

THE SHIFTING SANDS OF SPACE SECURITY: THE POLITICS AND LAW OF THE PEACEFUL USES OF OUTER SPACE

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Abstract

This article argues that the content of the legal term “peaceful purposes,” as used in international space law is changing. Peaceful Purposes as understood throughout the bulk of the Space Age has encompassed not only the UN Charter’s prohibitions on the use of force, but also a number of customary international law principles that enhanced it beyond mere non-aggression. Through an examination of state practice with regards to the military uses of outer space, this article concludes that the legal content of peaceful purposes is eroding towards an alignment with “non-aggressive” as understood in the law concerning the use of force. Specifically, this article argues that geopolitical and technological changes are encouraging states to pursue disruption in the space environment rather than stability, and this has been matched with state practice and rhetoric that exhibits that states are moving toward more offensive, rather than defensive, stances in the space environment.

Keywords : aggression, customary international law, peaceful purposes, space law, space security

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I. INTRODUCTION

A foundational legal concept in the use and exploration of outer space is that it should be for peaceful purposes. Although the notion of peaceful uses is almost universally held as a threshold legal requirement for space activities by space actors, the term lacks any clear definition. This is problematic as the content of the term is continually shifting as states develop new understandings of their own relationship to space security and overtime reinterpret the legal obligation. Thus, while the legal terminology is static the underlying politics reveals dynamic changes in how states understand their international obligations.

This paper will investigate how states currently understand the obligation to use space for peaceful purposes, and trace observation points that reveal the shifting notions of space security that affect the content of the legal obligation. Specifically, this paper will argue that the legal content of peaceful purposes

has been gradually eroding towards a legal minimum of non-aggressive uses of outer space within the context of contemporary geopolitics. It will argue that state rhetoric and actions, such as the US Space Force proposal and India's ASAT test, indicate that the term peaceful purposes is expanding to allow new classes of activities to fall within its legal bounds. Finally, this paper will discuss how changes in space technology will continue to create challenges for this bedrock principle.

This paper will proceed by first identifying the legal sources of the term 'peaceful uses'/'peaceful purposes' and the historical development of the term's legal content. Next, this paper will investigate contemporary trends in space security that impact the peaceful purposes obligation and determine whether these trends point to an erosion of the limits imposed by the obligation. Finally, this paper will look at the future challenges posed to the obligation in light of emerging technologies that undermine assumptions underlying an expanded scope of peaceful purposes.

II. THE OBLIGATION OF PEACEFUL USES

From the inception of the space age in 1957 with the launch of *Sputnik I*, space has been deemed to be used for "peaceful purposes" by states. The term makes its first appearance in the international fora in UN General Assembly resolution 1348 (XIII): Question of the Peaceful Use of Outer Space of 1958, which was the first General Assembly resolution to address space activities by states.¹ Since this time "peaceful uses" or "peaceful purposes" has become a threshold requirement for states engaging in space activities. This section will briefly sketch the development of the term and its legal content in the space domain.

Though peaceful uses emerge at the very beginning of the space age as a legal limitation of the space activities of states, it has never been codified as a treaty term applicable to all of outer space. The Outer Space Treaty of 1967 uses the phrase in the Preamble, but only operationalizes the term in Art. IV, with regards to the moon and other celestial bodies which "shall be used exclusively for peaceful purposes."² Even though states were unwilling to operationalize the term as applicable to all of space through positive treaty law, this has not excluded peaceful purposes as a legal obligation under the

¹ UN General Assembly, Resolution 1348 (XIII): Question of the Peaceful Use of Outer Space (13 Dec. 1958)

² Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Article IV, 610 UNTS 205 (entered into force 10 October 1967) [hereinafter Outer Space Treaty].

international legal framework governing outer space. Indeed, the term has arguably become a type of *grundnorm* for outer space activities by states. Whether or not a space activity is for peaceful purposes is *the* threshold question for determining the legality of any space activity, and those activities that are not for peaceful purposes are *de facto* illegal. This is, of course, an interesting situation since the Outer Space Treaty functions as a “constitution” for space, yet it never codifies the central legal requirement for space activities. This situation spawns from the Cold War genesis of space law.

The launch of *Sputnik I* dramatically changed the dynamics of international peace and security by exhibiting technologies that would be used to develop intercontinental ballistic missiles (ICBM) and technology that would facilitate space-based surveillance of other states. Recognizing the risk that Cold War conflict extended to space posed for itself and the international community the United States sought early to deploy a norm of “peaceful purposes” as applicable to space activities. Indeed, the United States insisted on making its first space launch a civilian launch rather than a military one, which in turn led to the Soviet Union “winning” the race to orbit an artificial satellite first.³ Further, the phrase was included in the first US legislation on space, passed in 1958, which required the newly formed National Aeronautics and Space Administration (NASA) to use space for peaceful purposes.⁴ As already noted this term then found its way into the development of the international legal framework, significantly in UN General Assembly Resolution 1962(XVIII), which represented the international community’s first attempt at defining the basic legal principles that would govern outer space. This resolution incorporated the idea of peaceful purposes into its perambulatory text

“Recognizing the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes”⁵

Despite the lack of the term’s use in operative language in either Resolution 1962(XVIII) or the Outer Space Treaty, it is widely recognized by states as a legal norm that applies to states. It is consistently included in UN General Assembly resolutions regarding space,⁶ it lends itself to the main UN body

³ Memo on Sputnik. Memorandum of Conference with President Eisenhower, October 8, 1957, National Archives..

⁴ National Aeronautics and Space Act of 1958, as amended, §102(a), codified at 51 U.S.C. §20102 (2019).

⁵ United Nations General Assembly, (December 13, 1963), Resolution 1962 (XVIII): Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space.

⁶ For example, Resolution 73/91. International cooperation in the peaceful uses of outer space (2018); 73/72. Transparency and confidence-building measures in outer space activities (2018); Resolution 73/30. Prevention of an arms race in outer space (2018); and Resolution 73/6. Fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space: space as a driver of

dealing with space issues – The United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), and is consistently referred to by states when describing their space activities. Two salient examples of this can be found in the cases of Iran and North Korea. Both of these states used their right to engage in peaceful uses of outer space to defend their space programs when these programs were criticized by the international community as missile development programs.⁷ As this author has argued in depth elsewhere, the term has force as customary international law supported by widespread *opinio juris* by states.⁸

What, then, is to be made of the decision not to operationalize the norm through treaty text? It seems as though, the language of Article IV of the Outer Space Treaty which reserves the Moon and other celestial bodies “exclusively for peaceful purposes” would undercut claims of the customary nature of the norm as applied to all of outer space. In other words, this argument claims that by acknowledging its applicability to celestial bodies, the state parties to the treaty have excluded the void of space from the scope of the norm. This interpretation would stand in opposition to the clear *opinio juris* expressed by states. Instead, it must be taken into account that the norm as used in the treaty is different than the customary norm that emerged at the beginning of the space age. In the treaty text, peaceful purposes on the Moon and other celestial bodies are defined as explicitly non-military, as the article states that “[t]he establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies shall be forbidden.”⁹ ‘Peaceful purposes’ as applied to the Moon and other celestial bodies tracks with the norm’s usage in the Antarctic Treaty, which also defines peaceful purposes as non-militarized,¹⁰ but it does not track with the United Nations Convention on the Law of the Sea which fails to define the term in the face of widespread military uses of the high seas. As a result, we can see that “peaceful purposes” can have different meanings in different contexts.¹¹ When it is used in a treaty’s text it is defined by that treaty, but the content of a customary norm will largely be defined by the state practice that

sustainable development (2018).

⁷ See Kevjn Lim & Gil Baram, “Iran Is Mastering the Final Frontier,” *Foreign Policy*, (14 March 2019) <https://foreignpolicy.com/2019/03/14/iran-is-mastering-the-final-frontier/> and P. J. Blount, “Developments in Space Security and Their Legal Implications,” *Law/Technology* 44 (2011): 35-39

⁸ See P. J. Blount, “Limits on Space Weapons: Incorporating the Law of War Into the Corpus Juris Spatialis,” in *Proceedings of the 51st Colloquium on the Law of Outer Space* (2009); “Space Security Law,” in *Oxford Encyclopedia of Interplanetary Science* (Oxford: Oxford University Press, 2018), <https://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-73#acrefore-9780190647926-e-73-bibItem-0071>

⁹ Outer Space Treaty, Art. IV.

¹⁰ Antarctic Treaty, 402 U.N.T.S. 71 (entered into force 23 June 1961), Art. I.

¹¹ See Blount, “Space Security Law”

underlies that norm.

This, then, brings us directly to the content of the obligation itself. During the early days of the space age both the United States and the USSR, at different times, argued that peaceful purposes should mean non-militarized. The United States abandoned this position when it recognized the ability that surveillance satellites would have to reveal information about the Soviet Union's armaments.¹² The Soviets, on the other hand, maintained the position until they had developed comparable technology,¹³ and the militaries from these two states were both prominent early users of space. Since militaries may use space, one might then reckon "peaceful" to be based on the UN Charter use of the word "peace" which means, in short, non-aggressive. Under the UN Charter, non-aggressive means that defensive military activities are permitted, including defensive weapons.¹⁴

During the Cold War, a more nuanced view prevailed in which "peaceful purposes" meant something in between non-militarized and non-aggressive. There was at least some customary content to the norm that created a situation in which the two diametrically opposed superpowers could widely agree that weaponizing space was not a useful, practical, or desired endeavor.¹⁵ This author has argued before that the customary content of peaceful purposes has been non-aggressive uses plus the content of the Principles enumerated in the UNGA Resolution 1962 (XVIII) Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space.¹⁶ This, of course, does not mean that these states did not ever pursue technologies that could be described as space weapons, but instead, that space was treated in whole more cooperatively and, in this author's words, as a "multilateral commons."¹⁷

However, it must be admitted that the interpretation of peaceful purposes as simply non-aggressive, is a valid interpretation of the term as a floor for the lowest minimum requirements to be compliant with UN Charter law. Thus, if we can accept that legal interpretations can change over time, the question becomes whether in the contemporary setting the meaning of peaceful purposes is bending more towards that minimum of non-aggressive. This is what the next section will address.

¹² *Ibid.*

¹³ James Clay Moltz, *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests* (Stanford, CA: Stanford Security Studies, 2008) 92-93, 125.

¹⁴ The bounds of peace are found between UN Charter, Art. 2(4) and Art. 51.

¹⁵ See Moltz, *The Politics of Space Security*, ch. 2

¹⁶ See Blount, "Space Security Law."

¹⁷ See Blount, "Innovating the Law: Fifty Years of the Outer Space Treaty," in *Innovation in Outer Space: International and African Perspectives*, Mahulena Hofmann & P.J. Blount, eds. (Nomos 2018).

III. WINDS OF CHANGE

In 1986, the United States and the Soviet Union settled into a voluntary moratorium on anti-satellite (ASAT) weapon testing.¹⁸ The two superpowers - without a treaty, without an explicit political agreement, and without a negotiation - mutually decided that ASAT testing was counterproductive and that it threatened the space environment as a whole.¹⁹ Around the same time, the earliest concern with issues of space debris was entering the discourse of the space community.²⁰ Based on a variety of factors such as the environmental effects, the lack of perceived strategic advantage, and the cost of an effective system, the two superpowers ceased testing kinetic ASAT technology. This is indicative of the approach to space security during the Cold War, wherein the superpowers held back their development of weapons systems in favor of a more safe and secure space environment. As a result, throughout the Cold War, there is acceptance of the use of outer space for passive military activities (e.g. the use of space for command and control or reconnaissance), but not for activities that extended to weaponization of outer space.

It is state practice such as this that is cited to indicate that peaceful purposes in the outer space context have heightened content that goes beyond non-aggressive. Unfortunately, such an interpretation is difficult to maintain in the contemporary geopolitical climate. The voluntary moratorium on ASAT development crumbled in 2007 with a Chinese ASAT test.²¹ This was followed by a reciprocal showing by the United States in 2008,²² and in 2019, India also successfully tested a ground to space ASAT. Significantly, after the Indian ASAT, Prime Minister Modi characterized the test as one that brought India into an elite status of nations:

Today March 27, a short while ago, India has achieved a remarkable success. India has today established itself as a global space power. So far only three countries in the world - USA, Russia and China had this capability. Today, India has become the fourth country to acquire this status as a space power. There can be no bigger moment of pride for every Indian than this.²³

It is, of course striking that President Modi claims that this ASAT test is

¹⁸ Laura Grego, "A History of Anti-satellite Programs," (Union of Concerned Scientists 2012) https://www.ucsusa.org/sites/default/files/legacy/assets/documents/nwgs/a-history-of-ASAT-programs_lo-res.pdf(2012)

¹⁹ Moltz, *The Politics of Space Security*, 202.

²⁰ *Ibid.*, 220.

²¹ Grego, "A History of Anti-satellite Programs," 13.

²² P. J. Blount and Joanne Irene Gabrynowicz, eds., *USA-193: Selected Documents* (National Center for Remote Sensing, Air, and Space Law, 2009).

²³ "Mission Shakti: Read PM Narendra Modi's full speech announcing how India took down satellite," *India Today*, (27 March 2019) <https://www.indiatoday.in/india/story/mission-shakti-narendra-modi-full-speech-1487838-2019-03-27>.

what allowed India to become a “space power,” rather than India’s highly competitive PSLV launch system and planetary exploration initiatives. This is especially so, because during the Cold War it was civil successes in space that indicated a “space power” rather than military successes in space.

In addition to this new string of ASAT tests, the concept of a “space force” has emerged. Specifically, the United States has used extensive rhetoric around the development of a Space Force as a branch of the military and re-established US Space Command. Under the Trump administration, the US Department of Defense (USDoD) has acknowledged space as a warfighting domain.²⁴ Then during the signing of Space Policy Directive 3, a directive on space traffic management that emphasizes international cooperation, President Trump unexpectedly instructed USDoD to establish a Space Force as a sixth branch of the US military, stating “[w]e must have American dominance in space.”²⁵ President Trump followed this instruction with Space Policy Directive 4 on the establishment of such a force. During the signing of this directive, he noted that space is “going to be a very big part of where the defense of our nation -- and you could say ‘offense’ -- but let’s just be nice about it and let’s say the defense of our nation is going to be.”²⁶ His nod to offensive weapons in the space domain is substantiated in the text of the directive itself which states, “[t]he United States Space Force should include both combat and combat support functions to enable prompt and sustained offensive and defensive space operations, and joint operations in all domains.”²⁷ As a first step to the establishment of U.S. Space Force, the administration reestablished Space Command (SPACECOM) as a combatant command of the U.S. military. At the ceremony for the reestablishment of SPACECOM, Trump echoed earlier language stating that “SPACECOM will ensure that America’s dominance in space is never questioned and never threatened because we know the best way to prevent conflict is to prepare for victory.”²⁸ The Space Force itself was established by the National Defense Authorization Act for Fiscal Year

²⁴ C. Todd Lopez, “Shanahan: Space No Longer Peaceful” (U.S. Department of Defense, 9 April 2019) <https://www.defense.gov/explore/story/Article/1810085/shanahan-space-no-longer-peaceful/>

²⁵ Marcia Smith, “Trump Upstages SPD-3 With Space Force Announcement,” *Space Policy Online* (18 June 2018) <https://spacepolicyonline.com/news/trump-upstages-spd-3-with-space-force-announcement/>

²⁶ Remarks by President Trump at Signing Ceremony for Space Policy Directive-4 (19 February 2019) <https://www.whitehouse.gov/briefings-statements/remarks-president-trump-signing-ceremony-space-policy-directive-4/>

²⁷ Space Policy Directive-4: Establishment of the United States Space Force (19 February 2019) <https://www.whitehouse.gov/presidential-actions/text-space-policy-directive-4-establishment-united-states-space-force/>

²⁸ Remarks by President Trump at Event Establishing the U.S. Space Command (29 August 2019) <https://www.whitehouse.gov/briefings-statements/remarks-president-trump-event-establishing-u-s-space-command/>

2020 and will be stood up over the year 2020.²⁹

Lest one think that this is isolated to the US, France has also recently deployed a new military division within its Air Force dedicated to space operations.³⁰ While France's President Macron did not echo the rhetoric of President Trump, French Defense Minister Florence Parly stated that it would deploy weapons on its satellites to defend them including lasers and machine guns.³¹ The United Kingdom has also discussed enhancing its military space role noting that the Ministry of Defense is "preparing for a space war within the next 15 years."³² Most recently, Japan has also announced that it will develop a "space defense force," though the rhetoric surrounding Japan's plans is much more measured.³³ It should be clear that the establishment of a Space Force does not violate international law, but the signaling that is used in the rhetoric surrounding such actions indicates that states are engaging in a new pugilistic approach to space, which has consequences for the stability of the term peaceful purposes.

In international fora there has been limited to no movement towards bolstering space security. The Conference on Disarmament remains deadlocked and unable to take forward its Prevention of an Arms Race in Outer Space (PAROS) agenda item.³⁴ In 2014, the European Union's attempts at negotiating a code of conduct for space activities failed based primarily on opposition from Russia and China, but there was also a significant debate on the inclusion or exclusion of the right to self-defense in the code. Significantly, the debate over the inclusion of the right to self-defense, was not a legal one as the EU Code of Conduct was intended to be a political agreement and nonbinding. As a result, it could not change a state's legal right to self-defense.³⁵ Instead, those that were in opposition seemed to think that the inclusion of the term would be

²⁹ Public Law No. 116-92 (20 Dec. 2019) Chap. 908.

³⁰ "Macron announces creation of French space force," *France 24* (13 July 2019) <https://www.france24.com/en/20190713-macron-france-space-force>

³¹ Tom McKay, "France Announces Plan to Launch Satellites With Defensive Lasers, Possibly Submachine Guns," *Gizmodo* (28 July 2019) <https://gizmodo.com/france-announces-plan-to-launch-satellites-with-defensi-1836776429>

³² Sarah Knapton, "Ministry of Defence preparing for space war within the next 15 years," *The Telegraph* (27 Sept. 2019) <https://www.telegraph.co.uk/science/2019/09/27/ministry-defence-preparing-space-war-within-next-15-years/>

³³ Mari Yamaguchi, "Japan to set up its own space force," *The Australian* (20 Jan. 2020) <https://www.theaustralian.com.au/world/japan-to-set-up-its-own-space-force/news-story/9a005c0707953584e94539be2ea8813f>

³⁴ United Nations, "At Crossroads on How to Overcome Disarmament Machinery Deadlock, First Committee Delegates Debate Paths towards Revitalization," (25 October 2017) <https://www.un.org/press/en/2017/gadis3588.doc.htm>

³⁵ See P. J. Blount, "Sorting Out Self-Defence in Space: Understanding the Conflicting Views on Self-Defence in the EU Code of Conduct," in *Conflicts in Space and the Rule of Law*, ed. Maria Manoli and Sandy Belle Habachi (Montreal: McGill University, 2017).

used to justify actions that could deny access to space.³⁶ In 2019, the UN General Assembly’s Group of Governmental experts failed to adopt a report when the United States broke consensus. Even in the aftermath of the Indian ASAT test there seemed to be little to no outcry or attempts at ‘naming and shaming.’

In short, as a disarmament expert put it, “it’s really difficult to say that we are not currently in an arms race in outer space.”³⁷ This is indeed problematic for arguments that assert that the legal content of peaceful purposes is “non-aggressive plus.” Each of these actions toward weaponization and the matching inaction within the international community lends itself towards the erosion of the content of the principle of peaceful purposes.

At the moment, it is still unclear to what extent the legal content of peaceful purposes has been lowered towards the baseline of nonaggressive, but it is submitted here that the legal content of the term has changed dramatically in the 21st century from its Cold War meaning. Despite the rhetoric of states, it seems that we are still short of deployed weapons in the space environment, but in a realm where there are active direct ascent ASAT systems. A simple perusal of the Secure World Foundation’s *Counter Space Report* will reveal that states have developed a variety of ways to interfere and deny adversaries the benefits of space assets, and the development of these technologies indicates these state’s willingness to use these capabilities in times of crisis. Further, it is anticipated that unless states take action to reverse this process through both political and legal mechanisms, peaceful purposes will continue to erode further towards non-aggressive. This is in part due to the traditional ambiguity of the space environment and the emergence of disruptive technologies in the space domain addressed in the next section.

IV. DISRUPTION AND CONFLICT

The idea of “disruptive technologies” emerged as buzz words to describe much of the technological boom emanating from Silicon Valley. Disruptive technologies upset the status quo by shifting markets and changing industry expectations. The term has taken hold in the space industry to describe a slew of newspace companies that are leveraging smallsats and big data to disrupt the traditional space industry.³⁸ The problem with the idea of disruptiveness in

³⁶ *Ibid.*

³⁷ Conversation with the Daniel Porras of UNIDIR (August 2019). See also Benjamin Silverstein, Daniel Porras, and John Borrie, *Alternative Approaches and Indicators for the Prevention of an Arms Race in Outer Space* (UNIDIR 2020)

³⁸ See for instance P.J. Blount “Report on the Symposium,” in *Proceedings of the International Institute of Space Law 2013*, Tanja Masson-Zwaan and Rafael Moro-Aguilar, eds. (Eleven International Publishing 2014), 745-748 (reporting on the 8th Eilene Galloway Symposium on Critical Issues in Space Law: Disrup-

space is that the *status quo* in space is not just a concern of industry and commercial interests. It is also, arguably primarily, an interest of military actors, and disruption of the *status quo* may consequently mean disruption of strategic stability. This section will argue that many new commercial developments threaten to disrupt space security. While many of these technologies are also exciting advancements with the potential to change how we use space for the better, without international cooperation on implementation these technologies could lead to further erosion of the term peaceful purposes. Specifically, this section will examine proximity and rendezvous operations, cyber operations, and large constellations.

Before turning to specific technologies, it is prudent to first discuss one of the reigning attributes of the space environment: ambiguity. It is very difficult to know with great precision what is in orbit and where it is exactly at any given time. The first issue, knowing what is in orbit, is difficult because while states are legally required to register their payloads, the practice of registration is uneven and the information that must be shared is *de minimis*.³⁹ Some launched items never get registered, and the descriptions of others are so general as to qualify them as any type of satellite. Additionally, though observing the satellite can shed light on operational parameters that inform about its use, such observation is hardly dispositive as most satellites will essentially appear as points of light in optical sensors. The second issue is that even the orbital parameters that observation reveals are estimates based on data from repeated measurement of a space object from Earth being processed using modeling algorithms. Different models result in different outcomes, and there is a general misunderstanding as to what extent we know or can know what a satellite is doing in real-time. In a sense, it's as if a race track is being observed only at a single point to construct a model of the entire race. In real terms, and this is a bit scary, a state could place a satellite in orbit and tell the world it was an Earth Observation satellite, and it could instead be a nuclear weapon, which is illegal under the Outer Space Treaty but with a low possibility of verification of compliance.⁴⁰ This action would go unnoticed until the owner of the weapon chose to reveal its true nature because direct observation of spacecraft can only reveal so much about the nature of the object. To date, it is believed that this would be unlikely to have happened, but that assumption is based on strong buy-in by states to the norm of not placing nuclear weapons on orbit.

Ambiguity is matched though with the laws of physics, which have tradi-

tive (Game Changing) Space Technologies, Laws and Policies, December 2013).

³⁹ See Convention on registration of objects launched into outer space, Art. IV, 1023 U.N.T.S. 15 (November 12, 1974).

⁴⁰ Outer Space Treaty, Art. IV.

tionally served to limit the efficacy of certain space technologies.⁴¹ For example, kinetic attacks would likely be extremely disfavored by any of the space powers because of the debris that such attacks result in. Similarly, kinetic weapons targeting the earth from orbit rely on massive constellations of satellites to be effective and that in the past have been prohibitively expensive due to the size and number of the required satellites. The law of physics also imbues space with a certain amount of transparency despite its ambiguousness. Though it is hard to definitively say what something is in space and exactly where it is, we can for certain see that it is there and develop an understanding of its overall behavior. So, in the case of space-based kinetic weapons, the launch of a large classified military constellation would have been observable behavior that is out of the ordinary and likely to raise suspicions of other states. The new technologies addressed below, serve to undermine the assumptions of the physical constraints of satellites, which in turn challenges the foundational technical understandings that underpin the obligation of peaceful purposes.

A. PROXIMITY AND RENDEZVOUS OPERATIONS

The first technology to be addressed is proximity and rendezvous operations. These are operations that are intended to maneuver into the proximity of another satellite for observation or to rendezvous with and take hold of another satellite for repair or other reasons. This has long been militarily interesting technology, but such operations were too cost heavy in terms of fuel to make practical. But as an example, this was one of the capabilities of the US Space Shuttle, which using the robotic arm could manipulate a satellite for servicing. At the UN, Russia argued that this was an ASAT weapon.⁴² More recently, the United States has been displaying its development of maneuverability with its *X-37B* project,⁴³ and Russia has been noted to be engaging in proximity operations as well.⁴⁴ These more recent displays are powered by changes in propulsion technologies and satellite size that make such maneuvers less costly. The interest of militaries in this technology is matched by a number of commercial interests that want to engage in Active Debris Removal (ADR) and On-Orbit Servicing (OOS) operations. Both of these technologies require one spacecraft to approach and engage physically with another spacecraft, and these technologies hold significant promise for making space opera-

⁴¹ See generally, David Wright, Laura Grego & Lisbeth Gronlund, *The Physics of Space Security: A Reference Manual* (Cambridge, MA: American Academy of Arts and Sciences, 2005).

⁴² Moltz, *Politics of Space Security*, 197.

⁴³ Kiona Smith-Strickland, "What's the X-37 Doing Up There?," *Air & Space Magazine* (March 2016).

⁴⁴ Mike Gruss, "Maneuvering Russian Satellite Has Everyone's Attention," *Space News* (17 July 2015) <https://spacenews.com/maneuvering-russian-satellite-has-everyones-attention/>

tions safer and more resilient. However, when a commercial company based in a particular state has developed this tool, it should be understood that the state has essentially also gained this capability. This could be used as an ASAT weapon that has the ability to function with low to no space debris creation. While domestic law will place limitations on a state's ability to directly co-opt that technology, it will most certainly become part of other state's strategic understanding of that state's capabilities.

B. CYBERSPACE

Second, Cyber operations pose a challenge because they undermine the transparency of space by adding another element of ambiguity. One of the effects of the transparency of space is that, if a state has access to sufficient sensors, it is relatively easy to determine where an attack might have originated. Cyber operations allow for a malicious attack on a satellite with the possibility of avoiding attribution for the attack.⁴⁵ Cyberspace gives states the ability to take action and then assert plausible deniability if blamed for the attack or even accepting that the attack originated within its borders, but attributing it to a criminal hacker rather than the state itself, for which the state is not responsible. Cyberspace gives states a unique ability to undertake interventions in another state's affairs that go beyond sanctions but fall below use of force without the high costs that used to be imposed on traditional espionage.⁴⁶ It gives the same ability in space and has the added benefit of interfering with a space object without creating unnecessary debris. Further, one could certainly envision that such an attack could be deployed against an entire constellation at once, which could be extraordinarily disruptive.

C. VERY LARGE CONSTELLATIONS

Finally, very large constellations are an innovation that relies on small satellite technology and reduced launch costs. These constellations are built on the theory that it can be cheaper to place a large constellation of smallsats in low earth orbit and replace them on an as-needed basis than to build larger satellites that are meant to stay in orbit for more than a decade. One of the added advantages to this model is that the satellites can be updated in the manufacturing process to add or improve capabilities and to patch onboard software.

⁴⁵ See generally David D. Clark and Susan Landau, "Untangling Attribution," in *Proceedings of a Workshop on Deterring Cyberattacks: Informing Strategies and Developing Options for U.S. Policy*, National Research Council (Washington, DC: The National Academies Press, 2010) and Collin S. Allan, "Attribution Issues in Cyberspace," *Chicago-Kent Journal of International & Comparative Law* 13 (2013): 55–83.

⁴⁶ See generally P.J. Blount, *Reprogramming the World: Cyberspace and the Geography of Global Order*, Chap. 6. (e-International Relations Press, 2019) <https://www.e-ir.info/publication/reprogramming-the-world-cyberspace-and-the-geography-of-global-order/s>

Very large constellations have two effects. First, they add a lot of noise to the data on what is a normal behavior in space. If the trend towards this economic model of space operations continues it might be very likely to see numerous very large constellation operating. This means that it could become much less suspicious if militaries begin to experiment with such technologies. The second effect is that this economic model presents the opportunity to create space weapons systems that have global coverage, which to date has been too expensive to be considered feasible. Any such system would be limited by the small size of the satellites needed to make such a constellation tenable in terms of launch costs, but the rise of the technology may breathe new hope into adherents of space-based missile defense systems.

These are, of course, not the only emerging technologies for space that have military applications, but they are representative of how new technologies can undermine the assumptions that underpin security environments. In these cases, what is observable is that these new technologies present specific military uses that challenge the status quo. Peaceful purposes, as understood by states during the Cold War, was bounded by the technological assumptions that these new technologies cause to shift. Such shifts have implications for legal terms that are filled with political content, and states may adopt new interpretations of norms in light of changed circumstances.

V. CONCLUSION

While there are currently shifts happening in state interpretation of the obligation to use space for peaceful purposes, it is unclear as to whether the point of no return has been crossed. Arguably, states still have the opportunity to pursue both political frameworks and legal frameworks for the limitation of space to peaceful purposes as understood at the time of the adoption of the Outer Space Treaty. Projects such as the UNCOPUOS's Long Term Sustainability Guidelines are valuable contributions to space security, but without direct action and good faith negotiations on issues directly related to space security, it is unlikely that true progress will be made at preserving the stability created by the eroding ideal of peaceful purposes.⁴⁷ It currently seems as if the major space players are actively trying to thwart, stall, and avoid any such talks or negotiations. This situation is likely to continue as global order continues to jostle in the post-Cold War Information Age.

This is an unfortunate situation as the stakes are high. Once a weapon is

⁴⁷ Report of the Committee on the Peaceful Uses of Outer Space, U.N. Doc. A/74/20, para. 163 and annex II (June 20 2019).

deployed in space it is likely that more will follow, and once that threshold is crossed, then it will be very difficult to roll back. This is one of the reasons that contemporary rhetoric such as that used by President Trump when discussing the space force and that used by President Modi when discussing Operation Shakti can be so disturbing to space security. These are read as signals within the international community, and the signal that is being rendered is a replacement of space prominence through a civil space program with space dominance through a military program. This is the exact opposite of the tact taken at the beginning of the Space Age to link space exploration to the idea of peaceful purposes. At the beginning of the Space Age, it was quickly seen that basing the use and exploration of space on a broad understanding of peaceful purposes was the best way to divorce space from its potential to result in Cold War conflict. Sixty years later we are witnessing a retreat from this value that will likely be fueled by technological innovation. Until the major spacefaring states are willing to discuss the various possibilities of limiting the weaponization of space, the legal content of peaceful purposes will continue to erode one ASAT test at a time.

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