the threat or use of force against Outer Space objects" (CD/1998)*, Conference on Disarmament, UN Doc CD/2042 (2015), online: <https://undocs.org/CD/2042>.

48 *Chairperson's Summary*, *supra* note 1.

49 See https://swfound.org/multilateral-space-security-initiatives/.

adopted Resolution 69/32, which encouraged all states (particularly space-faring nations) to also make a political commitment not to be the first to place weapons in outer space.[50] Similar resolutions have since been passed annually, with the latest having been adopted on December 4, 2023 (UNGA Resolution 78/21) (with a vote of 127 in favour, 51 against and six abstentions).

→ **No testing of destructive direct-ascent ASAT missiles:** Another example is the United States' announcement in April 2022 that it was making a commitment not to conduct destructive direct-ascent ASAT missile tests, largely due to the danger from the debris created from such tests (Secure World Foundation 2023). Thirty-eight countries have made this commitment, and this, too, has been multilateralized via UNGA Resolution 77/41,[51] which called upon all states to commit not to conduct destructive direct-ascent ASAT missile tests and to continue discussions in the relevant bodies to enhance space security. This resolution was adopted on December 7, 2022 (with a vote of 155 in favour, nine against and nine abstentions).

UNGA Initiatives and Resolutions

UNGA regularly establishes subgroups to investigate concerns on issues of interest and to make recommendations to the UN Secretary-General. These have proven helpful in terms of identifying key issues of concern but have not always had success in reaching consensus in their final reports. This is due largely to differences in what countries believe the threat to be (some focus on weapons created specifically to be placed in space to menace targets on the ground, while others focus more on behaviour rather than on the specific technology) and whether the end goal should be a legally binding treaty or if there are roles for non-legally binding efforts in these processes.

2013 Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities

One such group on space security issues created by UNGA was the Group of Governmental Experts (GGE) on Transparency and Confidence-Building Measures (TCBMs) in Outer Space Activities, called for in the 2010 UNGA Resolution 65/68. Then UN Secretary-General Ban Ki-moon created the GGE in 2011, and the group met three times from 2012 to 2013. It was composed of 15 states.[52] During their discussions, the GGE members examined different categories of TCBMs, implementation and a proposed central point of contact for all space TCBMs. It also became clear that while TCBMs are strictly voluntary in nature, they can come in many different forms, and certain categories of TCBMs already exist (consultations, visits, information exchanges and notifications, among others) (Johnson 2014).[53]

The GGE was able to reach consensus on its findings and deliver a report to the UN Secretary-General in July 2013. The report noted: "In general terms, transparency and confidence-building measures are a means by which Governments can share information with the aim of creating mutual understanding and trust, reducing misperceptions and miscalculations and thereby helping both to prevent military confrontation and to foster regional and global stability" (ibid.).[54] It also gave specific recommendations for space TCBMs, including information exchange on space policies, military space expenditures and activities in outer space; notifications of risk reductions; and voluntary site visits (ibid.).[55] It encouraged consultative mechanisms, international cooperation, coordination and outreach as appropriate space TCBMs (ibid.).[56] The report recommended states

50 GA Res 69/32, UNGAOR, 69th Sess, UN Doc A/RES/69/32, online: <https://undocs.org/A/RES/69/32>.

51 See https://swfound.org/multilateral-space-security-initiatives/.

52 The group was composed of the permanent members of the UN Security Council (China, France, Russia, the United Kingdom and the United States), as well as a geographically representative group of 10 additional countries (Brazil, Chile, Italy, Kazakhstan, Nigeria, Romania, South Africa, the Republic of Korea, Sri Lanka and Ukraine).

53 *Report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities*, UNGAOR, 68th Sess, UN Doc A/68/189, online: <www.unoosa.org/oosa/oosadoc/data/documents/2013/a/a68189_0.html>.

54 *Ibid* at 12.

55 *Ibid*.

56 *Ibid*.

and international organizations to review, consider and implement the TCBMs to the greatest extent possible. A decade later, the TCBMs still hold up but implementation, to date, has been lacking at both the national and international levels (Weeden 2023).

2019 GGE on Further Practical Measures for PAROS

Four years later, UNGA created another GGE via Resolution 72/250. This time, its mandate was to consider and make recommendations on substantial elements of an international legally binding instrument on PAROS, including, *inter alia*, on the prevention of the placement of weapons in outer space.[57] Its 25 members[58] met twice — once in 2018 and once in 2019. An informal consultative meeting was held in early 2019 so that other states not in the GGE could have the opportunity to provide input to the discussions. During its two one-week meetings, the GGE discussed the following:

> (a) The international security situation...in outer space;
>
> (b) The existing legal regime applicable to the prevention of an arms race in outer space;
>
> (c) The application of the right to self-defence in outer space;
>
> (d) General principles...;
>
> (e) General obligations...;
>
> (f) Definitions;
>
> (g) Monitoring, verification and transparency and confidence-building measures...;
>
> (h) International cooperation...; [and]
>
> (i) Final provisions and institutional arrangements.[59]

The chair's report noted that "a number of experts regarded the prohibition on placing any weapon in outer space as the primary purpose of any legally binding instrument. There was a robust discussion on the potential dual-use nature of space activities complicating effective verification of such a prohibition. It was suggested that an instrument could prohibit the placement of outer space objects specifically designed for use as weapons."[60] In the end, while the GGE was an effective way to clarify state positions on the various options for enhancing space security, the members were unable to reach consensus on a final report, so no recommendations were created.

2023 Open-Ended Working Group on Reducing Space Threats through Norms, Rules and Principles of Responsible Behaviours

A new approach was tried in the next go-round of UNGA resolutions. In December 2020, UNGA passed Resolution 75/36, which asked states to submit reports to the UN Secretary-General about the types of threats that they saw, identify behaviours that they thought were responsible or irresponsible, and share what they felt could be further development and implementation of norms, rules and principles of responsible behaviour, as well as how to reduce risks of misunderstanding or miscalculations regarding outer space.[61] This open-ended working group (OEWG) met twice in 2022 and twice in 2023. Its mandate was:

> (a) To take stock of the existing international legal and other normative frameworks concerning threats arising from State behaviours with respect to outer space;
>
> (b) To consider current and future threats by States to space systems, and actions, activities and omissions that could be considered irresponsible;
>
> (c) To make recommendations on possible norms, rules and principles of responsible behaviours relating to threats by States to space systems, including, as appropriate, how they would contribute to the negotiation of

57 GA Res 72/250, UNGAOR, 72nd Sess, UN Doc A/RES/72/250, online: <https://digitallibrary.un.org/record/1471654?ln=en&v=pdf#files>.

58 This GGE was comprised of the five permanent members of the UN Security Council plus Algeria, Argentina, Australia, Belarus, Brazil, Canada, Chile, Egypt, Germany, India, Iran, Italy, Japan, Kazakhstan, Malaysia, Nigeria, Pakistan, the Republic of Korea, Romania and South Africa.

59 *Report of the Group of Governmental Experts on further practical measures for the prevention of an arms race in outer space*, UNGAOR, 74th Sess, Annex II, Agenda Item 98(c), UN Doc A/74/77 (2019) at 8–9, online: <https://undocs.org/Home/Mobile?FinalSymbol=A%2F74%2F77>.

60 *Ibid* at 12.

61 GA Res 75/36, UNGAOR, 75th Sess, UN Doc A/RES/75/36, online: <https://undocs.org/A/RES/75/36>.

legally binding instruments, including on the prevention of an arms race in outer space; [and]

(d) To submit a report to the General Assembly at its seventy-eighth session.[62]

The OEWG discussed all parts of its mandate, but like the 2019 GGE on PAROS, it was also unable to achieve consensus, to the point where it could not even agree on a report detailing the discussions. The chair ended up creating and releasing a document that summarized the proceedings.[63]

While this OEWG did not reach consensus, some positive trends could be seen emerging over the four sessions that it met. There was not agreement on all the norms, rules and principles of responsible behaviour, but a few were getting traction. Many states also emphasized the importance of acting with due regard for others and avoiding harmful interference in their space activities, in accordance with article IX of the OST. Additionally, many countries had traditionally supported either legally binding initiatives or non-legally binding mechanisms in a mutually exclusive manner. By the end of the OEWG, many acknowledged that non-legally binding mechanisms and legally binding initiatives could be complementary approaches to space security — it is not either/or but rather both. As well, the process was truly inclusive, and many state actors that previously had not anticipated that space security discussions were immediately of relevance to them were active participants in these discussions. Seventy-eight states participated in the OEWG overall, plus 37 representatives of international organizations and civil society (academic institutions, commercial actors and non-governmental organizations) (Azcárate Ortega and Erickson 2024). It should be noted that a working paper authored by 34 states was submitted at the final meeting of the OEWG to demonstrate cross-regional support of the process and the discussions.[64] And a concluding joint statement on behalf of 39 states underscored that political commitments on responsible behaviours could be developed in support of legally binding initiatives and that the two approaches were not mutually exclusive.[65] Similar language was used in the chairperson's summary, which highlighted that "possible solutions to outer space security can involve a combination of legally binding obligations and non-legally binding measures, and that work in both of these areas can be further pursued in a progressive, sustained and complementary manner, without undermining existing legal obligations."[66]

2024 GGE on Further Practical Measures for PAROS

The international community has not lost its will to work on these issues of space security, even as complicated as the geopolitical situation has become and despite not having reached consensus on the last several efforts to shore up space security. Another GGE on PAROS was called for in the December 2022 UNGA Resolution 77/250 that would meet once in 2023 and once in 2024, plus have an intersessional meeting to allow non-member states to give input to the process. This group had 25 members and it, too, was mandated

62 GA Res 76/231, UNGAOR, 76th Sess, UN Doc A/RES/76/231 at 3, online: <https://undocs.org/A/RES/76/231>.

63 *Chairperson's Summary, supra* note 1.

64 The working paper in support of the OEWG at the final session was delivered on behalf of Argentina, Australia, Austria, Belgium, Brazil, Canada, Cambodia, Chile, Colombia, Costa Rica, Denmark, Ecuador, El Salvador, Ireland, Italy, Finland, Germany, Japan, Malawi, Mexico, the Netherlands, New Zealand, Nigeria, Norway, Panama, Peru, the Philippines, the Republic of Korea, Singapore, Sierra Leone, Spain, Sweden, Switzerland and Uruguay. See Open-ended working group on reducing space threats through norms, rules and principles of responsible behaviours, *Working Paper on a cross-regional initiative in support of the United Nations Open-Ended Working Group (OEWG) on Reducing Space Threats Through Norms, Rules, and Principles of Responsible Behaviours*, UN Doc A/AC.294/2023/WP.21 (2023), online: <https://undocs.org/A/AC.294/2023/WP.21>.

65 The joint concluding statement was delivered on behalf of Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Costa Rica, Colombia, the Czech Republic, Denmark, Ecuador, El Salvador, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Malawi, Mexico, the Netherlands, New Zealand, Nigeria, Norway, Panama, Peru, the Philippines, Portugal, the Republic of Korea, Samoa, Singapore, Spain, Sweden, Switzerland, the United Kingdom and Uruguay. See Philippines, *Concluding Joint Statement*, Final Session of the United Nations Open-Ended Working Group on Reducing Space Threats Through Norms, Rules, and Principles of Responsible Behavior (2023), online: <https://docs-library.unoda.org/Open-Ended_Working_Group_on_Reducing_Space_Threats_-_(2022)/PHL-_STATEMENT_-__Concluding_Joint_Statement.pdf>.

66 *Chairperson's Summary, supra* note 1.

to work toward a consensus report,[67] which it agreed on after its final meeting in August 2024. The consensus report considers substantial elements of an international legally binding instrument on PAROS, including, *inter alia*, on the prevention of the placement of weapons in outer space.[68]

The report, which constitutes the first consensus document on the issue of PAROS, builds on the international community's previous work, including the aforementioned 2023 OEWG, the 2019 GGE and the 2013 GGE. It highlights the importance of common understanding on key terms and definitions as well as the necessity of including measures for verification in a potential legally binding agreement on PAROS.

Moreover, it emphasizes the relevance for PAROS of the principles contained within the OST and the UN Charter. The group also discussed potential obligations to be enshrined in a legally binding agreement on PAROS, including the prohibition of the threat or use of force, as well as the damage, destruction, disruption or interference with space systems and services.

The group also highlighted in the report the importance of transparency and confidence-building measures as a means of reinforcing the objective of PAROS, recognizing that TCBMs as well as other forms of non-legally binding mechanisms can complement and contribute to, but not substitute for, an international legally binding instrument on PAROS.

Future OEWG

States had also proposed the establishment of parallel OEWGs starting in 2025. One, established by UNGA Resolution 78/20, would follow up on the 2022–2023 OEWG and examine norms, rules and principles of responsible behaviour and meet twice in 2025 and twice in 2026 to discuss the following:

> (a) Intentional damage to and destruction of space systems;
>
> (b) Threats to the safe operation of space objects;
>
> (c) Rendezvous operations and proximity operations that could increase the risk of misunderstanding and miscalculation;
>
> (d) Protecting critical space-based services to civilians as well as services that support humanitarian operations; [and]
>
> (e) Other activities and measures that could reduce the risk of unintended escalation and conflict.[69]

The other, established under UNGA Resolution 78/238, would build upon the discussions held in the 2024 GGE on PAROS and was mandated to meet twice a year from 2025 to 2028 in order "to consider and to make recommendations on substantial elements of an international legally binding instrument on the prevention of an arms race in outer space, including, *inter alia*, on the prevention of the placement of weapons in outer space, as well as to consider various aspects of the prevention of an arms race in outer space in the context of an international legally binding instrument on the prevention of an arms race in outer space."[70]

Delegations were concerned about the two processes interfering with each other's progress and the burden that five weeks of meetings in Geneva in 2025 and 2026 would place on national delegations, so multiple states, led by Egypt and Brazil, supported the merger of these two OEWG processes into one. The First Committee of the UNGA voted in favour of this proposal in November 2024, leading to the establishment of one sole OEWG on PAROS in all its aspects, which will "meet in Geneva for two substantive sessions of five days each in 2025, two substantive sessions of five days each in 2026, two substantive sessions of five days each in 2027 and two substantive sessions of five days each in 2028, with the contribution of

67 The members are the five permanent members of the UN Security Council (China, France, Russia, the United Kingdom and the United States), plus Australia, Brazil, Canada, Chile, Cuba, Egypt, Germany, Hungary, India, Iran, Israel, Japan, Morocco, Pakistan, the Philippines, the Republic of Korea, South Africa, Sweden and the United Arab Emirates.

68 Group of Governmental Experts on Further Practical Measures for the Prevention of an Arms Race in Outer Space, *Note by the Secretary-General*, UNGAOR, 79th Sess, UN Doc A/79/364, online: <https://digitallibrary.un.org/record/4063764?ln=en&v=pdf>.

69 GA Res 78/20, UNGAOR, 78th Sess, UN Doc A/RES/78/20 (2023) at 3–4, online: <https://undocs.org/A/RES/78/20>.

70 GA Res 78/238, UNGAOR, 78th Sess, UN Doc A/RES/78/238 (2023) at 3, online: <https://undocs.org/A/RES/78/238>.

relevant international and non-governmental organizations."[71]

While not all of these efforts have resulted in consensus and thus have not all created reports with recommendations, these discussions have proven useful in other ways. First, the near-constant creation of these special groups by UNGA indicates the importance that the international community places on space security and stability, something that is increasingly relevant due to the proliferation of interest in and work on counterspace capabilities. Second, these discussions have helped to identify gaps in countries' understandings of the topics and differences in how they approach space security, both of which are crucial if there is to be movement on these topics in multilateral settings (with the thinking that one cannot fix the problems that one does not know about). As well, more countries are getting involved in these conversations and contributing to them, demonstrating that the topics are not solely of importance to the geopolitical superpowers. This, again, is an indication both of how space is relevant to the global community and, consequently, how destabilizing counterspace capabilities could prove to be.

Nuclear Weapons in Space and UN Security Council Discussions

In April 2024, the UN Security Council voted on a draft resolution on WMDs in outer space, which was prepared by Japan and the United States and co-sponsored by 65 member states.[72] The resolution did not introduce anything particularly novel, and instead affirmed the obligations of states under the OST, namely, its article IV to not place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of WMDs, install such weapons on celestial bodies, or station such weapons in outer space in any other manner. In its paragraph 6, it includes a call not to develop nuclear weapons or any other kind of WMDs specifically designed to be placed in orbit around the Earth. This paragraph, which goes beyond the limitation established in article IV of the OST, was a reference to the rumours that Russia was developing a nuclear weapon to be placed in orbit (Faulconbridge and Mohammed 2024). Russia voted against the resolution and China abstained. The rest of the Council voted in favour (13), with one vote against and one abstention. During the negotiations, Russia and China proposed an amendment, calling on all states to prevent the placement of any weapons in space, and to work toward the negotiation of a legally binding agreement on this issue.[73] The amendment was not adopted as it did not have the required votes (seven in favour, seven against and one abstention).

The outcome of the proceedings in April 2024 was that several Council members expressed regret over Russia's use of the veto, arguing that the proposed resolution was an opportunity to enhance global security by preventing the potential weaponization of outer space. Some members accused Russia of undermining the global non-proliferation regime (United Nations 2024). The United States specifically criticized Russia for having "irresponsibly invoked dangerous nuclear rhetoric and walked away from several of its arms control obligations" (United States Mission to the United Nations 2024a).

Russia defended its veto by arguing that its goal is to ban the placement of any type of weapons in space, not just WMDs, saying that the sponsors of the resolution were "cherry-picking" WMDs from other weapons in space (United Nations 2024), and indicated that it would be presenting an alternative draft resolution to the Council, which the Council eventually voted on in May 2024.[74] The text of this draft resolution is similar in many respects to the one presented by the United States and Japan in April, including its paragraph 6 (which, in the Russian-proposed draft resolution,

71 Open-ended working group on the prevention of an arms race in outer space in all its aspects, *Brazil, Egypt, Indonesia, Jordan, Nigeria, Saudi Arabia and South Africa: revised draft decision*, UNGAOR, 79th Sess, Agenda Item 96(a), UN Doc A/C.1/79/L.61/Rev.1 at 3(a), online: <https://reachingcriticalwill.org/images/documents/Disarmament-fora/1com/1com24/resolutions/L61Rev1.pdf>.

72 UNSC, *Albania, Antigua and Barbuda, Argentina, Australia, Bahamas, Bangladesh, Belgium, Bosnia and Herzegovina, Bulgaria, Cabo Verde, Canada, Colombia, Costa Rica, Croatia, Cyprus, Czechia, Denmark, Djibouti, Estonia, Finland, France, Georgia, Germany, Greece, Honduras, Hungary, Iceland, Ireland, Israel, Italy, Japan, Kenya, Latvia, Lesotho, Liberia, Liechtenstein, Lithuania, Luxembourg, Marshall Islands, Micronesia (Federated States of), Montenegro, Netherlands (Kingdom of the), New Zealand, North Macedonia, Norway, Palau, Panama, Paraguay, Poland, Portugal, Republic of Korea, Republic of Moldova, Romania, San Marino, Singapore, Slovakia, Slovenia, Spain, Sweden, Timor-Leste, Türkiye, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland and United States of America: draft resolution*, UN Doc S/2024/302 (2024), online: <https://undocs.org/S/2024/302>.

73 UNSC, *China and Russian Federation: amendment to the draft resolution contained in document S/2024/302*, UN Doc S/2024/323 (2024), online: <https://undocs.org/S/2024/323>.

74 UNSC, *Belarus, Democratic People's Republic of Korea, Nicaragua, Russian Federation and Syrian Arab Republic: draft resolution*, UN Doc S/2024/383 (2024), online: <https://undocs.org/S/2024/383>.

is paragraph 7), but places much more emphasis on the prohibition of the placement of all weapons in outer space, as well as the need to agree on a legally binding instrument(s) on this matter.

The Russian-sponsored resolution was not adopted. It received seven votes in favour, seven votes against and one abstention. The United States claimed that Russia's goal with its draft resolution proposal was to "distract global attention from its development of a new satellite carrying a nuclear device" (United States Mission to the United Nations 2024b).

It is unusual for the UN Security Council to take up an arms control discussion and particularly one that is essentially reminding countries of their OST obligations. The fact that it was discussed this past spring demonstrates the true concerns countries have about what a nuclear explosion would do to satellites in orbit. The EMPs released would damage the circuitry of satellites in its vicinity that are not hardened against radiation (which most satellites are not). This is a very effective weapon against a large number of satellites, but it is not anything close to a targeted weapon: its effect would be felt by whatever satellites are near the EMPs, including those of allies of the launching state and even the satellites of the launching state itself (Conrad et al. 2010).

Looking Forward

There Is No "One Size Fits All" for Regulating Counterspace Capabilities

As the international community moves forward with its efforts to achieve and maintain space security and, more specifically, to address the issue of counterspace capabilities and mitigate the threats they pose, it is important that states acknowledge that counterspace capabilities cannot be considered, debated and regulated as a block, because they are very different. The political climate might be ripe to regulate some more than others — an issue that is further influenced by the state of the technology and the international community's understanding of it.

In this sense, it is important to note that when it comes to certain technologies, regulating capabilities could be sufficient to address the threat that they can pose. An example of this is the ban on nuclear weapons and other WMDs established by article IV of the OST. However, in other instances, to successfully mitigate the threat that counterspace capabilities pose, these capabilities must be considered in conjunction with how they are used as well as the effects that they could potentially cause (that is to say, by looking at the behaviours of the actors using them). This is particularly the case with dual-purpose space objects, whose capabilities may not be intended for counterspace functions, but which could nonetheless be repurposed for this end.

Counterspace capabilities regulation can therefore not be understood as a static issue. It will evolve continuously as technologies also evolve, and as national space capabilities mature. In this sense, there will be no one single effort that will achieve PAROS. What will be required is a multitude of approaches — non-legally binding mechanisms, legally binding initiatives, unilateral declarations and everything in between — to fully meet the problem at hand.

Addressing the Threat Posed by Counterspace Capabilities Concerns All

Through the discussions at the OEWG and other international fora, more states are getting involved in these discussions as part of the increasing recognition that everyone has an interest in space security and stability, not just geopolitical superpowers or space-faring nations. While there is not agreement across the board, there is coalescence around a few topics. For example, as became evident at the most recent OEWG on space threats and the success of UNGA Resolution 77/41, it is becoming increasingly clear that deliberately creating debris on orbit is perceived as an act that negatively impacts all (which multiple states have called an irresponsible behaviour). As such, it may be possible to build upon this emerging norm by which states should not conduct such activities that would result in deliberate creation of long-lived debris — and extend international support for this to result in a treaty banning the intentional creation of space debris through the use of counterspace capabilities. While admittedly limited in scope, this approach would be fairly easy to define, attribute and verify — all characteristics necessary for a legally binding initiative to be effective.

Considering the reality that all humankind uses and benefits from space services in one way or another, it is important that all states work to be part of these discussions, regardless of their indigenous spacefaring prowess. A state's involvement in space security issues can be carried out at the multilateral level, but efforts can also be conducted regionally,[75] as well as nationally. Implementation at the domestic level is of particular importance to ensure the security and stability of the space environment. As such, it is crucial to generate ideas that countries are willing and able to domesticize via national legislation and regulatory actions.

Efforts to Address Counterspace Threats Should Build Upon Existing Mechanisms and Initiatives

As this paper has sought to highlight, states have established a solid legal and normative framework for space that is specifically relevant for space security. Additionally, over the years, there have been multiple attempts to address the issue of space security and, specifically, to tackle the challenges presented by counterspace capabilities. As such, as the international community continues to take on the challenge of addressing the concerns that these technologies pose, it is crucial to rely on and make use of those existing frameworks and initiatives. Each new effort to achieve PAROS is a building block rather than a blank slate.

In particular, states should look at the OST as a frame of reference. Using the issue of intentional space debris creation as an example again, states can point to article IX of the OST and the duty of due regard it establishes, by which states are bound to refrain from any acts that might adversely affect the use of a domain by other stakeholders prior to and while conducting activities in that domain. Explicitly establishing linkages between specific space activities and the principles established in the OST can aid in informing the interpretation of these principles and facilitates common understanding regarding their meaning.

In this sense, it is important to note that common understanding is necessary for the success of any measure, and consensus cannot be achieved without it. Such common understanding is crucial at the most basic level: the terminology used. A common understanding of key terms, as well as how they may be interpreted differently by states with various legal traditions, and how the use of the different UN official languages may affect said interpretation, is necessary for the establishment of effective and long-lasting mechanisms for space security.

Space is an increasingly important part of everyday life: nearly everyone on this planet is a user of space-derived data in some format. As well, more and more countries are heavily depending on space as a national security enabler. Given these two trends, there is a growing incentive to interfere with or damage a rival's access to or use of space, which is vividly demonstrated by the increasing number of countries conducting research and development in, or even operationalizing, counterspace capabilities. As evidenced by the near-constant existence of special groups created by the United Nations to deal with concerns about space security over the past seven years and for at least four years to come, this will continue to be an issue that affects global security and stability.

75 The authors' organizations recently co-hosted a series of regional workshops on the relevance of space security to all countries and the important role that norms of behaviour can play in establishing it; these workshops were held in May 2022 (virtually by the Republic of Korea for members of the Association of Southeast Asian Nations); in August 2022 (in person in Chile for countries in Latin America and the Caribbean); in March 2023 (in person in Kenya for African countries); in August 2023 (in person in Argentina for countries in Latin America and the Caribbean); and in April 2024 (in person in the Maldives for small island states).

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