Review idara –National School of Administration - Algeria

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Outer Space as a New Geopolitical Frontier: Power, Law and Technology

الفضاء الخارجي بوصفه مجالاً جيوسياسياً جديداً: بين القوة، القانون والتكنولوجيا

Sofiane BENMOUSSA*
National School of Administration, Algiers
benmoussa.s@ena.dz

Received date : 11/05/2026 Admission date : 15/06/2026 Published date :30/06/2026

Abstract

Outer space is undergoing a profound transformation from a cooperative domain into a contested geopolitical frontier. Driven by rapid technological advancements, the emergence of private actors and the resurgence of great power competition, the space environment is increasingly shaped by dynamics traditionally associated with terrestrial power politics. This evolution challenges the long-standing conception of outer space as a neutral global commons governed by stable legal principles.

This article examines how the intersection of power, law and technology is redefining the strategic significance of outer space. It argues that the growing militarisation of space infrastructures, the expansion of mega-constellations, such as those developed by SpaceX, and the involvement of private actors in conflict situations are fundamentally altering the balance between state sovereignty and global governance. At the same time, the existing legal framework, centred on the Outer Space Treaty of 1967, appears ill-equipped to

* Corresponding author

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

regulate contemporary practices, particularly in relation to commercial exploitation, orbital congestion and security competition.

Drawing on a combined realist and institutionalist approach, the article demonstrates that outer space is no longer insulated from geopolitical rivalries but has become an extension of them. While realism explains the intensification of strategic competition among major powers, institutionalism highlights the growing inadequacy of international legal regimes. The analysis further shows that weak enforcement mechanisms and competing governance initiatives risk leading to a fragmented and unstable space order.

Ultimately, the article contends that without significant adaptation of international legal frameworks, outer space is likely to evolve into a domain characterised by strategic competition, regulatory ambiguity and increasing risks of conflict.

Key words

Outer Space, Geopolitics, Space Security, International Space Law, Militarisation, Private Actors, Orbital Competition, Global Governance.

الملخص

يشهد الفضاء الخارجي تحوّلاً عميقاً، إذ ينتقل تدريجياً من مجال يغلب عليه الطابع التعاوني إلى فضاء جيوسياسي متنازع عليه. ويعود هذا التحول إلى التقدم التكنولوجي المتسارع، وصعود فاعلين خواص ذوي قدرات مؤثرة، إلى جانب عودة المنافسة بين القوى الكبرى، ما أدى إلى إدماج الفضاء ضمن ديناميكيات الصراع التي لطالما ميّزت العلاقات الدولية على الأرض. ويضع هذا التطور موضع تساؤل التصور التقليدي للفضاء الخارجي باعتباره مرفقاً عاماً عالمياً محكوماً بقواعد قانونية مستقرة.

تتناول هذه الدراسة كيفية تفاعل عناصر القوة، القانون والتكنولوجيا في إعادة تشكيل الأهمية الاستراتيجية للفضاء الخارجي. وتُجادل بأن تنامي عسكرة البنى التحتية الفضائية، وتوسع الكوكبات الضخمة من الأقمار الصناعية، وعلى رأسها سبيس إكس، إلى جانب انخراط الفاعلين الخواص في

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

سياقات النزاع، كلها عوامل تُعيد صياغة العلاقة بين سيادة الدول وآليات الحوكمة العالمية. وفي المقابل، يبدو الإطار القانوني القائم، المرتكز على معاهدة الفضاء الخارجي لعام 1967، غير قادر على مواكبة هذه التحولات، لا سيما فيما يتعلق بالاستغلال التجاري، الاكتظاظ المداري والتنافس الأمني.

انطلاقاً من مقاربة تجمع بين الواقعية والمؤسساتية، تُبيّن الدراسة أن الفضاء الخارجي لم يعد معزولاً عن التنافسات الجيوسياسية، بل أصبح امتداداً لها. ففي حين تفسر الواقعية تصاعد المنافسة الاستراتيجية بين القوى الكبرى، تُبرز المؤسساتية حدود الأطر القانونية الدولية في ضبط هذه الديناميكيات. كما تُظهر الدراسة أن ضعف آليات الإنفاذ وتعدد المبادرات التنظيمية قد يؤديان إلى نشوء نظام فضائي مجزأ وغير مستقر.

وتخلص الدراسة إلى أنه في غياب تكييف جوهري للأطر القانونية الدولية، فإن الفضاء الخارجي مرشح لأن يتحول إلى مجال يتسم بالتنافس الاستراتيجي، والغموض التنظيمي، وتزايد مخاطر الصراع.

الكلمات المفتاحية

الفضاء الخارجي، حوكمة الفضاء، القانون الدولي للفضاء، عسكرة الفضاء، الفاعلون الخواص، الجيوسياسة، الكوكبات الساتلية، أمن الفضاء.

Introduction

In February 2022, within hours of Russian forces crossing into Ukraine, SpaceX activated its Starlink satellite internet service over the country at the request of the Ukrainian government. Within days, thousands of terminals were deployed to military units, enabling battlefield communications, drone coordination and command-and-control functions that Ukrainian forces would otherwise have struggled to maintain (Abels, 2024, p. 843). The episode was significant not only for its operational consequences, but also for what it revealed about the changing nature of outer space as a domain of power: for the first time in contemporary history, a private corporation became a decisive actor in a major interstate conflict, exercising strategic influence over the conduct of hostilities without formally being part of

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

any existing international legal framework governing warfare or space activities.

This episode reflects a broader and more profound transformation in the politics of outer space. For much of the second half of the twentieth century, space was governed, albeit imperfectly, by a normative architecture centred on peaceful use and the collective benefit of humankind. Negotiated at the height of the Cold War, the Outer Space Treaty of 1967 established the foundational principles of international space law, prohibiting national appropriation of outer space and promoting its use for peaceful purposes (Lyall & Larsen, 2025, p. 26). Yet the geopolitical and technological conditions that made this framework viable have changed dramatically. The monopoly once exercised by states over space activities has given way to an increasingly commercialised and technologically competitive environment dominated by both public and private actors.

Mega-constellations composed of thousands of satellites, such as Starlink, OneWeb and China's Guowang project, are promptly reshaping the orbital landscape. At the same time, the utility of space infrastructure for communications, intelligence, navigation, precision targeting and early warning systems has made outer space an essential component of contemporary military power (Bowen, 2023, p. 228). As a result, space is no longer merely a scientific or exploratory domain; it has become a critical extension of terrestrial geopolitics. This transformation is further intensified by the resurgence of great power rivalry. The United States, China and Russia perceive outer space as a strategic high ground whose control carries significant military advantages.

The growing militarisation of orbital infrastructures is reflected in the creation of dedicated space forces, the development of anti-satellite (ASAT) capabilities and the integration of space assets into modern military doctrines. Although outer space has long been militarised,

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

recent developments suggest an accelerating shift towards its potential weaponisation (Mills & Butchard, 2021, p. 15). The ASAT tests conducted by a few states demonstrated significant technological capabilities while simultaneously generating dangerous debris fields that threaten the long-term sustainability of orbital environments (Swope, Bingen, Young, & LaFave, 2025, p. 31-32). Beyond their immediate technical implications, these tests illustrate the mounting tension between strategic competition and the collective interest in preserving the stability and accessibility of outer space.

Concurrently, the architecture of outer space's governance is showing signs of fragmentation. The existing legal framework was designed during an era characterised by state-centric activities and limited commercial participation. Thus, it struggles to address contemporary challenges such as private mega-constellations, commercial exploitation of extra-terrestrial resources, orbital congestion and the use of private infrastructures during armed conflicts (Hasin, 2023). Moreover, contrasting governance initiatives are beginning to emerge. The Artemis Accords, led by the United States, stand in contrast to the Sino-Russian International Lunar Research Station (ILRS) project (Samson & Christensen, 2025). This reflected rival visions regarding the future governance of outer space.

These developments carry significant implications for both international relations and law. The emergence of new space technologies, the growing influence of private actors and the intensification of competition among major powers are transforming outer space into a contested geopolitical arena (Camargo & De Souza, 2025). Besides, these transformations are placing increasing pressure on the legal principles and governance mechanisms inherited from the Cold War era, whose capacity to regulate a rapidly evolving and commercialised domain appears constrained.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

In order to examine these dynamics, this article adopts a dual theoretical framework combining realism and institutional legal approaches. Realism provides the analytical tools necessary to understand the persistence of power competition, the strategic logic underpinning the militarisation of space and the behaviour of states in an increasingly competitive security environment (Dolman, 2002, p. 1-8). Institutionalism, by contrast, highlights both the role and the growing limitations of international legal norms and governance mechanisms in regulating state and non-state activities in outer space (Lyall & Larsen, 2025, p. 490). Together, these approaches help explain the tension between power politics, technological acceleration and legal regulation that characterises contemporary space governance.

This article argues that outer space is undergoing a structural transition from a relatively cooperative and regulated domain into a fragmented geopolitical arena shaped by strategic rivalry, technological disruption and legal ambiguity. The combined effects of militarisation, privatisation and normative fragmentation are progressively eroding the foundational principles of space governance established during the Cold War, thereby increasing the risks of instability, competition and potential conflicts. Examining this transformation requires an analytical framework capable of capturing the dynamics of space power politics and the evolving legal and institutional challenges associated with the contemporary space environment.

From a methodological standpoint, this article adopts a qualitative and analytical approach grounded in document analysis and interpretive case study. Its objective is to examine how the interaction between power, law and technology is reshaping outer space as an increasingly strategic domain of international relations, while assessing the implications of these transformations for contemporary governance frameworks. The empirical analysis draws upon a broad range of primary sources, including international treaties, national

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

space strategies, governmental statements and reports produced by international organisations and specialised institutions. These materials are complemented by a systematic review of the literature on international relations, space law, security studies and space governance. Source selection is guided by criteria of recency, institutional authority and theoretical relevance, with particular attention given to developments since 2019, a period marked by the acceleration of military, commercial and geopolitical transformations in the space domain.

Within this broader methodological framework, the Starlink–Ukraine episode constitutes a valuable analytical case study consistent with the approach outlined by Abels (2024), insofar as it provides a unique window through which broader structural transformations in the politics of outer space can be observed. Its selection is justified by two principal considerations: first, its unprecedented character as the primarily large-scale and operationally significant integration of a privately owned orbital infrastructure into an interstate armed conflict; and second, the availability of empirical material, including official statements, corporate communications, investigative reports and an expanding body of academic scholarship. Beyond its immediate relevance to the Ukrainian conflict, the case illuminates wider developments concerning the privatisation of strategic infrastructures, the evolving relationship between states and commercial space actors and the interdependence between orbital systems and contemporary military operations. Rather than serving as a universally representative case, it functions as a revelatory instance through which the broader dynamics of power, law and technology in outer space can be examined.

Nonetheless, it is important to acknowledge the limits of the theoretical framework adopted. The combined realist and institutionalist approach captures the dynamics of power competition and normative fragmentation with considerable explanatory force. Yet

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

it remains less equipped to account for the ideational and discursive dimensions of space politics. Furthermore, much of the evidence examined is derived from publicly available sources, including official statements, policy documents, institutional reports and investigations. Given the sensitivity of military space activities, significant portions of relevant information remain classified, limiting the ability to assess certain operational and decision-making processes. The rapidly evolving nature of the space sector also constitutes an inherent challenge, as technological innovations, commercial actors and governance initiatives continue to develop at a pace that may outstrip academic analysis. These limitations do not invalidate the analytical choices made in this article, but they identify productive avenues for future research.

The article proceeds in three sections. The first examines the significance of outer space within contemporary power politics and the growing militarisation of the domain. The second analyses the rise of private space actors and their impact on strategic dependency and the distribution of power. Finally, the third section explores the mounting pressures facing international space law and the fragmentation of governance frameworks.

I. Outer Space and Power Politics: From Strategic High Ground to Geopolitical Arena

The growing importance of outer space reflects a broader transformation in contemporary international relations. Once primarily associated with scientific exploration and technological prestige, space has evolved into a critical domain of power projection, military support and geopolitical competition. The increasing dependence of modern states on orbital infrastructures for communication, intelligence, navigation and deterrence has elevated outer space into a strategic high ground whose control carries considerable political and security advantages. In this context, the

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

dynamics shaping space activities aredriven by the logic of strategic rivalry and balance of power, reflecting the broader return of great power competition in international relations.

1. Outer Space as the New Strategic High Ground

The strategic significance of outer space has increased considerably over the past decades, transforming it from a domain primarily associated with scientific exploration into a central component of contemporary power politics. Modern states are reliant on space-based infrastructures for a wide range of civilian, economic and military functions, including satellite communications, navigation, intelligence, surveillance and early warning systems. As a result, the protection of orbital assets has become an essential element of national security and strategic planning.

This growing dependence has progressively elevated outer space into what many strategic thinkers describe as a new high ground in international relations. Drawing inspiration from classical geopolitics, Dolman (2002) argues that the actor capable of dominating orbital space would acquire a decisive strategic advantage comparable to the control of maritime routes in previous centuries[1]. In strategic terms, orbital superiority offers states enhanced capabilities for global communication, precision targeting, intelligence and force projection,

1- Dolman's conception of outer space echoes earlier classical geopolitical theories linking control over specific geographic domains to global power projection. Halford Mackinder's Heartland theory emphasised the strategic centrality of Eurasian land control as the key to world dominance, while Nicholas Spykman later argued through the Rimland theory that the coastal peripheries surrounding Eurasia constituted the true pivot of geopolitical power. Earlier still, Alfred Thayer Mahan highlighted maritime supremacy and control over sea lines of communication as the foundation of great power status. In many respects, contemporary astropolitical theories transpose these earlier geopolitical logics into the orbital domain, presenting outer space as the newest strategic environment through which technological superiority and global power projection may be exercised.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

thereby reinforcing both conventional deterrence and military effectiveness. Consequently, space is progressively perceived not as an isolated technological environment, but as a critical layer of modern geopolitical competition.

The military utility of space infrastructures became particularly evident during recent conflicts. Contemporary military operations rely extensively on satellites for battlefield reconnaissance, missile guidance and communications. The mounting integration of space assets into military doctrines has therefore blurred the distinction between terrestrial and orbital security. As Bowen (2020) notes, modern warfare is shaped by spacepower, meaning the ability to exploit space infrastructures in support of strategic and military objectives. This evolution reflects a transformation in the conduct of warfare, where the effectiveness of terrestrial operations is conditioned by capabilities deployed in orbit.

Besides, the strategic centrality of outer space has intensified concerns regarding vulnerability and dependence. As modern states rely heavily on orbital infrastructures, satellites have become potential targets during periods of conflict (Botti & Greco, 2023, p. 4). The disruption or destruction of communication and navigation systems could severely affect both military operations and civilian activities, including banking systems, air traffic management, energy networks and digital communications. This growing dependence creates new forms of vulnerability, reinforcing the perception of space as a contested and potentially fragile environment.

The strategic value attributed to outer space also reflects the broader resurgence of great power competition in the international system. The United States, China and Russia view space superiority as an essential component of geopolitical power (Hickman, 2024, p. 273). Massive investments in satellite systems, launch capabilities and military space programmes demonstrate that outer space is progressively integrated

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

into long-term security strategies. In this sense, the competition for orbital dominance mirrors earlier geopolitical struggles for the control of land, sea and air power.

Ultimately, the importance of outer space as a strategic high ground reflects a broader shift in international relations, where technological superiority and control over critical infrastructures growingly determine the distribution of power. Far from remaining a neutral or purely scientific domain, outer space has become a central arena in which states seek to secure geopolitical advantages.

2. Militarisation vs Weaponisation of Space

The strategic centrality of outer space has progressively transformed the domain from a support environment for terrestrial military operations into a contested security arena. As states became more dependent on orbital infrastructures for communication, intelligence, surveillance and missile warning systems, space assets evolved into indispensable components of modern military power. This growing dependence naturally accelerated the militarisation of outer space, a process that has in fact been underway since the Cold War, when both the United States and the Soviet Union integrated satellites into their defence architectures (Bowen, 2020). In this sense, outer space has long ceased to be a purely civilian environment. Rather, it has become deeply embedded within the strategic logics of warfare.

However, while the militarisation of space is widely acknowledged as an established reality, recent developments suggest a gradual but significant shift towards the weaponisation of the domain itself. Although these two concepts are often conflated, they refer to distinct dynamics (Khan & Sadeh, 2024). Militarisation primarily concerns the use of space infrastructures to support military activities on Earth, whereas weaponisation implies the deployment or utilisation of capabilities designed to attack or destroy objects in space or from

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

space. The distinction is important because it reflects the transition from space as an enabling environment to space as a theatre of confrontation in its own right.

For decades, the militarisation of space remained relatively stable within the framework of strategic deterrence established during the Cold War. Satellites played a crucial role in intelligence gathering, nuclear early warning, reconnaissance and communications, thereby contributing to the balance of power between the two blocs. Yet the relative restraint that characterised this period was largely rooted in mutual vulnerability (Costlow, et al., 2022, p. 7). Because both sides relied heavily on orbital infrastructures, preserving the stability of the space environment became an implicit interest. However, contemporary geopolitical conditions differ substantially from those of the bipolar era (Botti & Greco, 2023, p. 7). The resurgence of great power competition, combined with rapid technological advancements and the multiplication of actors operating in orbit, has increased both the strategic value and the vulnerability of space assets.

This transformation is particularly evident in the development of anti-satellite (ASAT) capabilities. China's destruction of one of its own satellites in 2007 represented a major turning point in contemporary space security. Beyond demonstrating Beijing's technological sophistication, the operation generated thousands of debris fragments, many of which remain in orbit today and continue to threaten satellites and space missions (Ballamudi , 2020). India's ASAT test in 2019 and Russia's test in 2021 further reinforced concerns regarding the accelerating militarisation and potential weaponisation of outer space. These operations revealed that major powers perceive the ability to neutralise adversary space assets as a critical capability in future conflicts.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

None | Limited / R&D | Significant | Operational | Used in conflict

	DA-ASAT[1] (LEO[2])	DA-ASAT[1] (MEO/GEO[3])	Co-orbital[4] (LEO[2])	Co-orbital[4] (MEO/GEO[3])	Directed Energy[5]	Electronic Warfare[6]	SSA[7]
United States	Oper.	Signif.	Oper.	Signif.	Signif.	Oper.	Oper.
Russia	Oper.	R&D	Oper.	Signif.	Signif.	Conflict	Oper.
China	Oper.	Signif.	Signif.	Signif.	Signif.	Signif.	Signif.
India	Oper.	—	R&D	—	R&D	R&D	Signif.
France	—	—	R&D	—	Signif.	R&D	Signif.
Japan	—	—	R&D	—	R&D	R&D	Signif.
United Kingdom	—	—	—	—	—	R&D	Signif.
Australia	—	—	—	—	—	R&D	R&D
Iran	—	—	—	—	—	Signif.	R&D
North Korea	R&D	—	—	—	—	R&D	—
South Korea	—	—	—	—	—	R&D	R&D

Figure 1: Global Counterspace Capabilities Matrix

Source: *Secure World Foundation, Global Counterspace Capabilities: An Open Source Assessment (2025).*
See footnotes for acronym definitions.

The consequences of such developments extend far beyond military considerations. As illustrated in the table above[2], the mounting

2- **LEO** (*Low Earth Orbit*): the orbital band extending from approximately 160 km to 2,000 km altitude. It hosts the majority of active satellites, including imagery reconnaissance systems, communication constellations such as Starlink, as well as the International Space Station. It is the primary target environment for current DA-ASAT systems.
MEO/GEO (*Medium Earth Orbit / Geostationary Earth Orbit*): MEO spans roughly 2,000 to 35,786 km and hosts Global Navigation Satellite Systems such as GPS, GLONASS, BeiDou and Galileo. GEO, at approximately 35,786 km, is occupied by communications and early-warning satellites of highest value. Counterspace capabilities effective at these altitudes remain limited to a restricted number of states.
DA-ASAT (*Direct-Ascent Anti-Satellite*): a missile launched from the ground or air designed to intercept and destroy a satellite on a direct ballistic trajectory, without first

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

diversification of counterspace capabilities among various states demonstrates that the vulnerability of orbital infrastructures is no longer confined to scenarios of great power confrontation (Bowman, 2021). Modern societies have become structurally dependent on satellites for telecommunications, navigation, financial transactions, weather forecasting, transportation systems and digital connectivity. Consequently, attacks against orbital assets could generate severe economic and societal disruptions extending far beyond the battlefield itself.

At the same time, the distinction between militarisation and weaponisation is additionally blurred due to the dual-use of many contemporary space technologies. Systems originally designed for

---

entering orbit. Four states have conducted confirmed kinetic DA-ASAT tests to date: The USA, the USSR/Russia, China and India.

Co-orbital ASAT (*Co-orbital Anti-Satellite*): a system that reaches orbit itself before manoeuvring to approach, inspect, jam or destroy a target satellite through Rendezvous and Proximity Operations (RPO). Unlike DA-ASAT, co-orbital systems are inherently dual-use, as the underlying technology is indistinguishable from civil docking and debris-removal missions.

Directed Energy (DE): a category of counterspace weapons that employ concentrated electromagnetic radiation, including high-powered lasers and high-powered microwave systems to dazzle, blind or permanently damage satellite optical sensors. Russia's *Peresvet* are the most documented operational DE counterspace asset to date.

Electronic Warfare (EW): the use of the electromagnetic spectrum to disrupt, deny or degrade space-based services. Principal techniques include satellite communications jamming and spoofing. Russia's extensive deployment of EW systems in the Ukraine conflict represents the most operationally documented case of counterspace EW in a major interstate war.

SSA (*Space Situational Awareness*): the capacity to detect, track, characterise and catalogue objects in orbit including satellites, debris and spacecraft manoeuvres using ground-based radars, optical telescopes and space-based sensors. SSA is a foundational enabler of offensive and defensive counterspace operations alike, as it is prerequisite to targeting, collision avoidance and the attribution of hostile on-orbit activities.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

civilian or defensive purposes can often be repurposed for offensive applications (Stewart, 2025). Satellite servicing technologies, robotic systems, cyber capabilities and directed-energy technologies all possess potential military applications capable of disrupting, disabling or interfering with orbital infrastructures. Therefore, determining whether a technological capability is intended for defensive or offensive purposes has become difficult from both legal and strategic perspectives.

The growing institutionalisation of military space structures further illustrates this transformation. The establishment of the United States Space Force in 2019 marked a symbolic and strategic milestone in the recognition of space as a distinct operational domain[3], while similar developments can be observed in China and Russia (Luzin, 2024, p. 7). This institutional evolution reflects a broader shift in strategic thinking whereby control over orbital infrastructures is associated with geopolitical influence and military superiority.

Consequently, the evolution from militarisation towards the potential weaponisation of outer space reflects the broader return of power politics in international relations. The orbital domain is progressively being integrated into the logic of rivalry, deterrence and

3- The U.S Space Force was officially established in December 2019 under the Trump administration through the *National Defense Authorisation Act*, becoming the first independent military branch created since the U.S Air Force in 1947. Its creation reflected Washington's growing perception of outer space as a distinct warfighting domain requiring dedicated operational, doctrinal and institutional structures. Similar developments have occurred elsewhere. France created the *Commandement de l'Espace* in 2019, while Russia consolidated its space operations within the *Russian Aerospace Forces* (VKS) as early as 2015. China similarly integrated space, cyber and electronic warfare capabilities into the People's Liberation Army Strategic Support Force (PLASSF) in 2015 before reorganising these structures further in 2024. Other states, including the United Kingdom, Japan, India, Germany and NATO itself, have also progressively expanded specialised military space commands and doctrines.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

technological competition that already shapes terrestrial geopolitics. Far from remaining insulated from international tensions, outer space is emerging as a contested and fragile security environment where the pursuit of strategic advantage risks undermining the long-term stability and sustainability of the domain itself.

3. Great Power Rivalry and the Strategic Competition for Outer Space

The growing militarisation of outer space cannot be understood independently from the resurgence of great power competition in international relations. The United States, China and Russia perceive space not only as a scientific domain, but as a strategic arena whose control carries decisive geopolitical, military and economic implications. As competition between major powers intensifies on Earth, outer space is emerging as an extension of terrestrial rivalry, reflecting the transformation of the international system towards renewed geopolitical confrontation.

For the United States, maintaining superiority in outer space has become a central component of national security strategy. Since the end of the Cold War, Washington has enjoyed a considerable technological and operational advantage in the orbital domain, supported by its advanced satellite infrastructures, launch capabilities and the dominant private space sector (Holland & Burns, 2018). The White House now explicitly identifies space as a warfighting domain requiring permanent operational superiority in order to preserve military effectiveness and global power projection capabilities (Williams, 2024). The U.S Space Force reflects this evolution, institutionalising the perception of outer space as a critical theatre of contemporary security competition.

However, the rapid development of Chinese and Russian counter-space capabilities is challenging this position. China has emerged as a major space power over the past two decades. Beijing's space

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

ambitions extend far beyond scientific prestige; it reflects strategic geopolitical objectives associated with technological autonomy and military modernisation (Price, et al., 2025, p. 31). China's investments in satellite systems and lunar exploration programmes demonstrate its determination to affirm itself as a leading actor in the future governance of outer space (Freeman, 2025). In this respect, space competition mirrors the wider geopolitical tensions characterising Sino-U.S relations in areas such as trade, technology, military power and global governance.

For its part, Russia also continues to perceive outer space as a crucial domain despite the relative decline of its technological capabilities since the collapse of the Soviet Union. Historically, the Soviet Union was one of the pioneers of space exploration and military space technologies. Contemporary Russia still considers the preservation of strategic parity with the United States an essential security objective (Vicente, Sinovets, & Theron, 2023). Moscow has therefore invested heavily in counter-space capabilities, electronic warfare systems and military satellite infrastructures designed to offset conventional asymmetries vis-à-vis the United States.

The convergence between Russian and Chinese positions on space governance further reflects the geopolitical fragmentation emerging within outer space. Both states regularly criticise what they perceive as U.S attempts to dominate space governance through unilateral or Western-led initiatives (Bowen, 2023). Conversely, the United States and its allies view Chinese and Russian space programmes through the prism of competition and potential security threats. As a result, cooperation in outer space, once considered a relatively insulated area of international relations, is becoming shaped by the same dynamics of mistrust and rivalry that characterise terrestrial geopolitics.

Moreover, the rivalry between major powers progressively extends beyond Earth's orbit itself towards the Moon and other celestial bodies.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Lunar exploration programmes, resource extraction projects and future plans for permanent installations on the Moon are progressively acquiring geopolitical significance (Colucci & Carlson, 2021). Access to resources, technological leadership and the ability to shape future governance mechanisms are becoming central dimensions of long-term space competition. In this context, the emerging frictions surrounding lunar exploration reflect broader struggles over influence and the future distribution of power in the international system.

Therefore, the rising rivalry between the United States, China and Russia demonstrates that outer space is progressively ceasing to function as a politically neutral environment. Instead, it is shaped by the same geopolitical calculations and balance of power dynamics that structure international relations on Earth. As major powers continue to integrate space into their geopolitical strategies, the orbital domain is likely to become a central arena of global competition.

II. The Rise of Private Space Actors: Technology, Power and Dependency

Alongside the resurgence of great power rivalry, the rise of private space actors has profoundly transformed the strategic landscape of outer space. Companies such as SpaceX, Amazon and Blue Origin possess technological and operational capabilities that were once the exclusive domain of states, particularly in satellite communications, launch systems and orbital infrastructures. This nascent commercialisation of space activities has created new forms of dependency, as governments and armed forces rely more on privately operated systems. As such, in addition to interstate competition, contemporary politics of outer space are also shaped by the expanding influence of private actors whose technological power intersects with questions of sovereignty, security and global governance.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

1. Private Space Actors as Strategic Game-Changers

The rise of private space actors constitutes a structural transformation in the contemporary politics of outer space. For most of the past century, access to space remained the exclusive preserve of states due to the immense technological and financial capacities required to design launch systems, manufacture satellites and sustain orbital infrastructures. Space exploration was therefore closely associated with state prestige and sovereignty, particularly during the Cold War era (Dolman, 2002). In recent decades, however, the expansion of commercial space companies has altered this state-centric model. Private corporations now possess capabilities once monopolised by national space agencies, thereby reshaping the distribution of technological power and geopolitical influence in orbit.

This transformation has been driven primarily by the emergence of highly capitalised and technologically integrated firms capable of drastically reducing launch costs while increasing the scale and frequency of orbital deployments. Among these actors, Elon Musk's SpaceX has emerged as the most consequential private space company of the contemporary era (Cao , 2024, p. 602). Through the development of reusable launch systems such as Falcon 9 and Starship, the company introduced a profound industrial disruption within the global space sector (Cen, 2025, p. 67). Historically, access to orbit operated according to a logic of scarcity due to the very high cost of launches. However, SpaceX challenged this model by introducing a production logic closer to mass industrial manufacturing than to traditional aerospace engineering. As launch costs declined, the possibility of deploying orbital infrastructures on an unprecedented scale became viable.

The clearest manifestation of this transformation is the deployment of Starlink by SpaceX, a vast network of interconnected satellites designed to provide global internet coverage. Likewise, the rise of

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Amazon Leo[4] further illustrates the accelerating competition regarding private orbital infrastructures (Rainbow, 2023). Although less advanced operationally than Starlink, Amazon Leo reflects the perception that global satellite networks constitute critical infrastructures capable of shaping digital sovereignty, economic influence and geopolitical leverage. Competition between major corporations over orbital communications systems resembles earlier struggles for control over maritime routes, telecommunications networks and energy infrastructures.

The rise of private space actors is not confined to Western liberal economies. China has likewise encouraged the expansion of commercial space enterprises, albeit within a markedly different political and institutional framework. While companies such as SpaceX and Amazon emerged primarily through private entrepreneurial initiative, the Chinese commercial space sector remains closely integrated into broader state objectives relating to technological sovereignty, national security and competition. This reflects Beijing's doctrine of "military-civil fusion"[5] (Gokireddy & Amrita, 2024), which seeks to systematically incorporate civilian technological innovation into national defence capabilities and long-term geopolitical ambitions

As a result, the distinction between civilian, commercial and military activities is significantly less pronounced in China than in

4- Formerly Amazon Project Kuiper.

5- Military-Civil Fusion is a national strategy formally elevated under the leadership of Xi Jinping that seeks to integrate civilian technological innovation, commercial enterprises, research institutions and industrial capabilities into China's broader defence and security objectives. The policy aims to reduce barriers between the civilian and military sectors, enabling the People's Liberation Army (PLA) to benefit directly from advances in emerging technologies, including artificial intelligence, aerospace, satellite communications and space systems. In the space sector, Military-Civil Fusion contributes to blurring the distinction between commercial and strategic activities, as ostensibly private companies may support national technological and military priorities.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Western space ecosystems. Companies such as LandSpace, i-Space and Galactic Energy are formally private entities, yet they operate within a regulatory environment that closely aligns commercial development with state priorities (Duchâtel, Curcio, Pinhas, Tavanti-Geuzimian, & Sheu, 2025, p. 9-10). Rather than constituting an autonomous commercial sphere, these firms contribute to a broader national effort aimed at strengthening China's technological independence and expanding its influence in outer space.

The Guowang satellite network provides a particularly illustrative example of this strategy. Frequently presented as China's response to Starlink, Guowang differs fundamentally in both origin and purpose. Whereas Starlink emerged as a privately financed commercial venture that was subsequently integrated into national security activities, Guowang was conceived from the outset as a state-backed infrastructure designed to support China's geopolitical and technological objectives (Clark, 2025). The comparison highlights an important distinction between two competing models of space commercialisation. In Western economies, private corporations generally retain a degree of formal autonomy vis-à-vis the state, despite increasingly close cooperation with governmental and military institutions. In China, by contrast, commercial space activities are embedded within a state-directed framework in which private innovation is expected to contribute directly to national goals.

This structural divergence reveals that the expansion of commercial space activities does not necessarily diminish the role of the state. Rather, it produces different configurations of state–market relations through which strategic power continues to be projected (Aleksandraviciute, Impink, & Seamans, 2025). Whether through relatively autonomous corporate actors in the West or through state-integrated commercial enterprises in China, the commercialisation of outer space remains intertwined with geopolitical competition. Far from signalling the emergence of a genuinely post-state space order,

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

these developments reinforce the broader realist argument that state power continues to shape the evolution of the space domain, even as new private actors acquire unprecedented influence.

Eventually, the rise of private space actors reflects not the retreat of the state, but the emergence of new configurations through which power is exercised in outer space. Corporations such as SpaceX, Amazon and their Chinese counterparts have become indispensable providers of critical infrastructures upon which states, societies and military institutions increasingly depend. Yet their growing influence does not diminish the importance of state power. Rather, it reconfigures the relationship between public authority and private capabilities, producing new forms of interdependence, competition and leverage. As orbital infrastructures become essential to economic activity, military operations and global connectivity, the distribution of power in outer space is shaped not only by sovereign capabilities, but also by technological innovation, industrial capacity and the ability of states to mobilise, regulate and integrate commercial actors into broader geopolitical objectives. In this respect, the commercialisation of outer space should be understood less as a departure from traditional power politics than as one of its most significant contemporary manifestations.

2. Starlink and the War in Ukraine: A Strategic Precedent

The war in Ukraine constituted a major turning point in the geopolitical significance of privately operated orbital infrastructures. Following the commencing of hostilities in February 2022, Ukrainian authorities urgently requested access to Starlink terminals in order to compensate for the destruction of conventional telecommunications infrastructures caused by Russian strikes. Initially, SpaceX rapidly deployed and financed much of the Starlink service in Ukraine largely on its own initiative, presenting the operation as a form of emergency civilian assistance designed to preserve internet connectivity during

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

wartime conditions (Abels, 2024, p. 843). Yet what initially appeared to be a humanitarian and technological support operation has evolved into one of the most consequential integrations of private space infrastructures into modern military conflicts.

Starlink quickly became embedded within the operational architecture of the Ukrainian war effort. The system enabled secure battlefield communications, encrypted group coordination, artillery fire correction, intelligence and drone operations across multiple fronts. Ukrainian commanders used Starlink terminals to maintain command functions even in areas where conventional communication systems had collapsed under Russian strikes. In several cases, terminals were reportedly deployed directly behind enemy lines in support of Ukrainian operations forces, while drone operators adapted Starlink systems for reconnaissance and strike missions (Adams, 2026). By late 2023, the network had become what observers described as the essential backbone of communication on the Ukrainian battlefield.

The implications of this development were unprecedented. For the first time in contemporary military history, the operational effectiveness of a state engaged in a large-scale war became dependent upon a privately owned orbital infrastructure controlled by a commercial corporation. This situation fundamentally questioned traditional assumptions regarding sovereignty and autonomy. Historically, critical military communications and satellite infrastructures were either sovereign assets or directly controlled through military alliances. In Ukraine, however, a private company acquired the capacity to influence the continuity of military operations within an active warzone.

This new reality exposed an ambiguity concerning the role of private actors in armed conflicts. Although Starlink formally remained a commercial service, its operational utility transformed it into a military asset. The Ukrainian case therefore illustrated the progressive

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

erosion of the distinction between civilian and military infrastructures in outer space (Cen, 2025). Technologies originally developed for commercial purposes promptly acquired direct operational significance in warfare, reflecting the dual-use of contemporary orbital systems.

At the same time, the conflict also revealed the limits and contradictions inherent in this new form of dependency. While Starlink became indispensable to Ukrainian military resilience, SpaceX executives repeatedly insisted that the network was intended to remain a civilian infrastructure rather than a dedicated military system (Kay, 2023). Indeed, SpaceX president Gwynne Shotwell expressed concerns regarding the progressive militarisation of the network, particularly after Ukrainian forces began integrating Starlink into offensive drone operations targeting Russian positions. This tension culminated in controversies surrounding requests to extend Starlink coverage to Crimea. SpaceX ultimately refused this request, citing both escalation concerns and U.S legal restrictions.

These controversies revealed a profound dilemma. Despite its central role within Ukrainian military operations, Starlink ultimately remained under the authority of a private corporation capable of restricting, conditioning or modifying access according to its own political calculations. In practice, a private company possessed the effective ability to shape certain operational parameters of an ongoing interstate conflict without being formally integrated into the traditional structures of military command or international governance (Cen, 2025). The situation generated concerns within Ukrainian and U.S circles regarding the vulnerability created by overdependence on privately controlled infrastructures.

This dependence became even more visible during financial disputes surrounding the continuation of Starlink services in Ukraine. By late 2022, Elon Musk publicly stated that the operational costs

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

associated with maintaining the system in Ukraine had become unsustainable (Abels, 2024, p. 853). The company requested that the U.S Department of Defense assume responsibility for financing the service, while some officials feared that SpaceX could potentially interrupt Starlink access if disagreements intensified (Jayanti, 2023). Although the Pentagon eventually formalised a contract with SpaceX in 2023 to guarantee continuity of service, the episode demonstrated how the functioning of a state at war had become partly contingent upon negotiations between governments and a private corporation.

The subsequent creation of Starshield by SpaceX further institutionalised the incipient convergence between private commercial infrastructures and national security systems. Unlike Starlink's purported civilian-oriented use, Starshield was specifically designed for military applications, including communications, intelligence and support functions for the U.S Space Force (Maidenberg & FitzGerald, 2024). In addition, SpaceX executives explicitly framed Starshield as the appropriate mechanism for military operations, arguing that Starlink itself should remain a civilian network (Heilweil, 2025). This distinction reflected both legal and political considerations, particularly regarding U.S export control regulations such as ITAR and EAR[6], which impose restrictions on technologies integrated directly into weapons systems.

Yet the necessity of creating Starshield illustrates the transformation underway within the politics of outer space. The Ukrainian conflict

6- ITAR refers to the *International Traffic in Arms Regulations*, a U.S. regulatory framework governing the export and transfer of defence-related technologies and services under the authority of the U.S. Department of State. EAR refers to the *Export Administration Regulations*, administered by the U.S. Department of Commerce, which regulate the export of dual-use technologies with potential civilian and military applications. Both frameworks impose strict legal controls on the international transfer and military integration of sensitive technologies, including satellite systems and space-related infrastructures.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

demonstrated that privately operated orbital infrastructures are not exclusively civilian commercial systems. They become central components of military resilience, strategic communications and operational effectiveness. In this context, the commercialisation of outer space does not reduce geopolitical rivalry; rather, it restructures it by introducing new actors, new dependencies and new forms of influence, operating at the intersection of technology, security and corporate power.

3. Technological Challenges: Mega-Constellations, Space Debris and Orbital Security Risks

The expansion of private and state-led space activities has generated profound technological transformations within the orbital environment. While these developments have significantly increased access to communications, navigation, Earth observation and digital connectivity, they have intensified concerns regarding the long-term security of outer space. The emergence of mega-constellations and the multiplication of orbital debris raise the prospect of a fragile and contested environment vulnerable to both accidental disruption and geopolitical confrontation.

Among these developments, the proliferation of mega-constellations represents the most visible transformation of the contemporary space sector. Historically, satellites were limited in number due to the extremely high costs associated with manufacturing and launch operations. Recent technological and industrial advances, however, have altered this model. Companies such as SpaceX through Starlink, Amazon Leo and several Chinese programmes linked to the Guowang constellation now envision orbital infrastructures composed of tens of thousands of interconnected satellites operating simultaneously in Low Earth Orbit (Julienne, 2023, p. 23). This shift reflects the transition from a logic of orbital scarcity to one of industrial-scale deployment.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Yet the terminology itself deserves close examination. The notion of constellation carries implicit symbolic and linguistic connotations that naturalise and depoliticise what are large-scale technological infrastructures deployed through deliberate political and economic choices. Traditionally associated with naturally occurring formations of stars observed from Earth (Bucur, 2023), the term creates the impression of a neutral and almost organic spatial environment. In practice, however, these so-called constellations consist of thousands of artificial objects launched into orbit by state or corporate actors pursuing commercial and geopolitical objectives. The language of constellations therefore obscures the material reality of a saturated orbital environment shaped by industrial and mercantile calculations.

This semantic dimension is not insignificant. The widespread use of seemingly neutral terminology contributes to the broader depoliticisation of contemporary transformations in outer space. As previously mentioned, Starlink does not only represent a communications infrastructure; it constitutes one of the largest privately controlled orbital systems ever constructed. With thousands of satellites already deployed and plans for tens of thousands more, the project reflects an unprecedented concentration of technological and infrastructural power (Abels, 2024, p. 855). Such developments fundamentally alter the landscape of outer space by enabling private actors to shape access to communications, connectivity and orbital infrastructures on a planetary scale.

Furthermore, the deployment of thousands of satellites into already congested orbital regions has dramatically increased concerns regarding orbital sustainability. Low Earth Orbit, which hosts the majority of operational satellites and strategic infrastructures, is becoming progressively saturated with active satellites, inactive spacecraft and fragments of debris generated by collisions, explosions and anti-satellite tests (Baccelli, Candel, Perrin, & Puget, 2024, p. 37).

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

This accumulation of debris represents one of the most serious long-term challenges facing contemporary space activities.

Space debris consists of defunct satellites, discarded rocket stages, collision fragments and microscopic particles travelling at extremely high velocities in orbit. Even small fragments are capable of inflicting catastrophic damage upon operational satellites due to the enormous speeds involved (Boley & Byers , 2021). The destructive potential of orbital debris became particularly evident following major ASAT tests which generated thousands of debris fragments still threatening orbital operations today. These incidents demonstrated how competition in space can produce consequences extending beyond immediate military objectives.

The multiplication of debris also raises the possibility of the so-called "Kessler Syndrome," a theoretical scenario in which collisions between orbital objects generate cascading chains of debris, progressively rendering certain orbital regions unusable (Baccelli, Candel, Perrin, & Puget, 2024, p. 40). Although often associated with speculative discussions, the rising congestion of Low Earth Orbit has transformed this scenario into a genuine strategic and technological concern. The increasing density of satellites associated with mega-constellations further heightens these risks by multiplying the number of objects operating within already crowded orbital environments.

Beyond the physical dangers posed by space debris, the increasing congestion of orbital environments generates broader security challenges related to surveillance, attribution and strategic stability. As the number of satellites, mega-constellations and manoeuvrable spacecraft continues to increase, monitoring activities in orbit becomes significantly more complex. Distinguishing between civilian, commercial, scientific and potentially hostile operations is increasingly difficult due to the dual-use nature of contemporary space technologies (Cao, 2024). Rendezvous and proximity operations,

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

satellite inspection missions and debris-removal technologies may all serve civilian purposes while simultaneously possessing potential military applications. This ambiguity contributes to the emergence of a more uncertain and potentially unstable orbital environment.

In terrestrial geopolitics, strategic stability often depends upon the ability of states to identify threats clearly and attribute hostile actions with a reasonable degree of certainty. In outer space, however, the attribution of interference, cyberattacks, electronic warfare activities and suspicious orbital manoeuvres remains particularly challenging (Bace, Gökce, & Tatar, 2024). As a result, states may struggle to distinguish between inadvertent incidents, technical malfunctions and deliberate hostile actions. Such uncertainty increases the risks of misperception, miscalculation and unintended escalation between major powers, especially in periods of heightened geopolitical tensions.

These vulnerabilities extend beyond the physical domain and increasingly encompass cyberspace. The war in Ukraine provided perhaps the most operationally documented example of this phenomenon. On 24 February 2022, only hours before Russian forces crossed into Ukrainian territory, a large-scale cyberattack targeted the KA-SAT satellite network operated by Viasat, disrupting communications for tens of thousands of users across Europe and disabling a significant portion of Ukrainian military communications at the outset of the conflict (Kazi, Kazi, & Bhosale, 2025, p. 60). The incident demonstrated that the disruption of space systems no longer requires the kinetic destruction of satellites. Cyber operations targeting ground-control stations, communication links, network infrastructures or satellite management software can generate comparable operational effects while often presenting lower political costs and reduced risks of attribution.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

The expansion of satellite constellations and the integration of artificial intelligence into orbital operations further amplify these concerns. AI-enabled systems are increasingly employed to optimise collision avoidance, communication routing, traffic management and autonomous satellite manoeuvres (Dey & Jagadanandan, 2025, p. 255). While these technologies enhance operational efficiency, they also create new vulnerabilities that may be exploited by hostile actors seeking to manipulate, deceive, or corrupt algorithmic decision-making processes rather than physically destroy space assets. Consequently, the intersection of cybersecurity, artificial intelligence and satellite operations is emerging as a new domain of strategic competition and hybrid warfare.

Therefore, the technological transformation of outer space reflects a broader paradox at the heart of contemporary space politics. The same innovations that expand humanity's technological capabilities and global connectivity simultaneously increase the fragility, congestion and vulnerability of the orbital environment. Mega-constellations, debris proliferation and the complexity of orbital operations are transforming outer space into a highly interconnected but very unstable domain in which technological progress and security risks evolve simultaneously.

III. International Space Law Under Pressure: Norms, Gaps and Challenges

The rapid transformation of outer space is exposing the limitations of the international legal framework governing space activities. Developed during the Cold War within a largely state-centric environment, international space law now faces growing pressure from the rise of private actors and the resurgence of great power competition. As technological and geopolitical realities evolve, significant legal ambiguities and governance gaps are progressively

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

emerging, raising broader questions regarding the future regulation of this contested domain.

1. The Existing Legal Framework

The contemporary legal framework governing outer space emerged primarily during the Cold War, at a time when space activities were shaped by concerns regarding the prevention of direct confrontation between the superpowers. Despite the geopolitical tensions of the period, outer space progressively came to be regarded as a domain requiring a minimum degree of international regulation in order to avoid the extension of terrestrial rivalries beyond Earth (Taylor, 2023, p. 6). This effort culminated in the development of a body of international treaties and legal principles that continue to constitute the foundation of contemporary space law.

At the centre of this framework stands the Outer Space Treaty[7], formally adopted in 1967 and widely considered the constitutional charter of international space law. Negotiated within the framework of the United Nations, the treaty established several foundational principles that continue to structure the legal governance of outer space (Lyall & Larsen, 2025, p. 49). It defined outer space as a domain not subject to national appropriation, declaring that celestial bodies could not become objects of sovereign territorial claims (Hasin, 2023, p. 393). The treaty also established the principle that outer space should be used *"for the benefit and in the interests of all countries"* (UNOOSA, 2019, p. 24), thereby promoting the idea of space as a global commons accessible to humanity as a whole.

In addition, the treaty sought to limit the militarisation of outer space by prohibiting the placement of weapons of mass destruction in orbit or on celestial bodies. It also restricted military activities on the

7- Formally titled the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Moon and other celestial bodies, which were to be reserved exclusively for peaceful purposes (Hasin, 2023, p. 394). However, while these provisions represented major achievements in the context of Cold War diplomacy, the treaty remained limited regarding several military activities and emerging technological developments (Dolman, 2002, p. 7). In practice, the Outer Space Treaty established broad principles rather than detailed enforcement mechanisms, leaving considerable room for interpretation.

The broader legal architecture of space governance was subsequently reinforced through additional international agreements negotiated under the auspices of the United Nations. Among the most important is the Moon Treaty of 1979, which sought to expand and clarify the legal regime applicable to the Moon and other celestial bodies (Dolman, 2002, p. 87). The agreement declared lunar resources to constitute the *"common heritage of mankind"* (Wilson, 2011, p. 189). However, the Moon Treaty suffered from a major structural weakness: it was never ratified by the principal space powers, including the United States, Russia and China (Nelson, 2010, p. 402). Consequently, despite its normative ambitions, the agreement has had limited practical influence on the evolution of contemporary space governance.

Other treaties focused on more specific aspects of space activities, particularly issues related to liability and registration. The 1972 Liability Convention established that launching states bear international responsibility for damages caused by their space objects, particularly in cases involving accidents on Earth or collisions in space (Lyall & Larsen, 2025, p. 75). Similarly, the 1975 Registration Convention sought to improve transparency by requiring states to provide information concerning objects launched into orbit (Degrange, 2021, p. 153). Together, these agreements contributed to the gradual institutionalisation of international space governance by creating legal obligations linked to responsibility and accountability.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Nonetheless, it is evident that the existing legal framework remains deeply rooted in the strategic and political context of the Cold War. The aforementioned treaties were negotiated during a period characterised by limited numbers of satellites, state monopoly and comparatively low levels of commercial activity in orbit. Contemporary realities were marginally considered during the drafting process (Albarrán, 2025, p. 13). Therefore, the realities of contemporary space activities call into question the capacity of the existing legal framework to regulate an environment characterised by accelerating technological innovation, expanding commercial participation and intensifying geopolitical competition.

From the combined realist and institutionalist perspective, these shortcomings are neither accidental nor unexpected. They reflect the structural conditions under which the current legal architecture was originally conceived. Realism suggests that states are willing to accept binding international obligations only insofar as such commitments remain compatible with their strategic interests. The ambiguities deliberately preserved in the Outer Space Treaty, particularly regarding military uses of space and the absence of meaningful enforcement mechanisms, illustrate this logic (Dolman, 2002, p. 7). Neither the United States nor the Soviet Union had an interest in restricting military satellite activities. Consequently, the treaty prohibited the placement of weapons of mass destruction in orbit while leaving conventional military uses of outer space mostly unregulated.

Institutionalism, by contrast, helps explain the progressive erosion of the regime's effectiveness. International institutions created under conditions of bipolar stability often encounter difficulties when confronted with significant shifts in the distribution of power, the emergence of new actors and rapid technological change. The legal framework established during the Cold War was designed for an environment dominated by two superpowers. Today, it must operate

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

within a complex landscape characterised by multiple space powers, commercial operators and technological developments that evolve far more rapidly than formal legal processes (Ballamudi , 2020). Taken together, these perspectives suggest that the inadequacy of contemporary space law should be understood less as a failure of legal drafting than as the predictable consequence of profound transformations in the political and technological environment that the original regime was intended to govern.

2. The Limits of Contemporary Space Law

Although the existing framework of international space law established important normative principles for the governance of outer space, it appears ill-equipped to address the profound geopolitical, technological and commercial transformations reshaping the orbital domain. The expansion of private actors, the intensification of competition among major powers and the emergence of new technologies have exposed significant legal ambiguities within the current system. In many respects, international space law remains anchored in the geopolitical realities of the Cold War, whereas contemporary space activities evolve at a considerably faster pace.

One of the most significant limitations of the current framework concerns the rise of private actors. The treaties governing outer space were negotiated during a period in which states exercised a near-monopoly over space activities. Consequently, private corporations occupied only a marginal place within the legal architecture of space governance. Today, however, companies such as SpaceX, Amazon and Blue Origin operate infrastructures whose economic and strategic significance rivals that of many states (Hasin, 2023, p. 405). While Mega-constellations, private launch systems and commercial lunar projects are shaping the orbital environment; international law continues to regulate these activities primarily through the intermediary of states.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Under the Outer Space Treaty, states remain internationally responsible for national space activities, including those conducted by private entities under their jurisdiction. However, this indirect regulatory approach appears inadequate in light of the scale and complexity of contemporary commercial operations (Lyall & Larsen, 2025, p. 390). The concentration of critical orbital infrastructures in the hands of a limited number of corporations raises important questions regarding accountability, sovereignty and political influence. Yet no comprehensive international mechanism currently exists to regulate the power exercised by private actors operating infrastructures of global significance.

The legal ambiguities surrounding the commercial exploitation of extraterrestrial resources constitute another major challenge for contemporary space governance. Article II of the Outer Space Treaty prohibits national appropriation of outer space and celestial bodies (Roth, 1992), but remains ambiguous regarding the ownership and commercial exploitation of resources extracted from them. This ambiguity has acquired increasing importance as space mining evolves from a speculative concept into a plausible technological and economic objective. In recent years, several states have adopted national legislation recognising rights over extracted space resources[8], thereby encouraging the development of future commercial mining activities.

The emergence of these national initiatives has generated a significant doctrinal controversy regarding the interpretation of the non-appropriation principle. Two broad schools of thought have

8- The United States adopted the *U.S. Commercial Space Launch Competitiveness Act* in 2015, granting U.S citizens and companies rights over resources extracted from asteroids and other celestial bodies. Luxembourg followed with the *loi sur l'exploration et l'utilisation des ressources de l'espace* (2017), becoming one of the first European states to establish a legal framework for commercial space mining. Similar legislative initiatives were later adopted by Japan in 2021.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

emerged. The first, often described as the *property rights approach* (Jayshree, 2023, p. 111), argues that the prohibition contained in Article II applies exclusively to territorial sovereignty and does not extend to resources once they have been extracted. Proponents of this interpretation frequently draw an analogy with the legal regime of the high seas: just as fishing activities do not amount to the appropriation of the oceans themselves, the extraction of resources from celestial bodies would not constitute territorial appropriation (De Zwart, Henderson, & Neumann, 2023). This interpretation provided the legal foundation for the U.S Commercial Space Launch Competitiveness Act of 2015. In the absence of a multilateral regulatory framework, such unilateral measures have progressively contributed to what some scholars describe as a permissive regime by default, whereby domestic legislation gradually shapes international practice.

A second school of thought, often characterised as the *commons integrity approach* (Kashwan, Mudaliar, Foster, & Clement, 2021), contests this interpretation on both textual and normative grounds. Its proponents argue that the expression *"by any other means"* contained in Article II was deliberately drafted in broad terms in order to prevent emerging forms of appropriation that the treaty's negotiators could not specifically anticipate. From this perspective, granting exclusive rights over resources extracted from a particular celestial body may ultimately result in forms of de facto control that are difficult to distinguish from appropriation itself, particularly when extraction activities require permanent infrastructures, access restrictions and operational exclusion zones (Aleksandraviciute, Impink, & Seamans, 2025). More fundamentally, critics contend that unilateral national legislation undermines the universalist principles upon which international space law was originally founded, notably the conception of outer space as the *"province of all mankind"*. By allowing technologically advanced states to establish legal precedents

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

unilaterally, such initiatives risk marginalising countries that lack the technological capacity to participate in resource extraction.

These ambiguities also raise broader concerns regarding the emergence of indirect forms of appropriation and domination in outer space. Although formal territorial sovereignty remains prohibited, the concentration of technological, financial and industrial capabilities among a relatively small number of states and corporations may enable them to exercise disproportionate influence over orbital regions, communication infrastructures and future resource zones (Dolman, 2002, p. 7). In this sense, the contemporary transformation of outer space risks producing a form of indirect nationalisation of the orbital domain[9] through technological and economic dominance.

The limitations of contemporary space law extend beyond questions of ownership and resource exploitation. Another major weakness concerns the limited nature of its enforcement mechanisms. The existing legal framework relies overwhelmingly upon voluntary compliance, diplomatic consultation and political restraint rather than robust institutional oversight. Unlike other areas of international law, no specialised international authority possesses the power to impose

9- Historical precedents on Earth suggest that the absence of formal sovereignty claims does not necessarily prevent the emergence of de facto systems of control and influence. The Antarctic regime constitutes perhaps the closest historical parallel to contemporary outer space governance. As Dolman (2002) observes, despite the cooperative framework established by the Antarctic Treaty of 1959, several states maintained pre-existing territorial claims or symbolic forms of reserved sovereignty while expanding their presence through scientific stations, permanent occupation, mapping activities and symbolic acts such as flag planting and administrative designations. Many of the political dynamics observed in Antarctica, including symbolic claiming, effective occupation and scientific research under a formally cooperative regime, closely resemble the early evolution of outer space activities. In this sense, the Antarctic precedent illustrates how formally internationalised spaces may gradually become subject to indirect forms of geopolitical claims.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

sanctions, regulate orbital traffic comprehensively or enforce binding rules governing military and commercial activities in outer space (Lyall & Larsen, 2025, p. 15). As a result, many provisions of space law remain legally fragile when confronted with the strategic interests of major powers.

Therefore, the gap between technological acceleration and legal adaptation represents one of the defining challenges of contemporary space governance. Technological innovation in launch systems, artificial intelligence, satellite networks, military capabilities and commercial space activities evolves at a pace that existing legal institutions struggle to match. This imbalance creates a fragmented regulatory environment in which competition and technological capabilities shape behaviour more effectively than formal legal norms.

3. Towards a Fragmented Space Governance?

The transformation of outer space is accompanied by the fragmentation of the governance structures intended to regulate it. While the foundational treaties of international space law were originally conceived within a multilateral framework centred on the United Nations, contemporary geopolitical rivalries are progressively reshaping space governance along competing ideological lines. As major powers seek to secure technological leadership and future access to orbital and lunar resources, outer space is evolving from a relatively cooperative domain into a fragmented geopolitical arena.

This evolution is particularly visible in the emergence of competing governance initiatives developed outside the traditional multilateral framework represented by the United Nations. Among the most influential are the Artemis Accords, launched by the United States in 2020 as part of the broader Artemis lunar exploration programme and subsequently expanded to include more than sixty signatory states (Botti & Greco, 2023, p. 42). Officially, the Accords seek to promote peaceful cooperation, transparency, interoperability, the sharing of

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

scientific data and the sustainable exploration of the Moon and other celestial bodies. Yet despite their cooperative language, they embody a governance model largely shaped by U.S technological leadership and normative influence, reflecting a trend towards the decentralisation of space governance away from universal multilateral frameworks.

The most controversial aspect of the Artemis framework concerns the establishment of so-called *"safety zones"* around lunar operations and infrastructures. Section 11 of the Accords encourages signatories to notify other actors of the location and nature of their activities and to establish safety zones designed to prevent harmful interference (Gilbert, 2023, p. 103). Supporters present these zones as a pragmatic mechanism intended to ensure operational safety and facilitate coordination among an increasing number of actors on the lunar surface. Critics, however, argue that safety zones may function as instruments of operational exclusivity capable of generating de facto forms of appropriation inconsistent with the spirit of the Outer Space Treaty. The zones are not subject to predefined size limitations, independent oversight mechanisms or multilateral approval procedures.

Consequently, technologically advanced states or corporations could potentially establish extensive operational perimeters around valuable infrastructures or resource areas, thereby restricting access for prolonged periods. Although the Accords explicitly reject territorial claims, this disclaimer does not entirely resolve the underlying legal tension (Gilbert, 2023, p. 104). The practical effect of safety zones may, in certain circumstances, become functionally comparable to territorial control, regardless of the formal legal terminology employed. From an institutionalist perspective, this ambiguity illustrates a recurring limitation of international legal regimes: cooperative norms can facilitate coordination and reduce uncertainty, yet their flexibility may also allow powerful actors to shape emerging practices in ways that

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

reinforce existing asymmetries of power while remaining formally compliant with established legal principles.

In this respect, the fragmentation of space governance reflects broader geopolitical rivalries between major powers. China and Russia have both expressed reservations regarding the Artemis framework, viewing it as an instrument of U.S dominance rather than a genuinely universal governance mechanism (Albarrán, 2025, p. 48). In response, Beijing and Moscow intensified cooperation through the International Lunar Research Station (ILRS) initiative, conceived as an alternative framework for future lunar exploration and scientific cooperation (Whittington, 2021). While officially presented as an open international project, the ILRS functions as a counterbalancing initiative reflecting the strategic convergence between China and Russia.

The coexistence of these competing governance frameworks illustrates the progressive emergence of rival geopolitical blocs in outer space. Rather than consolidating a universal legal order, contemporary space governance appears structured around partially competing coalitions (Colucci & Carlson, 2021). In practice, participation in orbital and lunar programmes is becoming intertwined with broader geopolitical alignments. This dynamic risks reproducing within outer space the same patterns of bloc competition and fragmentation that already characterise terrestrial geopolitics.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Criterion	Outer Space Treaty *(1967)*	Artemis Accords *(2020–)*	ILRS Framework *(China–Russia, 2021–)*
Legal status	Binding treaty	Non-binding	Non-binding
Signatories / partners	118 states parties	60+ states (2026)	17 agencies & states
Military use	Prohibits WMD in orbit; bars military bases on celestial bodies	Silent — no military provisions	Silent — no military provisions
Resource rights	"Province of all mankind"; no national appropriation	Permits commercial extraction via "safety zones"	Province of mankind principle reaffirmed
Enforcement	None	None	None
Governance model	UN multilateral (COPUOS)	US-led bilateral network	China–Russia-led coalition
Debris provisions	Silent	Transparency & debris mitigation pledges	Silent
Geopolitical implication	Eroding through selective compliance	Risk of fragmenting global commons via "safety zones"	Counter-hegemonic alternative to Western-led order

Table 1: A Comparative Overview of Competing Space Governance Frameworks

Source: *Author's compilation from the Outer Space Treaty (1967), Artemis Accords (2020), International Lunar Research Station Framework (2021), and COPUOS deliberations.*

As the comparative table above demonstrates, the three principal governance frameworks currently shaping the orbital domain embody different political logics. The Outer Space Treaty reflects the universalist ambitions of Cold War multilateralism centred on collective principles and legal obligations. By contrast, the Artemis Accords and the ILRS framework operate through more flexible and politically selective coalition-based models lacking binding enforcement mechanisms (Wu, 2023). Although all three frameworks formally endorse peaceful cooperation, important divergences emerge concerning governance structures and the geopolitical implications of space activities.

This fragmentation generates several important consequences for the future governance of outer space. First, it weakens the authority of

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

the United Nations by shifting regulatory initiatives towards competing geopolitical coalitions. Second, it increases the risk of normative divergence regarding issues such as lunar resource exploitation, orbital management and operational conduct in space. Third, it contributes to the emergence of partially incompatible technological and institutional ecosystems capable of reinforcing broader geopolitical divisions between major powers.

This dynamic reflects an imbroglio at the heart of contemporary space politics. The legal principles governing outer space continue formally to present it as a domain belonging to humanity as a whole, yet the material realities shaping the orbital environment reflect asymmetrical distributions of geopolitical power (Botti & Greco, 2023). As such, the risk is the gradual emergence of hierarchical systems of influence and technological domination operating beneath the formal language of international law.

Ultimately, the growing fragmentation of space governance illustrates the widening gap between the universalist aspirations of international law and the geopolitical realities of the twenty-first century. As competition intensifies and major powers pursue autonomous governance initiatives, the future regulation of outer space may depend less on legal consensus than on the evolving balance of power between rival space blocs.

Conclusion

The contemporary transformation of outer space reflects a broader reconfiguration of international relations in the twenty-first century. Once largely perceived as a domain of scientific cooperation and symbolic prestige, outer space has evolved into a central arena of geopolitical competition shaped by rivalry, technological acceleration and growing commercial influence. The resurgence of great power competition between the United States, China and Russia, combined with the rapid expansion of private space actors, is profoundly altering

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

both the distribution of power in orbit and the governance structures intended to regulate it.

This article has argued that outer space is undergoing a structural transition from a relatively cooperative and state-centred environment into a fragmented and contested geopolitical domain. The militarisation of orbital infrastructures, the development of counterspace capabilities and the emergence of mega-constellations demonstrate that space is no longer a support environment for terrestrial activities, but a strategic domain whose control carries significant military, economic and political implications. At the same time, the rise of private corporations has transformed the nature of strategic power itself by creating unprecedented forms of dependence on privately controlled orbital infrastructures.

The Ukrainian conflict illustrated this transformation with particular acuity. The integration of Starlink into military operations revealed that privately operated communication systems can now shape the operational effectiveness of states engaged in large-scale warfare. More fundamentally, it exposed the ambiguity surrounding sovereignty, accountability and the role of private corporations within contemporary security environments. The boundaries separating civilian and military infrastructures, public authority and private power, are becoming increasingly blurred within the orbital domain.

Simultaneously, the legal architecture governing outer space is ill-adapted to these transformations. International law continues to rely largely on principles and institutions developed during the Cold War, when orbital activities remained limited in scale and mainly state-controlled. Today, however, the expansion of private actors, the prospect of space resource exploitation and the fragmentation of governance frameworks progressively challenge the universalist foundations of the existing legal order. Initiatives such as the Artemis Accords and the International Lunar Research Station framework

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

reflect the broader emergence of rival geopolitical visions for the future governance of outer space.

In this context, the principal challenge facing the international community is no longer simply the preservation of peaceful access to space, but the prevention of a progressive fragmentation of the orbital domain into competing technological spheres of influence. Above the territorial partition of outer space through classical sovereignty claims, the emergence of indirect forms of domination exercised through technological superiority may constitute a major risk.

Ultimately, the future of outer space will depend upon the ability of international governance mechanisms to adapt to rapidly evolving geopolitical realities. Without significant regulatory innovation and renewed multilateral coordination, the orbital domain may become increasingly characterised by mistrust, legal ambiguity and intensifying competition between states and private actors alike. Far from transcending terrestrial rivalries, outer space mirrors them, emerging as one of the defining geopolitical frontiers of the contemporary international order.

Bibliography

- Abels, J. (2024). Private infrastructure in geopolitical conflicts: the case of Starlink and the war in Ukraine. *European Journal of International Relations, 30*(4), p. 842-866.

- Adams, P. (2026, February 19). *Musk cuts Starlink access for Russian forces - giving Ukraine an edge at the front*. Retrieved April 11, 2026, from BBC: https://www.bbc.com/news/articles/c0q3ndj7052o

- Albarrán, M. C. (2025). Space: The Final Frontier of Power. Geopolitics, Security and the New Space Race. *Instituto Español de Estudios Estratégicos* (73), p. 1-22.

- Aleksandraviciute, M., Impink, S. M., & Seamans, R. (2025, September 23). *Industrial policy for the final frontier: Governing growth in*

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

the emerging space economy. Retrieved June 09, 2026, from Brookings.edu: https://www.brookings.edu/articles/industrial-policy-for-the-final-frontier-governing-growth-in-the-emerging-space-economy/

- Baccelli, F., Candel, S., Perrin, G., & Puget, J.-L. (2024). *Large Satellite Constellations: Challenges and Impact.* Paris: Académie des sciences.

- Bace, B., Gökce, Y., & Tatar, U. (2024). Law in orbit: International legal perspectives on cyberattacks targeting space systems. *Telecommunications Policy, 48*(4).

- Ballamudi , K. R. (2020). Militarization of Space. *Asian Journal of Applied Science and Engineering, 9*(1), p. 169-178.

- Boley, A. C., & Byers , M. (2021). Satellite mega-constellations create risks in Low Earth Orbit, the atmosphere and on Earth. *Scientific Reports, 11*.

- Borgen, C. J. (2021, November 21). *Russia's ASAT Test and the Development of Space Law*. Retrieved May 05, 2026, from West Point Lieber Institute: https://lieber.westpoint.edu/russia-asat-test-development-space-law/

- Botti, F., & Greco, E. (2023). *The Geopolitics of Space.* Rome: Istituto Affari Internazionali.

- Bowen, B. E. (2020). *War in Space: Strategy, Spacepower, Geopolitics.* Edinburgh: Edinburgh University Press.

- Bowen, B. E. (2023). *Original Sin: Power, Technology and War in Outer Space.* Oxford: Oxford University Press.

- Bowman, B. (2021, Mars 31). *Russia and China Seek to Tie America's Hands in Space*. Retrieved May 01, 2026, from Foreign Policy Magazine.

- Bucur, D. (2023). The Semantics of Constellation Line Figures. *Researchgate*, p. 1-20. Retrieved from https://www.researchgate.net/publication/371988709_The_semantics_of_constellation_line_figures

- Camargo, A. V., & De Souza, M. C. (2025). Space, the New Geopolitical Arena: Satellites, Conflicts, and Space Situational Awareness. *Journal of the Americas*(1), p. 225-247.

- Cao , Y. (2024). Analyzing SpaceX's International Collaborations: Conflicts and Coordination Mechanisms with Space Partners. *Highlights in Business, Economics and Management, 24*, p. 602-607.

- Cen, A. (2025). Research on Elon Musk's Business Strategy and Leadership: From the Dual Perspectives of Innovation and Controversy. *Advances in Economics, Management and Political Sciences*(178), p. 66-70.

- Clark, S. (2025, August 20). *China's Guowang megaconstellation is more than another version of Starlink.* Retrieved June 09, 2026, from Arstechnica: https://arstechnica.com/space/2025/08/china-may-have-taken-an-early-lead-in-the-race-for-a-military-megaconstellation/

- Colucci, L., & Carlson, J. (2021, July 20). *Great Power Strategic Competition on Earth and in Space*. Retrieved March 12, 2026, from The Space Force Journal: https://www.afpc.org/publications/articles/great-power-strategic-competition-on-earth-and-in-space

- Costlow, M. R., Dunn, L. A., Rod, L., Murano, M., Roberts, B., Santoro, D., . . . Zhao, T. (2022). US-China Mutual Vulnerability Perspectives on the Debate. *Pacific Forum, 22*(2), p. 2-88.

- Courdier, A.-S., & Manciaux, S. (2023). *Newspace, la nouvelle économie des activités spatiales : enjeux juridiques et éthiques.* Paris: LexisNexis.

- De Zwart, M., Henderson, S., & Neumann, M. (2023). Space resource activities and the evolution of international space law. *Acta Astronautica, 211*, p. 155-162.

- Degrange, V. (2021). Nouveaux acteurs, nouvelle gouvernance : faire du droit spatial à l'ère du New Space. *Stratégique*(126-127), p. 151-172.

- Dey, A., & Jagadanandan, J. (2025). Unveiling the realm of AI governance in outer space and its importance in national space policy. *Acta Astronautica, 228*, p. 253-264.

- Dolman, E. C. (2002). *Astropolitik : Classical Geopolitics in the Space Age.* London: Frank Cass Publishers.

- Duchâtel, M., Curcio, B., Pinhas, P., Tavanti-Geuzimian, R., & Sheu, J.-S. (2025). *China's Space Dream: No Limits, No End.* Paris: Institut Montaigne.

- Freeman, C. P. (2025). The impact of US-China strategic competition on the idea of space as a "global commons". *Frontiers in Space Technologies, 6*, p. 1-6.

- Gilbert, A. Q. (2023). Implementing safety zones for lunar activities under the Artemis Accords. *Journal of Space Safety Engineering, 10*(1), p. 103-111.

- Gokireddy, H. B., & Amrita, J. (2024). China's Shift from CMI to MCF: Military Modernisation and the Defense Industry at the Core. *Issues & Studies, 60*(3), p. 1-30.

- Hasin, G. (2023). From "Space Law" to "Space Governance": A Policy-Oriented Perspective on International Law and Outer Space Activities. *Harvard International Law Journal, 64*(2), p. 386-430.

- Heilweil, R. (2025, August 13). *SpaceX differentiates between Starlink and Starshield, but the services are intertwined*. Retrieved May 06, 2026,

from FEDSCOOP: https://fedscoop.com/spacex-starlink-starshield-government-military-satellite-internet/

- Hickman, J. (2024). Outer Space. In B. C. Fong, & C. J. Ian, *The Routledge Handbook of Great Power Competition* (pp. 272-280). London: Routledge.

- Holland, D., & Burns, J. O. (2018). The American Space Exploration Narrative from the Cold War Through the Obama Administration. *Space Policy, 46*, p. 9-17.

- Jayanti, A. (2023, March 09). *Starlink and the Russia-Ukraine War: A Case of Commercial Technology and Public Purpose?* Retrieved May 05, 2026, from Harvard Kennedy School: https://www.belfercenter.org/publication/starlink-and-russia-ukraine-war-case-commercial-technology-and-public-purpose

- Jayshree, D. S. (2023). Status of property rights in outer space. *International Journal of Law, 9*(6), p. 111-113.

- Julienne, M. (2023). *China in the Race to Low Earth Orbit Perspectives on the Future Internet Constellation Guowang*. Paris: IFRI Center for Asian Studies and Geopolitics of Technology Program.

- Kashwan, P., Mudaliar, P., Foster, S. R., & Clement, F. (2021). Reimagining and governing the commons in an unequal world: A critical engagement. *Current Research in Environmental Sustainability, 3*.

- Kay, G. (2023, September 07). *SpaceX president was reportedly upset that Elon Musk kept financing Starlink in Ukraine before Pentagon deal*. Retrieved January 16, 2026, from Buisiness Insider: https://www.businessinsider.com/spacex-shotwell-mad-elon-musk-continued-financing-ukraine-starlink-report-2023-9

- Kazi, A., Kazi, S., & Bhosale, S. (2025). Invisible Battlefields: Analyzing the Viasat Attack and its Broader Implications. *Scientific Bulletin, 30*(1), p. 59-67.

- Khan, A., & Sadeh, E. (2024). *Sabre Rattling in Space: A South Asian Perspective.* Singapore: Springer.

- Kristensen, H. M., & Korda, M. (2025). World nuclear forces. In SIPRI, *SIPRI Yearbook 2025: Armaments, Disarmament and International Security* (pp. 178-213). Stockholm: Stockholm International Peace Research Institute.

- Luzin, P. (2024). *Russia's Space Program After 2024.* Philadelphia: Foreign Policy Research Institute.

- Lyall, F., & Larsen, P. B. (2025). *Space Law: A Treatise* (3rd ed.). London: Routledge.

- Maidenberg, M., & FitzGerald, D. (2024, February 20). *Musk's SpaceX Forges Tighter Links With U.S. Spy and Military Agencies*. Retrieved May 06, 2026, from The Wall Street Journal: https://www.wsj.com/tech/musks-spacex-forges-tighter-links-with-u-s-spy-and-military-agencies-512399bd

- Mills , C., & Butchard, P. (2021). *The militarisation of space.* London: House of Commons Library.

- Nelson, T. G. (2010). The Moon Agreement and Private Entreprise: Lessons from Investment Law. *LSA Journal of International & Comparative Law, 17*(2), p. 393-416.

- Newman, C. (2020, October 19). *Artemis Accords: Why many countries are refusing to sign Moon exploration agreement*. Retrieved May 06, 2026, from The Conversation: https://theconversation.com/artemis-accords-why-many-countries-are-refusing-to-sign-moon-exploration-agreement-148134

- Perrouault, L. (2023). Chinese Commercial Space Launchers: Historical Perspective. *Space Policy, 66*, p. 1-15.

- Price, R., Schriver, R., Brands, H., Friedberg, A., Goodwin, C. P., Hodges, J., . . . Stivers, J. N. (2025). *Report to Congress of the U.S.-China*

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

Economic and Security Review Commission. Washington, D.C: U.S.-China Economic and Security Review Commission.

- Rainbow, J. (2023, July 21). *Amazon picks Kennedy Space Center for Project Kuiper processing facility*. Retrieved April 18, 2026, from Spacenews: https://spacenews.com/amazon-picks-kennedy-space-center-for-project-kuiper-processing-facility/

- Roth, A. D. (1992). *La prohibition de l'appropriation et les régimes d'accès aux espaces extra-terrestres.* Genève: Publications de l'Institut de hautes études internationales.

- Samson, V., & Brett, K. (2026). *Global Counterspace Capabilities: An Open Source Assessment.* Washington D.C: Secure World Foundation.

- Samson, V., & Christensen, I. (2025, July 24). *Lunar Space Cooperation Initiatives*. Retrieved April 10, 2026, from Secure World Foundation: https://www.swfound.org/publications-and-reports/lunar-space-cooperation-initiatives

- Smet, A. (2024, October 29). *Elon Musk's Manufacturing Revolution: How Tesla and SpaceX Are Reshaping Industry Standards*. Retrieved April 02, 2026, from Medium: https://medium.com/the-tesla-digest/elon-musks-manufacturing-revolution-how-tesla-and-spacex-are-reshaping-industry-standards-707113e5a788

- Smith, D. (2025). International stability, human security and the nuclear challenge. In SIPRI, *SIPRI Yearbook 2025: Armaments, Disarmament and International Security* (pp. 3-18). Stockholm: Stockholm International Peace Research Institute.

- Stewart, R. (2025, May 22). *The shifting battlefield: technology, tactics, and the risk of blurring lines in warfare*. Retrieved April 06, 2026, from Humanitarian Law and Policy (ICRC): https://blogs.icrc.org/law-and-policy/2025/05/22/the-shifting-battlefield-technology-tactics-and-the-risk-of-blurring-lines-of-warfare/

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

- Swope, C., Bingen, K. A., Young, M., & LaFave, K. (2025). *Space Threat Assessment 2025.* Washington D.C: Center for Strategic & International Studies.

- Taylor, A. R. (2023). 'Houston, we have a problem': legal lacunae created by the lack of creativity. *European Journal of Law and Technology, 14*(1), p. 1-26.

- UNOOSA. (2019). *United Nations Treaties and Principles on Outer Space, related General Assembly resolutions and other documents.* New York: United Nations.

- Urcosta, R. B. (2026). The New Space Frontier: Geopolitics and Space Power to Heliopolitics. *Astropolitics, 23*(3), p. 290-319.

- Vicente, A., Sinovets, P., & Theron, J. (2023). Anchoring US–Russia Relations: Perspectives, Strategic Cultures, and Nuclear Posture. In V. Cassar, *Russia's War on Ukraine: The Implications for the Global Nuclear Order* (pp. 187–203). Stuhr: Springer.

- Wall, M. (2022, January 29). *China lays out ambitious space plans for next 5 years*. Retrieved May 06, 2026, from Space.com: https://www.space.com/china-five-year-plan-space-exploration-2022

- Whittington, M. (2021, April 28). *The new race to the moon: the Artemis Alliance vs. the Sino-Russian Axis*. Retrieved May 06, 2026, from The Hill: https://thehill.com/opinion/technology/545280-the-new-race-to-the-moon-the-artemis-alliance-vs-the-sino-russian-axis/

- Williams, C. (2024). *The Trump Transition and National Security Space: A Status Report.* Arlington: Moorman Center for Space Studies.

- Wilson, J. R. (2011). Regulation of the Outer Space Environment Through International Accord: The 1979 Moon Treaty. *Fordham Environmental Law Review, 2*(2), p. 173-193.

Year : 2026 Volume : 36 Number : 1 ISSN : 1111-3561 EISSN : 2716-957X

- Wu, X. (2023). The International Lunar Research Station: China's New Era of Space Cooperation and Its New Role in the Space Legal Order. *Space Policy, 65*.