

Security in Outer Space: International Law, Militarisation and Defence Strategies

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1. Introduction and objectives

In recent decades, outer space has become increasingly important strategically, establishing itself as a crucial dimension for defence, national security and the maintenance of global geopolitical balances. While space is traditionally conceived as a 'common heritage of mankind', according to the principle enshrined in Article I of the 1967 Outer Space Treaty, which guarantees freedom of exploration and use of space for the benefit of all states, the progressive militarisation of this dimension raises increasingly urgent questions in terms of international law, global governance and international stability. As highlighted by numerous studies (Barzi, 2008; Bernat, 2019; Prabowo, 2020; Grimal and Sundaram, 2022), the interest of the major powers has shifted from the simple civil and scientific use of space to the development of dual-use capabilities and technologies with a clear military vocation. This trend has accelerated in the 21st century with the creation of military structures whose main focus is space, such as the United States Space Force. The aim of this paper is to analyse the current international legal framework governing the military use of space, highlighting its limitations and ambiguities, and then to examine the strategies of the major powers with regard to its militarisation and the implications this has for collective security and the peaceful management of outer space.

2. The international regulatory framework governing the use of outer space

The legal framework governing outer space took shape during the Cold War, with the aim of preventing an arms race in space and promoting the peaceful use of space. The technological escalation between the United States and the Soviet Union, which began with the latter's launch of the Sputnik 1 satellite in 1957 and was accelerated by missile and satellite competitions, highlighted the need to establish common rules to avoid the risk of uncontrolled militarisation. According to Barzi (2008), it was precisely the growing awareness of the strategic potential of space that prompted the United Nations to adopt a series of multilateral treaties in an attempt to maintain the balance between the powers. As Prabowo (2020) also points out, space was immediately conceived not only as a technical-scientific domain, but as an indirect extension of the conflict between the two blocs.

The current legal framework for outer space is based primarily on the 1967 Outer Space Treaty, the first and most important international instrument on the subject and a fundamental pillar of international law in space. It establishes a number of fundamental principles that still form the backbone of international space law today. Article I, as already mentioned, enshrines the principle of freedom of exploration and use, including the peaceful use of outer space by all states; Article II prohibits any form of national appropriation, territorial or by means of occupation; Article III establishes that the activities of the contracting states in the exploration and use of space, including the Moon and other celestial bodies, must be conducted in accordance with international law and in particular with the Charter of the United Nations, in order to maintain international peace and security. In particular, Article IV prohibits the installation of nuclear weapons or weapons of mass destruction in Earth orbit, on the Moon and on other celestial bodies, but does not explicitly prohibit the presence or use of conventional weapons or dual-use technologies, nor does it clarify the limits of non-aggressive military use (e.g., through surveillance satellites or military communications support). This regulatory gap has left ample room for interpretation, which some states have exploited by positioning satellites with dual-use functions, developing anti-satellite (ASAT) technologies or implementing passive space defence programmes, without formally contravening the principle of peaceful use. Such practices, as highlighted by Grimal and Sundaram (2022), contribute to a silent militarisation of space, fuelling tensions and strategic uncertainty.

Alongside this treaty, the body of law is enriched by other multilateral legal instruments that outline a framework for cooperation and responsibility in space, without, however, directly and thoroughly addressing the issue of military use. The 1968 Agreement on the Rescue and Recovery of Astronauts focuses on emergency assistance obligations, establishing that states must rescue astronauts in distress and return crashed spacecraft (Articles II and V); however, it does not cover scenarios involving military personnel or operations related to the use of space for warfare. The 1972 Convention on International Liability for Damage Caused by Space Objects introduces the principle of strict liability of the launching state for damage caused on the ground or on board other space objects (Article II), but does not differentiate between civil and military uses, nor does it regulate the nature of missions. The 1974 Convention on Registration of Objects Launched into Outer Space requires states to register launched space vehicles (Article II), indicating technical and orbital data, but does not require the declaration of the military or civil purpose of the object; this allows a wide margin of discretion on the actual use of space technologies. These gaps confirm that the current legal framework, although solid in terms of technical cooperation, is not structured to effectively address phenomena related to the militarisation of space.

An attempt to strengthen the existing legal regime is represented by the 1979 Moon Treaty, which aims to prevent the appropriation of space resources and the militarisation of celestial bodies. In particular, Article XI states that the Moon and its resources are the common heritage of mankind, and expressly prohibits any form of appropriation by states, organisations or individuals. Furthermore, Article III, paragraph 4, establishes that activity on the Moon must be exclusively for peaceful purposes, while Article IV explicitly prohibits the installation of military bases, armaments and weapons testing on celestial bodies. However, the treaty has never been ratified by the major space powers and currently remains largely unenforced (Barzi, 2008). Within the UN, the main body responsible for space governance is the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), established in 1959. This committee played a key role in the drafting of the first space treaties, but its regulatory impact is currently limited, as its recommendations are not binding (Bernat, 2019).

Over the last few decades, several proposals for the negotiation of a new treaty on space disarmament have been presented at the United Nations Conference on Disarmament. Among these, the most significant is the joint proposal by Russia and China, formalised in 2008 and renewed in 2014, for the creation of a Treaty on the Prevention of the Placement of Weapons in Outer Space (PPWT). The draft treaty aimed to prohibit the deployment of any type of weapon in outer space, as well as the use or threat of force against space objects. However, the proposal was criticised by the United States and its allies, who deemed it vague in its verification mechanisms and lacking references to terrestrial anti-satellite technologies, thus leaving many practical aspects of space arms control unresolved. This has prevented a multilateral consensus on the definition of a new binding legal framework on space disarmament to date (Prabowo, 2020).

In this context of regulatory gaps, the growing development of space capabilities by states and private actors, and the creation of armed forces dedicated to space (such as the United States Space Force, but also specialised units in other countries such as China's Strategic Support Force or the French Space Command), call into question the validity of the principle of peaceful use of outer space. Furthermore, the lack of international consensus on the exact meaning of 'peaceful use', often interpreted as 'non-aggressive' rather than 'strictly civilian', has created a legal grey area. As highlighted by Grimal and Sundaram (2022), this ambiguity has allowed states to justify the use of dual-use technologies and passive defence operations, which are formally compliant with international law. Bernat (2019) also points out that the absence of a shared definition of the principle encourages silent militarisation, as existing rules do not expressly prohibit numerous activities of strategic importance.

3. *De facto* militarisation: main players, space doctrines and strategies

In recent decades, the militarisation of space has moved from a theoretical perspective to a concrete and operational dimension. Although the *corpus juris spatialis*, and in particular the 1967 Outer Space Treaty, enshrines the principle of the peaceful use of space and prohibits the placement of weapons of mass destruction in orbit, recent practice shows a growing integration of space capabilities into defence and national security strategies (Barzi, 2008). Suffice it to think, for example, of the use of satellites for strategic surveillance, tracking missile launches or managing encrypted military communications in complex operational scenarios. This evolution did not happen suddenly, but has consolidated over time through the development of dual-use technologies, i.e. tools and technologies that can be used in both civil and military contexts, and through the emergence of a geopolitical vision of space as a contested domain, no longer neutral or immune to power politics. This change reflects a redefinition of space no longer as a simple 'area of exploration', but as a strategic theatre where balances and deterrence between global and regional powers are played out.

According to several analysts, including Prabowo (2020), the concept of 'space power' has become central: space is now officially recognised as the fifth operational domain, alongside land, sea, air and cyberspace. In this context, the growing importance of space for national security has prompted many states to formalise military strategies and doctrines dedicated to the space domain that go far beyond mere satellite presence, developing orbital defence doctrines, dedicated command structures and rapid response capabilities to space threats. These strategies are not only defensive, but often part of a broader logic of deterrence, technological supremacy and strategic dominance. The major space powers have adopted different approaches in their actions, but they converge in substance: space is seen as a fundamental operational environment, to be monitored and protected, including with military means, reflecting a profound change in the perception of outer space.

The United States is the dominant power in the sector, both in terms of technological capabilities and military doctrine. The creation of the United States Space Force in 2019 marks a fundamental step towards a fully integrated doctrine, and is indicative of the growing strategic importance assigned to space as an autonomous operational domain; it is responsible for organising, training and equipping forces to conduct operations in space. In the 'Defence Space Strategy' document, published by the US Department of Defence in June 2020, the USSF emphasises the need to ensure space superiority, defined as the ability to ensure secure and

continuous access to space for US forces and their allies, while limiting or denying access and use of space to potential adversaries, if necessary. It also states that the United States must be prepared to 'deter, and if necessary defeat, aggression in space' (Grimal and Sundaram, 2022). This concept, which is openly strategic-military in nature, departs from the purely defensive vision evoked by the principle of peaceful use (Prabowo, 2020). The USSF operates an extensive infrastructure of advanced systems to keep space operations secure, including: the Space-Based Infrared System (SBIRS), used for early warning against missile launches by detecting infrared signals; strategic communications satellite networks, which provide secure and resilient connections between the armed forces; the Space Fence space surveillance system, which enables high-precision tracking of space debris and objects in orbit; integrated command and control (C2) facilities, which coordinate space operations in real time and support the management of orbital resources. This doctrine is accompanied by the enhancement of anti-satellite capabilities, Space Situational Awareness (SSA) and the resilience of space infrastructure in the event of conflict.

China has also invested significantly in developing military space capabilities, promoting integration between civil, commercial and military use. The country has developed a well-structured military space strategy under the direction of the People's Liberation Army Strategic Support Force (PLASSF), which is responsible for the coordinated management of space, electronic and cyber operations. According to Barzi (2008) and Prabowo (2020), this force is a central element of China's doctrine of 'war informatisation', which aims to dominate the information space, including through dual-use space technologies. China has proven anti/satellite capabilities, as evidenced by the 2007 test that destroyed one of its own weather satellites, generating thousands of pieces of space debris and raising serious concerns in the international community about international orbital and strategic stability. China has also developed electronic jamming systems, blinding lasers for satellite sensors and orbiting vehicles with ambiguous capabilities, fuelling fears about the real level of *de facto* militarisation (Barzi, 2008). The 2021 Chinese White Paper on Space emphasises the importance of 'space as a strategic frontier' and confirms Beijing's intention to achieve technological and military leadership. Furthermore, the fusion between civil and military use is particularly evident in China's strategy, integrating infrastructure and technologies under a coherent vision of global space power (Prabowo, 2020).

Although Russia has more limited resources than the United States and China, it retains strong space expertise inherited from Soviet-era programmes (Barzi, 2008). Russia continues to view space as a key component of its defence, and in recent years it has maintained and modernised

its space surveillance and defence capabilities, focusing on electronic warfare technologies, anti-satellite weapons and orbital manoeuvres, which include satellite communications jamming, GPS spoofing and radar surveillance from space (Grimal and Sundaram, 2022). According to Bernat (2019), Moscow considers space to be an integral part of its deterrence strategy in so-called 'New Generation Warfare', a doctrine that includes space, cyber and psychological components. The modernisation of Russian space facilities, initiated through the GLONASS (Global Navigation Satellite System) programme, the renewal of the military space command and the use of high-resolution satellites, confirms Moscow's desire to maintain strategic relevance in the orbital arena. Official Russian statements insist on the need for a 'space free of offensive weapons', but Russian military activities indicate a rather assertive and reactive approach. The conflict in Ukraine has also confirmed the importance of access to space for conventional warfare operations.

Other players have developed limited but expanding capabilities, particularly in the anti-satellite and SSA fields. India conducted an anti-satellite test in 2019 (Prabowo, 2020); Japan has strengthened its military cooperation with the United States in space (Grimal and Sundaram, 2022); France established the French Space Command in 2019 (Bernat, 2019). Added to this are transnational private actors, such as SpaceX, which through mega-constellations such as Starlink are actively participating in the reshaping of space governance (Grimal and Sundaram, 2022). At the same time, international organisations such as the European Union and intergovernmental agencies such as the European Space Agency (ESA) are helping to define technical standards, promote joint programmes and influence the development of policies on space security and sustainability (ESA, 2022).

Italy is a special case: although it does not have an autonomous military space structure comparable to that of the major powers, it is emerging as a significant European player in space security, thanks to a strategy of bilateral cooperation with other countries and sophisticated national capabilities: the Space Operations Command (COS), established in 2020 within the Ministry of Defence, coordinates the Sicral, Athena-Fidus and OPTSAT-3000 satellites and the dual-use COSMO-SkyMed constellation, which is used for both civil and military surveillance (Italian Ministry of Defence, 2022). In addition, Italy actively participates in major European space security programmes and plays an important role through its cooperation with intergovernmental organisations and industrial partners. In particular, it contributes to the Infrastructure for Resilience, Interconnectivity and Security by Satellite (IRIS²) project, promoted by the European Commission and ESA, which aims to develop a secure and sovereign European satellite constellation for strategic institutional communications (ESA, 2022; EU

Commission, 2023). Italy is also involved in the supply of key components and in defining the governance and system, through a synergy between public bodies and private companies such as Leonardo and Telespazio (ESA, 2022). It also participates in multilateral initiatives such as the Programme Associated to GOVSATCOM and collaborates bilaterally with France and Germany in the field of space surveillance, orbital traffic management and defence against hybrid threats (Bernat, 2019). The 2022 Space Strategy for Defence, published by the Ministry of Defence, places increasing emphasis on space security and technological autonomy, albeit within a primarily cooperative framework (Italian Ministry of Defence, 2022). In May 2025, during the Aerospace Power Conference held in Rome, Italy and the United States signed an interoperability agreement between the USSF and the Italian Air Force, including joint missions, personnel exchanges and increased cooperation in the space sector (Italian Ministry of Defence, 2025).

These developments reveal the willingness of states to protect their space assets, defend related critical infrastructure and, looking ahead, gain a strategic advantage in an environment that is becoming increasingly crowded and contested (Grimal and Sundaram, 2022). Furthermore, the progressive normalisation of the military use of space is taking place in the presence of a significant regulatory vacuum: in the absence of a shared update of the international legal framework, unilateral approaches and divergent interpretations prevail. This situation favours *de facto* militarisation, as defined by Barzi (2008), in which space remains formally a peaceful space, but in the meantime is filled with satellites for defensive purposes, military exercises, anti-satellite technologies and cyber defence operations related to space assets.

According to Barzi (2008), the growing strategic competition between global powers in space has not yet led to open conflict, but it is clear that an unstable equilibrium is developing, in which every expansionist move is perceived as a potential threat by the other players. This dynamic fuels a spiral of mutual reinforcement that is reminiscent, in some ways, of the mechanisms of nuclear deterrence during the Cold War, but with the paradox that common rules of conduct in space are still very weak, and effective confidence-building measures are lacking (Barzi, 2008). Furthermore, the tendency to emphasise the military dimension of space also reflects a cultural shift: from a collective good to a strategic theatre, space is increasingly seen as high ground to be conquered and maintained, rather than a domain to be preserved and shared. This evolution is visible not only in official doctrines, but also in the growing investment in dual-use technologies, often lacking in transparency, which blur the boundaries between civilian and military use. Faced with this transformation, the international community

finds itself unprepared to propose alternative models that are more cooperative and oriented towards conflict prevention, as pointed out by Bernat (2019) and Grimal and Sundaram (2022).

4. Environmental and political implications of the militarisation of space

The increasing militarisation of outer space raises not only strategic and legal concerns, but also significant environmental and political implications, which are often overlooked in international discussions. As Barzi (2008) points out, there is a growing risk that space, once regarded as a global commons and a domain for scientific cooperation, is being transformed into a competitive and conflictual environment.

One of the most critical aspects concerns the production and accumulation of space debris in low Earth orbit. Anti-satellite tests alone have generated thousands of fragments, endangering both military and civilian space assets. According to the European Space Agency, it is estimated that over 36,000 objects larger than 10 cm are currently orbiting the Earth, resulting from deliberate destruction, accidental collisions, fragmentations, or abandoned rocket stages (ESA, 2022). This uncontrolled proliferation poses serious threats to future space missions and strategic capabilities, as key infrastructure such as communication, observation and navigation satellites, many of which are dual-use, are increasingly at risk of damage.

Barzi (2008) argues that militarisation contributes to the saturation of low Earth orbit, further complicating an already fragile technical and legal scenario. Although the 1972 Convention on International Liability for Damage Caused by Space Objects formally establishes the liability of the launching State for damages caused by space objects, no binding international framework currently exists to prevent the creation of space debris or to clearly regulate the management and mitigation of such risks (Grimal and Sundaram, 2022). This legal gap reinforces the urgency of cooperative governance mechanisms, aimed at ensuring the long-term sustainability of orbital environments. These challenges are exacerbated by the growing strategic competition among spacefaring nations, which accelerates the deployment of dual-use technologies and increases the risks of miscalculation. While the militarisation of outer space contributes significantly to the generation of orbital debris, it is important to note that other factors such as commercial activities, accidental collisions and insufficient post-mission disposal protocols also play a major role in the growing congestion of orbital pathways (ESA, 2022). The cumulative effect of these processes threatens not only the security of military space assets, but also the critical infrastructures that underpin civilian life, including communication networks, GPS, weather forecasting, and emergency response mechanisms. The interdependence between

military and civilian uses of space highlights the urgent need for stronger legal instruments and multilateral governance frameworks that ensure both the sustainability and peaceful use of outer space.

Furthermore, the potential hostile use of space can have repercussions on key sectors such as disaster management, food security (through precision agriculture) or the protection of the Earth's environment. The deliberate or accidental disruption of satellite services could severely affect vulnerable populations, amplifying existing inequalities. As Bernat (2019) notes, there is a growing imbalance between states that have autonomous space capabilities and those that depend on space technologies controlled by other actors, without being guaranteed stable and secure access to these strategic resources.

At the political level, the absence of clear and shared rules risks generating systemic mistrust among international actors at a time when multilateral cooperation is already struggling. The growing opacity of military space activities and the lack of transparency regarding the capabilities developed by states contribute to a climate of suspicion among the various actors, which could translate into a new arms race in the future.

5. Conclusions

Outer space is now an increasingly strategic dimension for global geopolitical balances. The emergence of interest in space on the part of military actors, the development of new dual-use technologies and growing competition between the major powers highlight how the *de facto* militarisation of space is already underway. However, the current regulatory framework, built in a profoundly different historical context, shows significant limitations in effectively regulating these new dynamics. The absence of legally binding instruments on space weapons, the weakness of control mechanisms, and the asymmetry between actors raise numerous questions about the future of space governance.

In this context, there is a need to strengthen international cooperation, update the existing regulatory framework and promote a multilateral approach that takes into account both security needs and the collective nature of space. If space is to remain a common good of humanity, it is essential to ensure that its use, including for defence purposes, is guided by principles of transparency, accountability and conflict prevention, preventing it from becoming a new strategic battleground.

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