Centre for International
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Acronyms and Abbreviations

BDS	BeiDou Positioning and Navigation System
CCP	Chinese Communist Party
DoD	Department of Defense
ESA	European Space Agency
GPS	Global Positioning System
ILRS	International Lunar Research Station
ISO	International Organization for Standardization
ISS	International Space Station
NASA	National Aeronautics and Space Administration
OST	Outer Space Treaty
PRC	People's Republic of China
SSA	space situational awareness
STM	space traffic management
UNGA	United Nations General Assembly
USSR	Union of Soviet Socialist Republics

Executive Summary

During the Cold War, space exploration served as a forum for global powers to compete against one another in a race for knowledge, power and prestige. Space governance — the setting of international rules on technology, security and accountability — accordingly became a heavily contested issue. In drafting agreements and founding institutions, key players sought to display their diplomatic prowess and have a hand in creating the "rules of the game."

This paper considers how space governance frameworks — largely unchanged since the 1980s — are likely to fare in modern times. The paper maps the current governance landscape, before analyzing recent developments in the space policies of the United States, the People's Republic of China (PRC) and the Russian Federation. In doing so, the authors argue that existing governance systems are no longer fit for purpose. Instead, real change is necessary to account for the commercial, technological and military interests that are emerging in tandem with a new geopolitical order. The paper concludes with recommendations and identifies opportunities for global powers to develop a revised and most robust governance regime.

Introduction

With the launch of Sputnik in 1957, space exploration became the new frontier for researchers and scientists worldwide. As countries competed to secure resources and develop technology, the challenge also took on a decidedly political dimension. Against the backdrop of the Cold War, the United States and the Soviet Union came to see ambitious space programs as a vital component of national identity and national security. But more broadly, the novelty of space exploration also presented an opportunity for countries to assert themselves in a field entirely unregulated by international norms. Accordingly, the "Space Race" became not only the defining scientific undertaking of a generation, but also a high-profile, seemingly neutral forum in which ideologically opposed powers could test their strengths and approaches to governance (Kharchenko 2007).

In the almost 70 years that have followed, small steps and giant leaps alike have been taken to realize the scientific potential and geopolitical significance of outer space. In addition to affording a better understanding of the universe, space-based technologies have transformed our knowledge of Earth, guided research on water cycles and air quality and provided valuable information on environmental sustainability.[1] Satellite technology has also shaped the development of commercial interests in a wide range of industries, including telecommunications, navigation, energy and farming (Ellerbeck 2022). Even in some less conventional applications, space has come to have a significant impact. For example, in the medical sphere, research conducted in space has aided our understanding and treatment of Alzheimer's disease, cancer and osteoporosis, among other conditions (Space Station Research Integration Office 2022).

On a geopolitical level, too, space exploration has continued to play a significant role, both in ideological competition and especially in international security. Satellite navigation systems — such as the United States' Global Positioning System (GPS) and Russia's Global Navigation Satellite System — provide positioning and target information to military users around the world. Satellite imagery technology similarly provides critical information to national intelligence agencies, and the renewed testing of direct ascent, kinetic energy anti-satellite weapons signifies that space will likely drive innovation in modern warfare and may see new forms of military conflict (Starling-Daniels and Massa 2024).

While this element of the Space Race between the United States and Russia persists, new challengers have entered this contest, and the course of the race for knowledge, power and prestige is rapidly shifting. The fall of the Soviet Union in the early 1990s greatly diminished Russia's space exploration capacity. Despite a brief resurgence of Russian influence in the early 2000s, economic malaise, a war of aggression with Ukraine and coordinated economic sanctions have limited Russia's domestic space program and narrowed its focus to military applications (Foust 2023). Both the PRC and India have emerged as new contenders for action and influence, having increased their government spending on military and civil

1 See www.unoosa.org/oosa/en/benefits-of-space/environment.html.

space programs by 23 percent and 36 percent, respectively, in the past year (the United States is at 18 percent, for reference) (Space Foundation 2022). The PRC, in particular, has increased the pace of its space program dramatically; though the country is only responsible for around 1,000 of the 7,500 satellites currently in orbit, it is projected to launch an additional 26,000 satellites by 2029 to rival the US company SpaceX, which has projected the use of a similar number of satellites as part of its StarLink initiative.

With Russian influence fading as the PRC and India have assumed more visible roles, the United States has shifted its approach from managed competition with Russia to an assertion of global dominance in space capabilities. To date, the vast majority of satellite activities in space are the result of American programs, and since the initial ground-breaking achievements of the USSR in the late 1950s and early 1960s, the United States has generally led space-related scientific innovation. Nonetheless, the past 20 years have seen the United States pivot away from government-sponsored activity and toward private enterprises developing and deploying space resources. Under the Obama administration, the United States opted against a National Aeronautics and Space Administration (NASA)-engineered space shuttle successor in favour of commercially contracted crewed launches (Matson 2010). The resulting Commercial Crew Program took nearly a decade to produce a successor to the space shuttle; however, the long-term result has been a massive reduction in the cost of payload deployment (H. W. Jones 2018). The launch cost of the privately developed Falcon X is roughly one-third of that required for the next cheapest platform, the Russian Soyuz launch vehicle (ibid.). This currently unrivalled space capacity has put the United States in a central position not only to dominate space resources but also to shape the norms and institutions governing space.

Yet, despite remarkable scientific achievement and the rise of geopolitical tensions, space governance has seen very little change since the Cold War. As is set out in greater detail below, the current governance framework for space-based activity can be traced to a small number of treaties signed in the 1960s and 1970s, when space still seemed more a sphere of prestige than one where power and international cooperation were viable. These early agreements include, most notably, the Outer Space Treaty (OST) of 1967,[2] which provides broad principles to guide national space programs. For example, core principles in the OST include that space exploration ought to be conducted peacefully, in the spirit of international cooperation and for the benefit of humankind as a whole. Other treaties adopted during this period provide baseline rules and principles for specific aspects of space exploration, including the safe return of astronauts from space, the registration of space-based objects and state responsibility for damage caused by deorbiting space objects on their return to Earth.

Starting in the 1980s, an era of multilateral treaty making came to an end. Indeed, since that time, while members of the international community have entered into agreements regarding specific space projects (for example, the construction and operation of the International Space Station [ISS] and, more recently, the Artemis Accords), there has been no development of the multilateral treaty regime providing norms and rules for space governance. As technologies have improved, new players have entered the scene, and new space-related national interests have been identified. Stagnation in norm-setting has resulted in a shockingly underdeveloped set of rules for governing human activities in space.

Against this technological, political and governance background, significant gaps have emerged in the existing international legal rules of space governance that must be addressed if conflict among great powers is to be managed and cooperation facilitated. The United States, Russia and the PRC have each identified core national interests in space and developed distinct strategic approaches to fill these governance gaps. Underdeveloped legal rules, combined with competition to shape the future content of those rules, are a recipe for conflict. Both the institutional structures and substantive legal regimes for space governance will prove consequential to great-power contestation and the effective use of space resources in the years ahead. To that end, both renewed attention and a new approach toward international space governance are urgently needed.

2 *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, Res 2222 (XXI), UNTS 610 (entered into force 10 October 1967) [*OST*], online: <www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html>.

This paper first outlines the existing framework for space governance, most of which emerged nearly half a century ago, before proceeding to articulate a number of key challenges in space governance that collectively suggest existing legal regimes are no longer fit for purpose. The paper then explores the strategies currently being pursued by the United States, Russia and the PRC to exploit or fill these governance gaps, highlighting both areas of mounting tension and potential cooperation. It concludes with recommendations about how areas of common interest among great powers could lay a foundation for urgently needed development of a more robust legal regime, which itself bounds competition in and over space.

The Existing Framework for Space Governance

The existing regime of treaties and institutions for space governance that emerged in the late 1960s and early 1970s has remained largely stagnant for the past 50 years. While this legal framework proved effective in an earlier era and was able to put guardrails around the US-Union of Soviet Socialist Republics (USSR) space competition, it was neither designed to manage conflict in an era of multiple great powers nor deal with expanded national interests and new technologies. Yet it does offer a starting point critical to understanding the legal framework behind emerging strategic rivalries in space governance.

Table 1: Key International Legal Agreements on Space Governance

Treaty	Date	Parties	Key Provisions
OST	1967	115 parties, including the PRC, Russia and the United States	Establishing overarching principles concerning peaceful activities in space: ban on military use of the Moon or other celestial bodies; international responsibility to avoid harmful contamination of space.
Rescue Convention (Rescue Agreement 1968)	1968	98 parties, including the PRC, Russia and the United States	Establishing duties of international cooperation with respect to astronauts in distress.
Liability Convention	1972	67 parties, including the PRC, Russia and the United States	Establishing that states bear international responsibility for all space objects launched within their territories.
Registration Convention (Registration Convention 1976)	1975	72 parties, including the PRC, Russia and the United States	Establishing a register to be kept by the United Nations Office of Outer Space Affairs and the data to be recorded therein.*
Moon Treaty (Moon Treaty 1984)	1979	17 parties (the PRC, Russia and the United States, among others, are not parties)	Establishing freedom of scientific exploration on the Moon; ban on military use of celestial objects.

Source: Hobe, Schmidt-Tedd and Schrogl (2015).

* *Convention on Registration of Objects Launched into Outer Space*, 14 January 1975, Res 3235/XXIX, UNTS 1023 (entered into force 15 September 1976), online: <www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introregistration-convention.html>.

Treaties and Legal Agreements

Five international treaties, as described in Table 1, offer "the fundamental legal basis for space activities" (Stubbe 2018, 72). Each of the treaties — set out in the table — is a multilateral agreement, drafted under the auspices of the United Nations, as a result of extensive consultation processes involving key stakeholders (Hobe, Schmidt-Tedd and Schrogl 2015). The United States, Russia and the PRC are signatories to four of the five treaties, with the Moon Treaty being the principal exception.

Of these treaties, the most significant is the OST of 1967, which provides a set of overarching principles for space-based activities developed primarily by US and Soviet stakeholders. The OST's guiding principle is that the exploration of outer space should be for peaceful purposes, its use for the province of all humankind, and its research carried out for the benefit and in the interests of all countries (articles I and II). Emphasizing the need for transparency and collaboration, the treaty requires that space remain an area of exploration free from claims of national appropriation or sovereignty (article II). While the OST marked the international community's first foray into the regulation of outer space, these ideas were not entirely novel: indeed, many of the treaty's principles — scientific freedom, demilitarization of the Moon and celestial bodies, and the suspension of traditional sovereign interests — mirror the approach taken almost a decade earlier in the Antarctic Treaty of 1959 (Yao 2021).

The OST and its four related treaties also address specific issues including the need to register launched space objects (article VIII, as well as the separate Registration Convention of 1975); the need to provide emergency assistance to astronauts in distress (article V, as well as the separate Rescue Agreement of 1968);[3] the need for accountability for the damages that space objects might cause on return to Earth (article VII, as well as the separate Liability Convention of 1972);[4] and the need for transparency with respect to plans and activities on the Moon, as well as the free international sharing of scientific data derived therefrom (article XI, as well as the Moon Treaty of 1970). It should be noted that the United States, Russia and the PRC have not signed or ratified the Moon Treaty, and that that treaty has attracted significantly fewer states parties than the other agreements. While many of the core principles of the Moon Treaty are also found in the OST, there are important distinctions. For example, the Moon Treaty shifted key language in the OST stating that "outer space…shall be the province of all mankind" to instead recognizing the Moon as "the common heritage of mankind."[5] While linguistically subtle, this distinction has salience to many current debates. More specifically, the "common heritage" phraseology invokes a legal principle that limits both states' and private actors' exploitation of and claims to space resources.

Through the 1960s and 1970s, the OST and the four treaties that followed it helped to establish a common ground for space-based activities. This initial period of legal stability helped foster a number of collaborative international space efforts even in the midst of the Cold War, such as the Apollo-Soyuz test project of 1975 (Newkirk 1990). In the years that have followed, however, little has been done to update these treaties' broad provisions as trends, technologies and players have shifted. None of the treaties has ever been subject to adjudications that might have filled gaps or generated definitional clarity.

In place of these early multilateral successes, space-related rulemaking has subsequently progressed in a piecemeal fashion, primarily through domestic legislation governing national space programs. For example, where space-faring nations permit private companies to engage in space-related projects, they typically have domestic legislation to govern the licencing and permits; Canada, the United Kingdom and the United States all have domestic legislation to provide for this. However, the degree to which governments are directly involved in scrutinizing and even authorizing decisions made by private companies in space activities varies greatly. For example, the United States' Commercial Space Launch Competitiveness Act of 2015 restricted the ability of the Federal Aviation Administration to issue regulations

3 *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, 3 November 1967, Res 2345 (XXII), UNTS 672 (entered into force 3 December 1968), online: <www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introrescueagreement.html>.

4 *Convention on International Liability for Damage Caused by Space Objects*, 29 November 1971, Res 2777 (XXVI), UNTS 961 (entered into force 1 September 1972), online: <www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html>.

5 *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 5 December 1979, Res 34/68, 1363 UNTS 3 (entered into force 11 July 1984), online: <https://treaties.unoda.org/t/moon>.

governing commercial space flight until 2023 during a designated "learning period" (Foust 2015).

These five early treaties and subsequent piecemeal domestic regulatory efforts provide a problematic foundation for effective space governance, for four reasons. First, the provisions of the five treaties are, for the most part, drafted in very broad terms, reflective of the then-applicable consensus in the 1960s and 1970s. For example, though the OST specifies that space activities should be carried out for the benefit of humankind, it sets no parameters for defining the outer limits of this "benefit." Consider, for example, the questions of whether private actors might be involved in setting research aims for space-based activities and, if so, how they would go about doing this. The OST requires states to "authorize and continuously supervise" the activities of private actors within their jurisdiction and to ultimately bear liability for the activities of private actors. However, these principles offer little assistance in addressing the more practical question of balancing individual commercial interests against those of the collective state, scientific research or space resource sustainability.

Second, even where the terms of the treaties are specific, modern practice often diverges from legal requirements, frequently as a result of new technological developments. The Registration Convention is indicative of this divergence. It provides a clearly articulated list of features that should be recorded by states about their space objects and made available to the United Nations for centralized record keeping (these include, for example, identification numbers, object descriptions, projected coordinates, and so on). However, a survey of registration practice reveals that, despite an initial period of compliance (with approximately 95 percent of space objects duly registered over the first 20 years following the convention), states and private companies now routinely fail to register objects by providing required information in an appropriate form (Hobe, Schmidt-Tedd and Schrogl 2015). Practice also varies widely between states on the provision of identification or tracking information for space debris, such as abandoned satellites, debris caused by collisions and other space waste. In contrast to the aims of the Registration Convention, then, the status quo is such that the UN record "barely covers a comprehensive catalog of space objects currently in orbit" (ibid.).

Third, the drafting of the initial suite of treaties was driven, in large part, by contemporary plans for space exploration and technological issues of the 1970s. This explains, for example, why the treaties dedicate significant attention to the status of astronauts and the safe return of objects to Earth, but relatively little to the potential consequences of widespread commercial space activities (von der Dunk 2020). As a result of these ambiguities, countries have taken markedly different stances toward the role of private actors in space-related activities, with the United States harnessing commercial potential and the PRC permitting only its own state-sponsored programs, at least until recently.

Fourth, and relatedly, the provisions of the treaties are bounded by technological capabilities anticipated half a century ago. At the time of their drafting, the primary focus of the Cold War-era space treaties was the challenge of sending astronauts to the Moon via space shuttle, with semi-permanent space stations and sophisticated satellite activity only becoming technologically feasible later on. The treaties leave little guidance on the emergence of new technologies, such as rendezvous and proximity operations. As a result of these substantive gaps, the rules governing potentially high-risk technologies often fall short of their objectives (Freeland 2020).

Without significant expansion of the multilateral treaty regime, additional space governance rules have emerged instead through domestic rulemaking, bilateral or mini-lateral agreements, or project-specific initiatives. Agreements for the development and regulation of the ISS — entered into by Canada, Japan, the PRC, Russia, the United States and 11 members of the European Space Agency (ESA) — perhaps best reflect this. A 1993 treaty for the design, construction and deployment of the ISS facilitated cooperation among various domestic initiatives to establish a permanently manned space station, but only with a limited group of countries. Alongside the primary treaty, which sets out objectives aligned with those of the OST, the signatories entered into a series of agreements expanding the scope of existing rules under international law, introducing rules governing the allocation of responsibility for management of the station and commercial arrangements for the purchase of seats on flights to the ISS, as well as rules governing the roles and behaviours of astronauts (Farand 2001).

This project-centred approach continues to this day and is at the core of US space strategy, as discussed in greater detail below. In 2020, the United States announced the Artemis Accords, a series of bilateral agreements to govern America's relationship with international partners as part of its Artemis Program, which seeks to explore mining and research opportunities on the Moon. Though the accords ground many of their provisions in the language of the OST, they also represent a US effort to alter the norms of space governance related to extraction and utilization of space resources, commercial activities and the sovereign ownership of celestial bodies, for which there are currently no existing norms.

Institutional Structures

Legal rules are at the heart of existing space governance, but institutions also play a critical role, as outlined in Table 2. Throughout the 1960s and 1970s, the United Nations sat at the centre of these institutional structures. Yet the United Nations' primacy has faded, in part, due to the political difficulties of UN-led treaty making and the breadth of existing treaty provisions (Oto and Johnson 2022). A tiered system of institutional authorities has emerged in its place that includes standards organizations, ad hoc international groups, domestic governments and private actors. Table 2 sets out how some of these institutions contribute to the existing governance framework.

Table 2: Key Actors and Institutions in Space Governance

Institution	Current Role in Institutional Framework
United Nations	The United Nations continues to act as the overarching authority for fundamental principles of space law, though its actions have varying degrees of impact in the international community. While the formal space treaties, for example, are broadly recognized as setting ground rules for space activity, the guidelines on space debris mitigation and space object registration by the United Nations Committee on the Peaceful Uses of Outer Space are viewed as recommendations (Peter 2021).
International Organization for Standardization (ISO)	Independent, non-governmental organizations such as the ISO look to produce voluntary, consensus-based standards that act as a reference point for space projects (Kato et al. 2013).[6]
Minilateral coalitions	In addition to UN membership, a number of states have entered into agreements for collaboration with other states, whether as permanent regional groups (for example, the 22 countries of the ESA)[7] or on an ad hoc basis for individual projects (for example, the 15 countries and five international agencies that contribute to the running of the ISS).[8] While these collaborative efforts lack formal authority to bind non-parties, they offer a forum for consensus-driven decision making. The ISS project is a notable example here, as in addition to sanctioning technical standards, it is regarded as setting modern governance practices around astronaut safety and behaviour (Farand 2001).
National bodies	Domestic governments have become the site of most modern regulation and rulemaking, as the OST charges them with supervising space-based activities associated with their jurisdictions. However, approaches vary widely from country to country and even within domestic systems. For example, both the United States and the United Kingdom have allocated responsibilities for government space programs and commercial activities to substantively distinct regulators (Oto 2022).
Private entities	For states that permit private actors to engage in space activities, these companies also have internal governance procedures that help contribute to standards of practice. While these standards are a relatively "soft" form of norm-setting, commercial activity has come to dominate some areas of space activity (particularly the launching of satellite constellations) and the impact of internal company standards is likely to increase accordingly.

6 By way of example, the ISO has produced a series of interrelated standards that private entities can use to ensure that debris mitigation is considered appropriately (including 11227: Test procedures for ejecta; 16126: Survivability against impacts; and 24113: Space debris mitigation requirements). The Consultative Committee for Space Data Systems, meanwhile, has produced a packet of standards that can be used for data management and communications in space.

7 See www.esa.int/About_Us/Corporate_news/Member_States_Cooperating_States.

8 See www.nasa.gov/international-space-station/space-station-international-cooperation/.

This multilayered approach to institutional governance does offer advantages. Drafting formal, multilateral treaties is complex and protracted. In contrast, deferring to domestic agencies or collations of states around particular projects is more flexible and responsive, and promotes innovation. Further, on some governance issues, variations in domestic regulatory approaches foster experimentation and subsidiarity. Some states naturally emerge as leaders in these domestic regulatory processes based on financing, expertise, risk-tolerance and domestic policy agendas (Burke-White 2015). In allowing the gradual evolution of space governance norms through national action, the existing institutional framework often allocates norm-setting responsibilities to countries most invested in the issue.

Yet this flexibility often comes at the expense of clarity and may itself fuel norm competition. The implementation of the Registration Convention is a case in point. Domestic rules differ as to which country must register objects, with some countries requiring registration only by the country that has primary responsibility over the object and others requiring registration even if the country merely provides ancillary services in support of a launch. This has resulted in gaps where multiple countries might collaborate on a satellite project, but none are required by their own domestic laws to register it. Several satellites developed by private corporations in France, the Netherlands and the United States went unregistered for this very reason (Nelson 2018). Perhaps because of these gaps in national regulation, only 88 percent of the 9,000 satellites currently in orbit are registered with the United Nations.[9]

As informal norm-setting processes continue while modern space technology progresses far beyond what was envisaged in the 1960s and 1970s, the existing UN-centred legal regime is gradually losing its ability to guide and shape space activity. Indeed, the lack of a formal process and institutional hierarchy for updating existing rules and developing new ones means that space activity has once again become an arena for great-power competition.

Contemporary Challenges in an Outdated Governance Structure

The initial flurry of international treaties in the 1960s and 1970s laid a solid — if stagnant — legal foundation for national space programs and, in turn, managed to de-escalate some of the tensions around the Cold War Space Race. For the better part of 50 years, international collaboration on space-based projects — including the successes of the ISS, which started as competing US and Soviet projects — thrived. More recently, however, geostrategic competition has made its way beyond Earth to outer space. As rising powers have assumed seats in international governance institutions, national interests have shifted and tensions have been exacerbated by conflicts including Russia's illegal annexation of Crimea in 2014 and invasion of Ukraine in 2022 — the limitations of an outdated legal framework for space governance have been revealed.

As countries compete to establish both international space norms and the processes through which those norms are created, core substantive points of contention have emerged. Notwithstanding these conflicts, other areas of mutual interest have simultaneously emerged where collaboration appears, at least, plausible.

Norm Contestation and the Limits of Governance

Perhaps the single most fraught area of space governance is national security itself. The use and control of space presents an existential security threat to both states with active space programs and those without. Increasingly sophisticated satellite technology has given rise to very precise tracking capabilities that transcend physical boundaries between states on Earth. Though the OST contains provisions prohibiting the use of nuclear weapons in space, leading world powers have continued to raise allegations against one another regarding the militarization of space. For example, in May 2024 then US national security advisor Jake Sullivan offered intelligence suggesting that Russia has an "intention of deploying nuclear weapons in space" and is indeed "developing a new satellite carrying a nuclear device" (The White House 2024). Dual-use technologies present a particular problem as they could ostensibly be launched for non-military purposes but reoriented to serve military applications or functions while in orbit (Azcárate Ortega 2023). These might

9 See www.unoosa.org/oosa/en/spaceobjectregister/index.html.

include, for example, satellites such as the US SOLRAD system, commonly used to study X-rays and solar activities but capable of intercepting radio waves (delle Fave 2023). States have taken radically different approaches to how these dual-use technologies should be regulated, as well as the information that should be provided to the international community about them.

In addition, the extent of government monopoly over space programs versus the autonomy of private actors in space has become increasingly contested. During the original drafting of the OST, the United States and the USSR were deeply divided on the appropriate role of private actors in space activities, the control of space-based resources and the commercial use of space. While many of these issues were never fully resolved, Soviet delegates insisted on OST provisions that stipulated direct state responsibility for space activities undertaken by associated private entities. This "private activity but public responsibility" compromise remains in place today (Hobe, Schmidt-Tedd and Schrogl 2015). More recently, the United States has established a very permissive domestic legal regime for private action in space and appears to be seeking to internationalize that approach. In contrast, the PRC's ever-increasing investments in space have been directed primarily through a state-governed program intended to ensure sovereign control of space programs.

Finally, on a structural level, debates — both expressed and implied — persist over the forms and institutions of space governance. The views of great powers diverge as to whether space exploration should be governed by a gradually evolving series of non-binding principles and norms, or whether the international community should instead look to reinforce the multilateral treaty architecture, a dichotomy that oversimplifies the situation (United Nations 2023). There are real concerns with both approaches. Specific technical and narrow treaty rules may not produce consensus or may become outdated even before they enter into force. A natural crystallization of rules through evolving state practice and *opinio juris* may be the most effective norm-creation mechanisms in a field evolving so rapidly (ibid.). Yet the development of rules through gradual evolution may preference the interests of particularly active countries, never generate unambiguous and enforceable legal doctrines, and increase the potential of continuing norm contestation over time (ibid.).

Shared Interests and Possibilities for Collaboration

Even in light of rising great-power competition, shared use of the space domain generates common interests for many states, around which cooperation appears both necessary and potentially fruitful. Common interests may drive opportunities for collaboration across a number of issues, including the tracking of international activities, oversight mechanisms, accountability for accidents and the management of environmental harms.

Even among space rivals, the management of space debris is a pressing area of common interest. Scholars and government officials alike consider space debris — any form of human-made material in space not serving a productive purpose[10] — to be the most significant threat to the space environment.[11] The concern is well founded. Even if no additional objects were launched into space, the current number of abandoned, inactive satellites and other space debris makes collisions between space objects inevitable (United Nations 2023b). As this debris continues to orbit, the rate of collision becomes ever greater and, without intervention, will result in an impassable array of debris.[12] Ultimately, if getting outside the debris belt becomes impossible, space access itself may be denied. Space debris also presents other security threats. An untracked, unregulated body of space objects creates ripe opportunities for covert satellites or weapon systems to hide within these debris fields (Imburgia 2011). Increasingly dense bands of space debris also have the potential to disrupt imaging, communications and military intelligence satellites (ibid.).

Related to the space junk problem, the increasing number of space objects raises the importance of space situational awareness (SSA) data that records activities in space and the movements of space objects (Kennewell and Vo 2013). Scientists tracking space objects have raised concerns around the lack of available information on these objects and the importance of access to SSA data in avoiding collisions in an ever-more-crowded near-Earth

10 See www.esa.int/Space_Safety/Space_Debris/About_space_debris.

11 *Reducing space threats through norms, rules and principles of responsible behaviours*, UNGAOR, 76th Sess, Supp No 99/d, UN Doc A/76/50 (2021).

12 See www.spacesafetymagazine.com/space-debris/kessler-syndrome/.

orbit.[13] An effective SSA network requires readily available, accurate information on the whereabouts and trajectories of space objects, which, in turn, requires standards for the registration and tracking of these objects. Despite general rules set out in the Registration Treaty, the collection of registration and tracking information has been inconsistent across countries and that data is often shared only through bilateral, rather than multilateral, mechanisms (Hitchens 2023). These data gaps create discrepancies between information that is available to different countries, thereby increasing the risks of near-Earth-orbit collisions. For example, there are significant differences in the data measured, recorded and shared by the US Strategic Command Space Surveillance Network, the ESA's SSA program and the Russian Military Space Surveillance Network. All space-active countries would be better off with more transparency and data sharing.

Other mechanisms for ensuring the safety and sustainability of objects in orbit also "present very real potential for collaboration."[14] Such measures, termed space traffic management (STM), typically build on the data collected as part of SSA tracking initiatives, but go a step further in setting out concrete action plans for promoting the safe operation and, where applicable, return of space objects from orbit. These include safety and sustainability standards for all space-based activities. Again, STM is rooted in treaties from the 1960s and 1970s, which, given the Cold War focus on manned space flight, was concerned primarily with the safe return of astronauts. Today, despite shared interests, the lack of a comprehensive and binding legal framework governing STM leads to significant variation in national STM practices (Barbano 2022). Currently, the United States is the only country to have adopted a formal STM framework for its national activities.[15] There may well be opportunities for the harmonization of STM and the development of new norms that extend beyond "mere knowledge of objects in orbit" to expressly address safety and sustainability principles (Sadat and Siegel 2022).

13 US, *Space Situational Awareness: Key Issues in an Evolving Landscape*, 116th Cong, 2020, online: <www.congress.gov/event/116th-congress/house-event/LC65655/text?s=1&r=9>.

14 See https://defence-industry-space.ec.europa.eu/eu-space/space-traffic-management_en.

15 Ibid.

Diverging Strategies for Space Governance

While the Cold War era was defined by fierce competition between the United States and the USSR on many fronts, at least in the realm of space governance, both countries were broadly committed to a shared multilateral process for the development and institutionalization of norms and rules under the auspices of the United Nations. This shared approach to governance — if not to the rules themselves — bounded competition and created common ground on which non-overlapping interests could be advanced. Today, however, three great powers — the United States, the PRC and Russia — as well as several other interested states, such as the European Union, India and Japan — are contesting both the appropriate rules for outer space and the governance institutions through which those rules are developed and implemented. This new context lacks guardrails to manage competition or off-ramps to de-escalate conflicts that may arise. With key powers having a vested interest in both the rules and process of space governance, there is a significant danger that unbounded competition could potentially lead to conflict.

The United States

US space strategy has both a substantive and structural objective. Substantively, the United States seeks to promote the role of private actors in space activities, outsourcing traditionally sovereign functions to key private partners. Structurally, the United States seeks to leverage its existing dominance in order to entrench governance norms and rules that favour US interests before competitors can entrench rules that suit their own interests.

These US objectives took root during the decline of the Soviet Union in the 1990s. From that point onward, the United States has found itself in a position of primacy in space activity and, though times have changed, the country has largely maintained this dominance. As of May 2022, the United States is responsible for nearly 63 percent of all satellites currently in orbit and, as home to SpaceX, is projected to continue to benefit from this imbalance in the immediate future (Buchholz 2023; Lipton and Barbaro 2024). In

recent years, the United States has articulated its approach to space governance in three key documents: the 2020 National Space Policy (Executive Office of the President 2020), the 2021 United States Space Priorities Framework (The White House 2021) and the 2022 National Security Strategy (The White House 2022). Notably, these domestic instruments have allowed the United States to frame its own approaches unburdened by multilateral frameworks.

The 2020 National Space Policy makes clear the US prioritization of commercial actors in space: "A robust, innovative, and competitive commercial space sector is the source of continued progress and sustained United States leadership in space. The United States remains committed to encouraging and facilitating the continued growth of a domestic commercial space sector that is globally competitive, supports national interests, and advances United States leadership in the generation of new markets and innovation-driven entrepreneurship" (Executive Office of the President 2020). Indeed, the policy makes the promotion of commercial interests the primary US goal: "[Goal 1: The United States shall] promote and incentivize private industry to facilitate the creation of new global and domestic markets for United States space goods and services, and strengthen and preserve the position of the United States as the global partner of choice for international space commerce" (ibid.). The 2020 National Space Policy, along with these other statements, has allowed the United States to frame a long-standing priority that never gained significant traction in the context of the OST: private, commercial space activity. For example, US support for private activity in space prompted a "heated debate" (Hobe, Schmidt-Tedd and Schrogl 2015) during the negotiations of the OST. The result was the inclusion of provisions in the OST that provided some acknowledgement of a role for private actors in space projects: article VI of the OST and articles I and II of the Liability Convention envisage private actors engaging in space activities, ensuring strict liability and imposing strong responsibility obligations on host states.[16] Yet, in the OST, these private actors obviously were to play a secondary role to national governments, and their rights and obligations were never clearly defined.

The US commitment to private space activities has grown ever more prominent as commercialization has become financially profitable. From the early 2000s, businesses have been exploring the possibility of mining and recreational ventures in space and have repeatedly called for greater government support (Shaer 2016). The financial resources available to these private entities have also proven to be a powerful incentive: SpaceX is estimated to have generated a revenue of US$4.6 billion from its space projects in 2022 alone,[17] while Boeing's revenue across its space, aeronautics and defence divisions is valued at US$22.3 billion for the same period.[18] In 2015, lobbying efforts by interested business parties spurred the passage of Title IV of the Commercial Space Launch Competitiveness Act, pursuant to which US citizens are entitled to own, use and sell resources obtained in the course of space recovery operations (Tronchetti 2016). This is a clear case where multilateral treaty frameworks are challenged by US national action. The US acknowledgement of private property rights over space-based resources in domestic law appears *prima facie* to run counter to article II of the OST (O'Brien 2020a), which provides that "outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[19]

The 2020 US policy document reinforces the US commitment to creating room for private actors to pursue commercial opportunities in space by expressly making them the primary means of US space efforts. In a section titled "Commercial Space Guidelines," the policy instructs heads of

16 In particular, article VI of the OST provides: "States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty." Articles I and II of the Liability Convention reaffirm this position. See OST, *supra* note 2, art VI.

17 See https://sacra.com/c/spacex/#:~:text=Click%20here%20for%20our%20SpaceX,to%20%244.6B%20in%202022.

18 See www.boeing.com/company/about-bds#anchor1.

19 This text amounts to the full language of article II of the OST and is supported further by the text of article I, which reads: "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind. Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies. There shall be freedom of scientific investigation in outer space, including the moon and other celestial bodies, and States shall facilitate and encourage international co-operation in such investigation." See OST, *supra* note 2, art I.

government agencies to "develop Government space systems only when in the national interest and no suitable or cost-effective United States commercial or, as appropriate, international commercial capability or service is available or could be available in time to meet Government requirements" (Executive Office of the President 2020). In line with this strategy, the US government has integrated private entities into its SSA framework. For example, the Department of Defense (DoD) is exploring the use of SSA data from commercial companies, which can provide sensor coverage in politically sensitive or inaccessible regions and track smaller objects than DoD sensors. Today, NASA fundamentally relies on private companies for space missions (Bardan 2024).

Turning from substance to structure, while the United States often leads the development of space norms through domestic legal and regulatory processes, it also seeks to leverage its existing dominance to internationalize those norms. Notably, it has done so not through traditional multilateral frameworks, but rather through minilateral agreements and voluntary commitments. The United States has sought to globalize its own approaches in several key areas, including anti-satellite testing and the creation of international SSA frameworks. The United States was the first country to commit to refrain from anti-satellite missile testing, following Russia's controversial anti-satellite missile test in November 2021. At the behest of the United States, other countries have followed suit, including Canada. The United States remains open to working more broadly with a range of partners, particularly when it is in a position to shape the norms in question. US support of a UN General Assembly (UNGA) resolution in December 2022, encouraging all nations to refrain from anti-satellite missile tests, is a case in point. Additionally, the United States shares collision-warning technology with major space players, including the PRC, and has more than 170 SSA-sharing agreements with partners across academia, international governmental organizations, private entities and various nations.

At the core of US space diplomacy, however, is not new multilateral agreements, but rather a series of bilateral commitments — notably, the Artemis Accords — that fundamentally reflect a distinct US view of space governance. The US State Department describes the Artemis Accords as the "centerpiece of United States' civil space diplomacy."[20] The accords are bilateral agreements with select international partners concerning the United States' proposed space activities on the Moon. The proposals themselves are extensive, including plans to establish a permanent human presence on the Moon and use this Moon station as a base for human missions to Mars (The White House 2017). More broadly, however, the accords represent a strategic effort to internationalize and concretize several key elements of an international space order under US leadership. The US decision to use these Moon-related activities agreements to shape broader space-governance norms reflects the US recognition of a unique diplomatic leverage point. Moon-related activities hold significant international appeal, with both key partners and competitors itching to pursue their own lunar interests. India, Israel, Japan and the PRC have all initiated unmanned explorations on the Moon, while the ESA has announced an ambitious "Moon Village" project of its own (von der Dunk 2020).

The Artemis Accords seek to exploit the strategic opportunity to advance a US vision of international space norms, related to the Moon and beyond. In particular, section 9 of the accords calls for signatory states to "preserve" Apollo landing sites and those of robotic lunar missions — so-called outer space heritage sites[21] — while section 11 establishes exclusive "safety zones" around the newly proposed Artemis mission areas, ostensibly on the basis of preventing harmful interference (ibid.).[22] Though the language of these provisions appears to be grounded in the OST, it offers an interpretationof some principles that may not be shared by all states. The Artemis Accords advance a US vision for limited sovereign claims

20 See www.state.gov/bureau-of-oceans-and-international-environmental-and-scientific-affairs/artemis-accords.

21 See *Artemis Accords*, 13 October 2020 (not yet entered into force), online: NASA <www.nasa.gov/wp-content/uploads/2022/11/Artemis-Accords-signed-13Oct2020.pdf>. Section 9.1 reads in full: "The Signatories intend to preserve outer space heritage, which they consider to comprise historically significant human or robotic landing sites, artifacts, spacecraft, and other evidence of activity on celestial bodies in accordance with mutually developed standards and practices."

22 *Ibid*. Section 11.7 reads, in part: "In order to implement their obligations under the Outer Space Treaty, the Signatories intend to provide notification of their activities and commit to coordinating with any relevant actor to avoid harmful interference. The area wherein this notification and coordination will be implemented to avoid harmful interference is referred to as a 'safety zone.' A safety zone should be the area in which nominal operations of a relevant activity or an anomalous event could reasonably cause harmful interference."

to extraterrestrial resources and territories (O'Brien 2020b). Section 10 of the accords goes even further, allowing for the utilization and extraction of space resources by private entities. Opponents have criticized these provisions for breaking — or rewriting — the norms of the existing multilateral framework. Securing mining and extraction rights, for example, contravenes article XI of the Moon Treaty, which establishes that the Moon and its resources are the "common heritage of all mankind." Of course, the Moon Treaty itself is contested, and the PRC, Russia and the United States are not parties thereto. Through the Artemis Accords, the United States is pushing ahead to interpret (and perhaps reshape) the legal regime in its own interest through more limited minilateral agreements (ibid.).

The Artemis Accords may well become the governance framework for future lunar exploration and exploitation, in part, because the Moon Treaty never attracted a significant number of ratifications. At the time of their announcement in October 2020, the Artemis Accords had seven signatories. By 2024, that number has risen to 43 countries, including 21 in Europe, as well as India and Japan. While the accords do serve important substantive purposes, they can also be understood as an attempt by the United States to leverage its technological capabilities, historical dominance and promise of the Artemis projects to establish an expanded — or even alternative — set of principles underpinning space governance. Seen through this lens, the United States' use of a less formal rulemaking process is an important one. In choosing not to engage in an expansion of existing agreements through the United Nations, the United States has made a clear choice for less formal governance through which it believes greater control can be asserted.

The PRC

As a result of its extraordinary economic and political rise in the past decade, the PRC has become far more assertive in shaping a wide range of international norms and institutions. Casting aside the advice of early party leaders to maintain a low global profile, Chinese President Xi Jinping has instead decided that the moment for China to assume global leadership on its own terms has arrived. In his 2017 remarks at the nineteenth Party Congress, Xi noted that "trends of global multipolarity" are "surging forward" and prompting "changes in…the international order." As "relative international forces are becoming more balanced," he argued that China must stand ready to become "a global leader in terms of comprehensive national power and international influence" (Funaiole and Glaser 2017). In conjunction with these statements, China has doubled down on its support of traditional international diplomatic frameworks, including the United Nations, where it is now the second-largest contributor to both the organization's regular budget and its peacekeeping budget (ChinaPower 2017).

This newly assertive foreign policy is evident across all of the PRC's international endeavours, including its space program. In light of this new assertiveness, the PRC's space policy contains two broad elements. First, it has invested heavily in developing its domestic space capabilities, both as part of the Chinese Communist Party's (CCP's) broader "national rejuvenation" rhetoric and as a means of ensuring that the PRC has the technological capacity to compete both militarily and economically. Second, drawing on its newfound geopolitical strength, the PRC is increasingly turning to multilateral international frameworks, such as the United Nations, to promote its ideological vision for the future of space-based activities.

In the lead-up to the nineteenth Party Congress in 2017, the PRC articulated its space policy. In 2016, the Information Office of the State Council of the People's Republic of China (2016) published the "White Paper on China's Space Activities," in which the PRC committed to "build[ing] China into a space power in all respects," so that the country would be capable of driving independent innovation, conducting high-level scientific research, promoting economic development and guaranteeing national security. The white paper identifies space development as a source of "support for the realization of the Chinese Dream of the renewal of the Chinese nation," signalling a growing focus on space programs as prime markers of pride, prominence and even sovereignty (ibid.). Toward the end of 2021, the PRC issued a second white paper that reiterated these priorities, stressing not only the importance of developing domestic technological capabilities and internal legal governance frameworks, but also "safeguarding the central role of the United Nations in managing outer space affairs" (Information Office of the State Council of the People's Republic of China 2022). Akin to US-Soviet space competition during the Cold War, the PRC is pursuing space power as a symbol of national prestige, with the goal of achieving the CCP's ambition of becoming a leading world power by 2049 (Pollpeter et al. 2020).

The PRC is well on its way to achieving these goals, having made considerable progress on its space agenda since 2016. It was the third nation to successfully land on the Moon in 2013 and became the first to make a controlled landing on the Moon's far side in 2019. So far, the PRC is the only country (other than the United

States) to land a robotic rover on Mars, and it is aiming to put humans on the Moon and Mars in the next 10 years (Phys.org 2023). The Chinese State Council's 2021 white paper reaffirms the importance of a "journey towards strong space presence" and highlights several major achievements, including 207 completed launch missions from 2016 to 2021, a diversification of launch vehicle services, satellite remote-sensing, communications and navigation systems, as well as manned spacecraft development (Information Office of the State Council of the People's Republic of China 2022).

In line with these objectives tied to the strengthening of national prestige, the 2021 white paper also seeks to put the PRC at the centre of global networks for space science research, featuring the modernization of space governance and international cooperation. It expressly links the PRC's space development to President Xi's policy proposals for a "global community for a shared future," with Beijing at its centre (ibid.). The PRC views space projects and space governance as opportunities to consolidate geopolitical alliances and achieve independence from US-controlled networks and systems. Critical to this objective is China's independent access to space and space-based technologies, which can be offered to its partner countries as an alternative to US-controlled options. For example, the PRC's successful development and construction of the BeiDou Positioning and Navigation System (BDS) in 2020 greatly reduced its reliance on the GPS developed and maintained by the United States, and opened up opportunities for competition. The PRC advertises the BDS as part of its "Information Silk Road" under the broader Belt and Road Initiative, offering BDS as a free and open system to other countries (Goswami 2020). The PRC presently seeks to exploit space technologies, such as the BDS, to expand its economic, diplomatic and political leverage with countries in Central Asia, Southeast Asia and the Middle East (Zhang 2020).

As part of its strong emphasis on space-related technological development and domestic capacity building, the PRC's state-led approach has, in recent years, increasingly accommodated and encouraged public-private partnerships on space exploration, fuelled by the recognition that commercial spaceflight is key to achieving strategic advantage and sustained growth in the long term. In 2023, commercial launches constituted nearly 40 percent of the PRC's total launches, with a success rate of 96 percent. Various private companies have entered the PRC's space industry, with each specializing in a different technology, ranging from rocket launchers to satellite manufacturing and services (Liu 2024). In 2024, commercial spaceflight was written into the State Council's annual *Report on the Work of the Government* for the first time, signalling the CCP's resolve to "foster new growth engines" in the space sector (Information Office of the State Council of the People's Republic of China 2024). The PRC's decision to further expand and invest in the commercial space industry is not surprising given rapid US commercial successes, such as Starlink, which have the potential to quickly reduce the availability of low-Earth orbit for future launches by other states. From the PRC's perspective, the military and strategic implications of SpaceX simply cannot be ignored, and Beijing has built up domestic capabilities to enable lasting growth in the space realm, including through commercial space activity.

Inherent in the PRC's reputational and political objectives in space is an effort to structure space governance rules. While not an original architect of the Cold War-era treaties, the PRC has quickly emerged as an international rulemaker on space-related issues. The PRC's efforts have largely focused on multilateral settings, particularly the United Nations, where it believes it wields influence through unique sources of legitimacy. In recent years, for example, the PRC has either solely or jointly made proposals or voted in favour at the UNGA on issues including the prevention of an arms race in outer space, transparency and confidence-building measures, and no first placement of weapons in outer space — even if it has not made such commitments itself. (Qisong and Nishan 2021). Responding to UNGA Resolution 75/36 in 2020, the PRC's Permanent Mission to the United Nations stated that it "stands ready" to work with other member states and seeks "practical and effective solutions against space security threats," especially an arms race in space where the security of all humankind hangs in the balance (Permanent Mission of the People's Republic of China to the UN 2021). The PRC's representatives at the United Nations have also called out countries, such as the United States, for their purported unwillingness to "subject their military capabilities in outer space to substantive restrictions" by refusing to negotiate for legally binding instruments to prevent an arms race in space (United Nations 2023a).

The PRC's reliance on UN frameworks stands in contrast to the US bilateral and minilateral approach. PRC commentators have raised significant concerns about the US-led Artemis Accords, criticizing both the US understanding of sovereign principles in space, as well as its proposals for private property and extraction rights (Ji, Cerny and Piliero 2020). Though Chinese officials have not commented directly on the Artemis proposals, the PRC has announced plans with Russia for the construction of a rival International Lunar Research Station (ILRS) based on principles somewhat different from those of the United States (Bilal 2024; Wu 2023). The joint Chinese-Russian proposals centre around state-sponsored and state-managed missions that would conduct research on the Moon using resources in situ. In contrast, the Artemis Accords, while covering in situ use of space resources, also allow for removal of resources to other bodies (A. Jones 2021). Mapped against the current landscape of space governance, the ILRS project would fit neatly within the multilateral frameworks established in the 1970s, reinforcing rather than rejecting the principles of the OST. The PRC's efforts to globalize this approach, however, have gained limited traction. Beyond Russia, only Pakistan and the United Arab Emirates have backed the proposal, while talks with nations from the ESA have stalled.

The PRC asserts a view of space governance consistent with existing, but perhaps outdated, international legal norms and rooted in multilateral processes. Yet it has been criticized for not living up to these principles. The US Department of Defense's congressionally mandated report (2022) on PRC military and security developments notes the country's "dogged pursuit of space superiority" and continued investments to improve its military space capabilities despite public advocacy for the peaceful use of outer space (Erwin 2022). While the PRC has not openly tested its anti-satellite abilities since 2007, Pentagon officials believe that it has experimented with other offensive capabilities that can disrupt satellites in orbit. Given that superiority and rulemaking are baked into both US and PRC space-governance objectives, competition and mutual criticisms appear inevitable in the years ahead.

Russia

While the United States' and China's approaches to space governance might best be characterized as maximization of both security and commercial interests (the former) and enhancing regional influence and global prestige (the latter), the core of the Russian Federation's attitude toward space governance is military advantage.

Since the fall of the Soviet Union, Russia has found both its technological and diplomatic capabilities in the space realm greatly diminished. Although a period of economic growth and cooperation with the West in the early 2000s allowed for some post-Soviet advances in space-faring capacity, particularly by virtue of the ISS project (O'Callaghan 2020; Zak 2016), Russia's growing diplomatic isolation and national militarization have brought cooperation to a halt (Troianovski, Nechepurenko and Hopkins 2021). The illegal annexation of Crimea in 2014 and invasion of Ukraine in 2022, along with resultant sanctions regimes, have deprived Russia of the resources and geopolitical standing necessary to expand its space goals, develop commercially viable space programs and shape new governance efforts (A. Jones 2023).

Adding to Russia's woes, its space program has been marred by significant failures. Observers have noted three leakage incidents on the Soyuz crewed spacecraft in 2018 and 2022 and the Progress MS-21 cargo spacecraft in 2023, which collectively suggest significant quality control issues plaguing Russian spacecraft manufacturers (Skibba 2023). Most recently, the failure of the Luna-25 mission to make a controlled landing on the South Pole of the Moon has contributed to the perception that Russia's space capabilities have been greatly reduced. Reports suggest that these failings are largely the result of geopolitical events, and they have adverse consequences for the Russian economy and manufacturing capabilities. In the case of the lunar explorer, reports suggest that restrictions on sales by EU manufacturers led to the use of substandard components (The Associated Press 2023). Even relatively straightforward technologies — Russia's equivalent to GPS, for example — are unreliable. Almost all of Russia's positioning satellites are now past their service lives and starting to fail (Swope and Young 2024). To supplement insufficient Russian satellite communications capabilities, Russian troops allegedly use illicitly procured Starlink terminals in Ukraine (ibid.).

Not surprisingly, Russia's declining space capabilities have tempered its ambitions, influence and strategy. Lofty goals and expansive ambitions have given way to a space program far more focused on military and security objectives, including through cooperation with like-minded states, especially the PRC. As the Russian Federation's 2021 National Security Strategy notes: "Space and information spaces are being actively developed as new areas of warfare" (President of the Russian Federation 2021, 3). As a result, Russia commits to "strengthening the leading positions achieved by the

Russian Federation and competitive advantages in…the rocket and space industry," so as to ensure "the interests of the Russian Federation related to the development of outer space" (ibid., 24).

Beyond these stated national security objectives in space, Russia continues to militarize its space program (Vidal and Privalov 2023). In April 2022, then-head of Roscosmos, Dmitry Rogozin, stated that "in the current situation, Roscosmos has had to become a much rigid structure [*sic*], working first of all for the benefit of defence and security of the country" (Yachmennikova 2022). Some two months later, having lost his position at Roscosmos, Rogozin posted more candid comments to X (formerly Twitter), framing Russia's space activities as underfunded when compared to US efforts: "We allocated $2.5 billion (for Roskosmos, while) the civilian budget of NASA is $25 billion and the civilian budget at SpaceX is equal to that at Roskosmos, and that is not counting tens of billions of dollars allocated annually for feverishly deploying US system for the control of the entire planet. In two-three years, we will have orders of magnitude more dense US command, control and targeting system" (Zak 2024, 32). While Russia has championed movements to prevent the weaponization of space, its actual conduct appears to advance the militarization of space. US news agencies have reported on US intelligence surrounding Russian plans for a nuclear space weapon designed to incapacitate satellites (Barnes et al. 2024). Russia's 2021 anti-satellite test against a decommissioned Soviet communications satellite demonstrated the country's military capabilities in space, notwithstanding OST commitments to the exclusively peaceful pursuit of space activities (Vidal and Privalov 2023). Despite outcry from the international community, Russian Defence Minister Sergei Shoigu confirmed that the test had taken place, characterizing it as a routine operation of a "cutting-edge future weapon system" designed to strengthen Russia's defence against US attempts to attain "comprehensive military advantage" in space (Sankaran 2022a).

Perhaps recognizing its more limited influence on issues of space governance, Russia's strategic approach has shifted and narrowed in the past five years. While Russia still is a space power to be reckoned with, it has increasingly relied upon partnerships with the PRC to expand its influence. Russia and the PRC share many common interests and strategies — even if framed somewhat differently — that have facilitated cooperation in shaping governance regimes. This cooperation was perhaps most evident in a joint statement by President Vladimir Putin and President Xi on the sidelines of the Beijing 2022 Winter Olympics. A significant portion of the statement was dedicated to Russian and Chinese space policy, and called for international efforts under Russian and PRC leadership to "prevent the weaponization of space and an arms race in outer space" (President of Russia 2022).

Like the PRC, the Russian Federation sees the United Nations and other multilateral frameworks as the most promising avenues to advance their visions of space governance and a means to counterbalance US influence. The 2022 joint PRC-Russia statement calls for international cooperation on space matters, and urges "negotiations to conclude a legally binding multilateral instrument based on the Chinese-Russian draft treaty on the prevention of placement of weapons in outer space and the use or threat of force against space objects" (ibid.). The Russian Federation, often with PRC support, has sought to use the United Nations to advance its space governance interests in a bid to counter those of the United States. In 2008, Russia and China proposed a draft treaty — referred to in the 2022 joint statement — which included a complete ban on the use of military applications of space technology.[23] Although the proposal was viewed as an expansion of existing OST provisions concerning the peaceful exploration of space and ban on nuclear weapons of mass destruction, no consensus was ultimately reached regarding its adoption (Press and information team of the Delegation of the UN in Geneva 2022).

More than 15 years later, in early 2024, the United States and Japan — acting on US intelligence that Russia was engaging in the development of nuclear weapons for use in space — introduced a UN Security Council resolution calling for a ban on

23 Notably, the definition of "weapon" under article 1(c) of the draft treaty is particularly broad: "the term 'weapons in outer space' means any device placed in outer space, based on any physical principle, specially produced or converted to eliminate, damage or disrupt normal function of objects in outer space, on the Earth or in its air, as well as to eliminate population, components of biosphere critical to human existence or inflict damage to them" (Press and information team of the Delegation of the UN in Geneva Delegation of the EU to the UN in Geneva Press Team 2022). See *Draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects*, 2 February 2008 (not yet entered into force), online: <www.mfa.gov.cn/eng/wjb/zzjg_663340/jks_665232/kjfywj_665252/202406/t20240606_11405272.html>.

both nuclear weapons and the development of such weapons in space. Russia vetoed the resolution, arguing that Western countries were simply "cherry-picking" weapons of mass destruction out of all other weapons to "camouflage their lack of interest" in preventing military activity in outer space more generally (United Nations 2024). Instead, the Russian Federation resubmitted its own 2008 draft treaty to prevent an arms race in space, which the United States, in turn, vetoed. China abstained from the US resolution but voted in favour of Russia's (Swope and Young 2024). Ultimately, then, while the United Nations continues to be Russia's preferred forum for space governance, the veto structure — as well as Russia's own hypocritical and other UN members' arguably disingenuous actions — has limited its success.

While Russia and the PRC committed to a "no-limits" partnership in 2022 and that cooperation has materialized in diplomatic circles, it has yet to be translated into deepening technical cooperation. The PRC's ambitions and recent accomplishments have vastly outpaced Russian resources and current capabilities, leading to the prospect that Russia may find itself growingly reliant on the PRC for technology in the future (Vidal and Privalov 2024). Even when the two nations have converged on space-based endeavours, mutual efforts have been mostly limited to non-military applications (such as their joint ILRS initiative), and the PRC has thus far refrained from public cooperation on military space programs. Russia and the PRC have announced a joint effort to construct a satellite-based early ballistic missile-detection system, which may herald a new era of cooperation (ibid.).

It could be said that Russia's space and space-governance ambitions have been humbled in recent years. Yet, at least in the military domain, Russia remains a formidable actor with both strong aspirations and capabilities. It continues to use multilateral institutions for what can best be described as disingenuous attempts to condemn the deployment of space-based weapons systems and thwart consensus-building efforts among other actors. As a permanent member of the UN Security Council, Russia will continue to exert outsized influence in this venue, which may drive the United States further in the direction of informal agreements and minilateral cooperation. Indeed, Russia's twin approach of enhancing military development efforts while seeking to leverage vestigial geopolitical influence in established international institutions has led some commentators to argue that Russia's current approach to space policy almost amounts to a return to Cold War-era strategies (Sankaran 2022b). The marked difference, however, is Russia's significantly diminished role on the world stage more generally. Accordingly, alignments, partnerships and potential dependence on the PRC will also shape Russia's objectives and strategies and amplify its voice on governance issues, while limiting its strategic flexibility to take independent positions.

The Road Ahead

This paper has outlined the contours of a new geopolitical landscape and its implications for space governance. Although the Cold War "Space Race" has run its course, space governance is quickly re-emerging as a forum for global powers to assert their technological and diplomatic prowess. The legal regimes created in the 1970s are no longer adequate to address the present practical realities of space activities, much less manage great-power competition. Much is at stake for the great powers now and in the future as they seek to shape the outcomes of these governance challenges; there is every reason to expect the issue to continuously rise in prominence on national policy-making agendas. As a result, a simultaneous contest of both norms and governance processes has emerged.

For the United States, space presents a commercial and diplomatic opportunity to not only promote its conception of commercial interests, but to also consolidate its international alliances and engage in rulemaking more aligned with its interests. The PRC is ready to capitalize on its emerging global power status, building on its technological capacity to enhance profile, prestige and profit. Yet, to date, it has been unable to mount a serious challenge to US governance processes or build a broader consensus for its vision of sovereignty beyond Earth's orbit. Though Russia's lustre has faded, it continues to assert its positions on space issues and has the capacity to both advance its own military interests and to thwart formal law-making processes with which it disagrees.

This competition will likely be lasting, with the forces driving increased tensions among great

powers unlikely to fade. As countries pursue divergent governance strategies, global consensus is out of reach, and the contestation of both governance norms and processes will endure. In that context, the critical question is whether limited cooperation on key issues, such as space debris, can be achieved and how to go about doing so. The current geopolitical environment is not conducive to the drafting of a new and all-encompassing multilateral treaty in the style of the original OST. Not only does the international community appear to lack the political will to engage in the drafting process, but also the technological demands and national interests in space are so varied that it is unlikely consensus could be achieved. Russia and the PRC may try, but these efforts will flounder.

A more promising path — likely to be pursued by the United States on one side and Russia and the PRC on the other — is to increase participation in distinct minilateral rulemaking exercises. Expanding the circle of participating states may cement norms, enhance legitimacy and deepen cooperation among like-minded states. Both sides in this process are likely to seek new partners, with the United States attempting to diversify the countries included in its coalition and Russia and the PRC looking for others to join their alternative approach. Like-minded groupings, such as the Group of Seven or BRICS (Brazil, Russia, India, China, South Africa, Iran, Egypt, Ethiopia and the United Arab Emirates), could emerge as more formidable negotiating fora. Under this model, middle powers may be able to play an outside role, offering neutral ground for compromise or advancing norm-building outside of geopolitical contestation.

A miniliteral approach to rulemaking carries both opportunities and risks. It has the potential to allow the continued development of both rules and governance processes despite political competition. It may allow experimentation and norm entrepreneurship in which new ideas are tried, tested and adopted. But minilateralism runs the risk of a more permanent fracture in the space governance architecture, with some countries following one set of rules and others another. In the shared environment of outer space, countries operating under different rules may lead to conflict or even catastrophe.

International standards-setting organizations and related entities may also emerge as points of contestation where the PRC, Russia and the United States look to embed their preferred rules or governance approaches in more formal standards. In a best-case scenario, such institutions may serve as neutral, subject-limited fora for international rule setting. For example, standards associated with the ISO might be applied across space projects from Artemis to SpaceX satellites to the ILRS. In other circumstances, standards-setting organizations may simply be rendered ineffective in light of geopolitical contestation. In a worst-case scenario, these institutions might be co-opted by states on either side of the governance divide, thereby limiting their bridging potential. Beyond these minilateral approaches likely to dominate space governance in the years ahead, there may be a few substantive areas where alignment of national interests makes broader consensus more plausible, perhaps even through formal treaty-making processes. First, given geopolitical tensions and rapid technological advancements, the normative commitment of the OST to banning nuclear weapons in space must be reaffirmed. The procedural battles between the United States and Russia on this issue must be overcome, perhaps through a neutral third country putting forward a resolution of its own that draws on both the US and Russian positions. Second, registration, sustainability and technical issues could produce a sufficient level of common interest to drive new rulemaking processes. Third, if the United States succeeds in carving out a more significant role for commercial actors in space, new mechanisms are needed to ensure that these commercial activities remain consistent with the OST's ultimate commitment to securing space for the interests of humankind. Most interestingly, perhaps, the PRC's recent move toward commercial space activities could create an unexpected alignment of US and PRC interests — in tension with those of Russia — to develop more permissive norms for private commercial space activities.

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