

Space Armament Governance

I. The Launch of a New Era

On October 4, 1957, the Soviet Union launched into orbit the world's first satellite, Sputnik 1. This historic achievement was not only a moment of political, military, technological, and scientific might, but also the inception of a new era in space exploration with far-reaching legal implications. Leading up to Sputnik, the 1944 Convention on International Civil Aviation established that sovereignty extended vertically to the airspace above its territory, of which the extent of it in outer space was unclear¹. As the Soviet satellite orbited over numerous sovereignties, including the United States, it became evident that a new rule of law for space was necessary. In response to the escalating space race, members of the United Nations began negotiation and drafting an agreement that would address exploration, claims, and arms in outer space. The multilateral Outer Space Treaty (OST) entered into force on October 10, 1967, with the signatures of the United States, the United Kingdom, and the Soviet Union², marking it as the most fundamental legal framework for space law to date³.

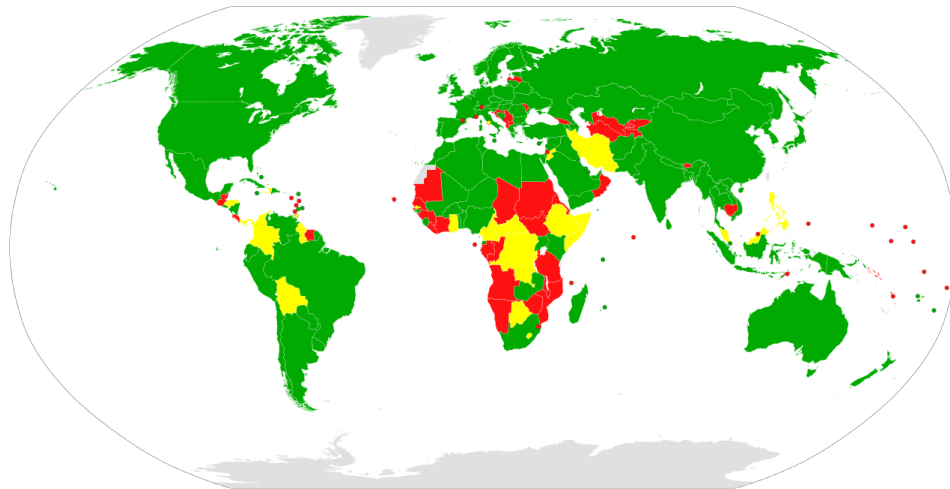


Figure 1 – As of September 2021, there are 111 parties (green) and 23 signatories (yellow) to the Outer Space Treaty. Red indicates neither parties nor signatories.²

¹ Matthew J. Kleiman, "Space Law 101: An Introduction to Space Law." 27 August 2013. *American Bar Association*. https://www.americanbar.org/groups/young_lawyers/publications/the_101_201_practice_series/space_law_101_an_introduction_to_space_law/

² United Nations Office for Disarmament Affairs, "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies". 10 October 1967. https://treaties.unoda.org/t/outer_space

³ United Nations Office for Outer Space Affairs, "Space Law Treaties and Principles". Accessed 10 December 2021. <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html>

Although the OST prescribed clear limitations on the use of celestial bodies for peaceful purposes and precluded any nation from claiming sovereignty in outer space, it did not altogether forbid weapons or militarization in space. Specifically, Article IV of the Outer Space Treaty declared:

State Parties 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.⁴

The ban on weapons of mass destruction (WMD) is indisputable, but it does not assert a ban on *all* weapons. Furthermore, the same Article IV prohibits weapons testing and military exercises “on celestial bodies” but stops short of mentioning celestial *orbit* or space far from celestial bodies. Whether this omission is by design or error, that is also unclear. Herein lies an issue far more consequential than mere semantics; the use of other munitions such as conventional or hypothetical weapons are fair game. Kinetic bombardment, linear particle accelerators, and heliobeams may sound deceptively science-fiction but have been in development with some success⁵. For instance, the United States is developing the Prompt Global Strike (PGS) system using hypersonic gliders in space that can deliver a precision-guided airstrikes anywhere in the world within an hour.⁶ Not unlike the emergence of artificial intelligence or cryptocurrency, these technological advancements grow at a rate far quicker than society can recognize. As Liu, Lautau, and Maas cautioned, when linear expectations are confronted with exponential threats, reactionary chaos ensues⁷. Some critics will dismiss a *Star Wars* future when there are more pressing matters on Earth only to fall victim to this precarious cognitive bias.

The emergence of private corporations has also significantly reduced barriers into space. The cost of payload delivered to low Earth orbit has decreased from \$894,000 per kg in 1957 to just

⁴ United Nations Office for Outer Space Affairs, “2222 (XXI). Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.” 19 December 1966. <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html>

⁵ P. G. O’Shea, et al., “A Linear Accelerator in Space – The Beam Experiment Aboard Rocket”. 1990. *Proceedings of the Linear Accelerator Conference 1990, Los Alamos National Laboratory*. <https://accelconf.web.cern.ch/l90/papers/th454.pdf>

⁶ United States Naval Institute, “Report to Congress on Conventional Prompt Global Strike and Long-Range Ballistic Missiles”. 17 February 2020. <https://news.usni.org/2020/02/17/report-to-congress-on-conventional-prompt-global-strike-and-long-range-ballistic-missiles-2>

⁷ Hin-Yan Liu, Kristian Lautau and Matthijs Maas, “Apocalypse Now? Initial Lessons from the Covid-19 Pandemic for the Governance of Existential and Global Catastrophic Risks”. *Journal of International Humanitarian Legal Studies*. 9 December 2020. <https://www.wired.com/2004/02/pentagon-preps-for-war-in-space/?currentPage=2>

\$1,000 per kg in 2018 (adjusted for inflation)⁸, while the number of spacefaring nations has increased from two to 17 during the same period⁹. As technological advancements continue to grow at an unprecedented rate and new governmental and non-governmental actors enter this realm, it is imperative that the Outer Space Treaty is amended, or altogether rewritten, to define unequivocally the laws of space armament.

II. A Constellation of Actors

Whereas the Soviet Union and the United States were the duopolistic entrants during the 20th century space race, shifting geopolitical influence in recent decades has seen the emergence of new competitors, namely China. In 2003, the People's Republic of China became the third country to independently send humans into space with its successful launch of the Shenzhou 5 spacecraft¹⁰. Soon after in 2019, the Chang'e 4 lunar exploration mission marked the first time a nation had landed on the far side of the moon¹¹. Other skyrocketing opponents include India and Saudi Arabia, the latter which the OECD noted as a “new large investor [in space]” following a series of recent launches¹². As more developing countries cross the Kármán line (the official demarcation between Earth’s atmosphere and outer space), their positions on space governance will only present a greater role in shaping future policy.

Non-state actors alike have had a profound effect in space exploration. Space exploration was once limited to world superpowers with vast amounts of technological and capital prowess, but now multinational corporations have encroached into space too. Aside from the technological advancements these actors have contributed, particularly reusable rockets, their engagements with the space defense sector have increased as well. In 2020, SpaceX lobbied an estimated \$2.2M for bills including the U.S. Department of Defense Appropriations Act (H.R.2500) and U.S. Military

⁸ Harry W. Jones (NASA Ames Research Center), “The Recent Large Reduction in Space Launch Cost”. 12 July 2018. *International Conference on Environmental Systems*. https://ttu-ir.tdl.org/bitstream/handle/2346/74082/ICES_2018_81.pdf

⁹ European Space Policy Institute, “ESPI Report 79 - Emerging Spacefaring Nations - Full Report”. June 2021. <https://espi.or.at/publications/espi-public-reports/send/2-public-espi-reports/577-emerging-spacefaring-nations-full-report>.

¹⁰ Jim Yardley, “China Sends a Man Into Orbit, Entering the U.S.-Russian Club”. 15 October 2003. <https://www.nytimes.com/2003/10/15/world/china-sends-a-man-into-orbit-entering-the-us-russian-club.html>

¹¹ Ken Moritsugu, “China lunar probe sheds light on the ‘dark’ side of the moon”. 3 January 2019. <https://apnews.com/article/ap-top-news-international-news-china-the-moon-science-c4dc6858a32b4b61bdbc6aebf5459a91>

¹² Organisation for Economic Co-operation and Development, “OECD paper for the G20 Space Economy Leaders’ Meeting”. 20 September 2021. <https://www.oecd.org/sti/inno/space-forum/space-economy-for-people-planet-and-prosperity.pdf>

Construction Authorization Act (H.R. 7617) on the funding of military space launches¹³. Just as terrestrial conflicts have been profitable for defense contractors, suppliers of armed spacecraft could be a future lucrative business model. The emergence of multinational (or perhaps someday multiplanetary) corporations could bear serious weight in space governance given their technological and political influence.

Civil society actors have moreover been involved. In April 2021, the International Committee of the Red Cross (ICRC) submitted a position paper to the Secretary-General of the United Nations on issues related to space weaponization. It argued that the use of kinetic or non-kinetic weapons in outer space could have significant impacts on critical civilian infrastructure, for instance damage of global navigation satellite systems¹⁴. Other NGOs, such as the Space Court Foundation, explores how conflicts outside Earth's jurisdiction could arise and be adjudicated, including terrestrial geopolitical tensions extending into space warfare¹⁵. Its board of directors includes former U.S. government officials, members of U.N. bodies working on space security issues, and private sector leaders¹⁶. The Carnegie Endowment for International Peace also highlighted that the mere threat of space force against a state's territorial integrity or political independence under Article 2(4) of the United Nations Charter is unclear, and any such efforts to reduce misinterpretation in space law would require increased clarity¹⁷. It is evident that any attempts to revise or even draft new space law should include the expertise of these advocacy networks.

Momentum continues to grow for greater space governance. In the informal polycentric governance sphere, the United Nations Office of Outer Space Affairs (UNOOSA) delivered the keynote address at the 2020 G20 conference, which signaled the first time space was included on the G20 agenda¹⁸. Even more, the G20 Saudi Secretariat suggested establishing a governance model to ensure the space sector becomes a stable component of the G20 institutional architecture in

¹³ OpenSecrets, "SpaceX Annual Lobbying Totals: 1998-2020". Accessed 10 December 2021.

<https://www.opensecrets.org/orgs/spacex/lobbying?id=D000029147>

¹⁴ International Committee of the Red Cross, "The Potential Human Cost of the Use of Weapons in Outer Space and the Protection Afforded by International Humanitarian Law". 9 April 2021.

https://www.icrc.org/en/download/file/163654/icrc_potential_human_cost_of_use_of_weapons_in_outer_space_and_ihl_protection.pdf

¹⁵ The Space Court Foundation, "Competing for Space Superiority? Arms Racing, Rivalries, and Hype in Space". 13 May 2021. <https://www.spacecourtfoundation.org>

¹⁶ The Space Court Foundation, "Board of Directors". 2021.

<https://www.spacecourtfoundation.org/directors/>

¹⁷ Carnegie Endowment for International Peace, "Submission to UNODA re: A/RES/75/36". 30 April 2021.

https://front.un-arm.org/wp-content/uploads/2021/04/CEIP_Response-to-UNODA-Res75_36.pdf

¹⁸ United Nations Information Service, "UNOOSA delivers keynote at G20 virtual conference and G20 considers a Space20 Working Group". 7 October 2020.

<https://unis.unvienna.org/unis/en/pressrels/2020/unisos536.html>

future summits. Yet perhaps the most notable recent capacity development was the formation of the United States Space Force (USSF) – the world's first independent space force. Consisting of over 6,000 personnel and operating 77 spacecraft, its capstone doctrine *Spacepower* defines its cornerstone mission as providing freedom of action in the space domain while also “enabling joint lethality and effectiveness”¹⁹. Whereas popular culture ridiculed the Space Force, insofar as being the subject of an American comedy television series of the same name, expert advocacy networks once again helped bring greater legitimacy to the issue²⁰. The bipartisan thinktank Center for Strategic and International Studies supported the creation of this new military branch, arguing that it was needed to consolidate national security space responsibilities and to develop a space doctrine²¹. The conservative Heritage Foundation was likewise supportive, citing the rise of competing nations from the Russian Aerospace Forces to the Chinese People's Liberation Army Strategic Support Force²². The USSF cannot alone claim a space force superiority, however. The United States' top military officer, chairman of the Joint Chiefs of Staff Mark Milley, likened China's recent hypersonic weapons system as a “Sputnik” moment, perhaps ushering in the next chapter of the space arms race.²³

III. Navigating Future Frameworks

Considering the developments since Sputnik 1, a universal ban on space weaponization would be premature at best, provocative at worse. It would conflict with the principles of a sovereignty's right to self-defense as recognized by the United Nations Charter and hamper the economic and scientific developments flourishing from this growing sector. Therefore, a practical step toward achieving reasonable, unambiguous space armament regulation is first to recognize how past attempts failed. Following the Outer Space Treaty, other multilateral efforts such as the

¹⁹ United States Space Force, “Space Capstone Publication, Spacepower (SCP)”. June 2020.

https://www.spaceforce.mil/Portals/1/Space%20Capstone%20Publication_10%20Aug%202020.pdf

²⁰ Sophie Gilbert, “Space Force Tells a Terrible Joke About America”. 30 May 2020.

<https://www.theatlantic.com/culture/archive/2020/05/space-force-steve-carell-netflix-terrible-joke/612337/>

²¹ Todd Harrison, “Why We Need a Space Force”, Center for Strategic and International Studies. 3 October 2021. <https://www.csis.org/analysis/why-we-need-space-force>

²² Deng Cheng, “The Space Force Is Coming. Here's Why the U.S. Needs It”, The Heritage Foundation. 9 November 2018. <https://www.heritage.org/defense/commentary/the-space-force-coming-heres-why-the-us-needs-it>

²³ Peter Martin, “U.S. General Likens China's Hypersonic Test to a ‘Sputnik Moment’”. 27 October 2021. *Bloomberg*. <https://www.bloomberg.com/news/articles/2021-10-27/milley-likens-china-s-hypersonic-weapon-test-to-sputnik-moment?sref=jAWOgqts>

1979 Moon Treaty attempted to ban “any type of weapons” on the moon under Article III²⁴. Together with its other provisions of conflicting interpretation, legal experts described it as a complete failure²⁵. As of 2021, no spacefaring nation apart from India has signed, let alone ratified, the Moon Treaty, with the United States calling it “a failed attempt” for space governance²⁶. Thereafter, the 1981 Prevention of an Arms Race in Outer Space (PAROS) reaffirmed the fundamental principles of the OST and advocated for a ban on space weaponization²⁷. Its principal committee under the auspices of the Conference on Disarmament was mandated to examine prevention of an arms race in space, existing agreements governing space activities, and initiatives for further prevention. In 2014, the U.N. General Assembly passed a notable resolution as a result of PAROS: A/69/438, “No first placement of weapons in outer space”. Nevertheless, the United States together with Georgia, Israel, and Ukraine, voted against it.²⁸ As past attempts have demonstrated, limitation rather than prohibition would be a more conducive compromise to regulating space armament. Moreover, addressing this challenge as an amendment to existing treaties or isolating it as a new agreement instead of conflating it with other space-related questions, such as debris or mining, could increase the chances of it being adopted.

At the time of drafting the Outer Space Treaty, no private individual or corporation had launched into space. In less than a lifetime, some of the world’s wealthiest individuals have funded and successfully entered orbit through their private corporations. Jeff Bezos’ Blue Origin will receive \$24.3 million from the U.S. Department of Defense to develop cryogenic fluid while Elon Musk’s SpaceX has already launched military satellites for the U.S. government²⁹. Dmitry Rogozin, the head of Russia’s state space agency Roscosmos and former Deputy Prime Minister, went as far as accusing Elon Musk’s idea to terraform Mars with bombs as a ploy to launch nuclear weapons in

²⁴ United Nations, “Resolution 34/68 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.” 5 December 1979. <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/moon-agreement.html>

²⁵ James R. Wilson, “Regulation of the Outer Space Environment Through International Accord: The 1979 Moon Treaty”. 1991. *Fordham Environmental Law Review*. <https://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?article=1325&context=elr>

²⁶ United States White House, “Executive Order on Encouraging International Support for the Recovery and Use of Space Resources.” 6 April 2020. <https://trumpwhitehouse.archives.gov/presidential-actions/executive-order-encouraging-international-support-recovery-use-space-resources/>

²⁷ Official Records of the General Assembly, A/RES/36/97 C, 9 December 1981. <https://undocs.org/pdf?symbol=en/A/RES/43/70>

²⁸ United Nations, “General Assembly Adopts 63 Drafts on First Committee’s Recommendation with Nuclear Disarmament at Core of Several Recorded Votes”. 2 December 2014. <https://www.un.org/press/en/2014/ga11593.doc.htm>

²⁹ Aria Alamalhodaie “US Space Force awards \$87.5M to Rocket Lab, SpaceX, Blue Origin, ULA for next-gen rocket testing.” 9 September 2021. *TechCrunch*. <https://techcrunch.com/2021/09/27/u-s-space-force-awards-87-5m-to-rocket-lab-spacex-blue-origin-ula-for-next-gen-rocket-testing/>

space³⁰. Although the Outer Space Treaty made clear that states bear responsibility for the activities of their non-governmental entities, a quickly evolving arena of transnational private actors across multiple jurisdictions will be sure to complicate liabilities. As such, including non-governmental actors in shaping policy is crucial for reforming space arms law. These transnational corporations have profit-driven incentive for bolstering space defense, not to mention hold the technology of spacecraft that could favor, or disfavor, certain countries based on government regulations.

In the absence of clear international laws surrounding space armament, it is perhaps non-binding norms that will guide the principles of responsible behavior in space conflict. During the seventy-fifth session of the United Nations General Assembly, agenda item 101(a) stood out as a clear focus area on this issue³¹. “Prevention of an arms race in outer space”, as it was titled, resulted in the adoption of resolution 75/36 aimed to reduce space threats through norms. It reaffirmed that the prevention of a space arms race would avert “grave danger” for international peace and security and recognized that efforts to prevent future conflicts in space would have to consider unforeseen technological advancements³². Furthermore, the Assembly encouraged member states to develop ideas for greater development and implementation of norms, rules, and principles with respect to outer space threats, of which 30 nations (including the United States, Russia, and China) and 28 non-governmental organizations (notably the International Committee of the Red Cross and United Nations Institute for Disarmament Research) submitted responses as of November 2021³³. It is worthwhile to note that no private corporation was invited to participate in this key discourse. Nonetheless, the agenda setting has brought forth greater global cooperation on non-binding norms that could influence future space policy.

IV. Conclusion

Withal, are existing treaties and norms sufficient to govern space armament? Although the Outer Space Treaty is explicit about banning weapons of mass destruction (WMD), it is not so clear

³⁰ Kaelan Deese, “Russian space chief: Elon Musk’s plan to bomb Mars is a cover to put nuclear weapons in space.” 28 May 2020. *The Hill*. <https://thehill.com/policy/transportation/499968-russian-space-chief-elon-musks-plan-to-bomb-mars-is-a-cover-to-put?rl=1>

³¹ United Nations General Assembly, “Allocation of agenda items for the seventy-fifth session of the General Assembly”. 18 September 2020. <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N20/242/34/PDF/N2024234.pdf?OpenElement>

³² United Nations A/RES/75/26, “Reducing space threats through norms, rules and principles of responsible behaviours”. 7 December 2020. <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N20/354/39/PDF/N2035439.pdf?OpenElement>

³³ United Nations Office for Disarmament Affairs, “Report of the Secretary-General on reducing space threats through norms, rules and principles of responsible behaviors”. 2021. <https://www.un.org/disarmament/topics/outerspace-sg-report-outer-space-2021/>

about alternative space weaponry such as kinetic orbital strikes or particle beams of destructive force³⁴. The United States, Russia, and China have all expanded their capacity for space defense, with India being the latest entrant when its anti-satellite weapon (ASAT) targeted a live test satellite in 2019³⁵. The United States has opposed limits on space armament, as illustrated with the PAROS resolution and its *Space Power* doctrine, while allies with their own space programs including the European Union, Japan, Saudi Arabia have yet to sign onto the Moon Treaty banning all weapons. Past attempts have made clear that banning space weapons altogether is ineffective. After all, the use of force on Earth is allowed – with just cause and limitations – so it should follow that similar law apply in celestial jurisdiction. Meanwhile, private multinational corporations continue to encroach into space by increasing defense lobbying spending and netting multimillion dollar contracts for military space programs. The Outer Space Treaty is an outdated framework that is more dangerously ambiguous than constructive. An amended resolution permitting space armament with clear limitations, but not prohibition, would result in the support of the world's largest space powers while also protecting the interests of sovereignties, peace, and rule of law in space.

³⁴ Noah Shachtman, "Pentagon Preps for War in Space". 20 February 2004.

<https://www.wired.com/2004/02/pentagon-preps-for-war-in-space/?currentPage=2>

³⁵ Manu Pubby, "India tests first anti-satellite missile system, codenamed Mission Shakt". 28 March 2019.

<https://economictimes.indiatimes.com/news/politics-and-nation/pm-modis-big-announcement-india-successfully-tests-anti-satellite-weapon/articleshow/68592702.cms?from=mdr>