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BEYOND THE FINAL FRONTIER: NAVIGATING THE LEGAL COSMOS OF OUTER SPACE REGULATION

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I. ABSTRACT

This research examines how the existing international space law regime responds to the rapid expansion of commercial, strategic and dual use activities in outer space. It analyses the constitutional role of the United Nations space treaties, especially the Outer Space Treaty, and shows how soft law, UN practice and domestic legislation now carry much of the regulatory burden in areas like resource utilisation, space security and sustainability. The paper evaluates the international liability and registration framework, highlighting its limits when confronted with mega constellations, complex contractual chains and debris intensive operations. It then interrogates debates on space mining, the interpretation of non appropriation and claims that outer space forms part of the global commons. Special attention is given to security and militarisation trends, including anti satellite testing and behaviour based security norms. Against this backdrop, the study critically maps India's evolving policy architecture, centred on the Indian Space Policy 2023, and identifies the requirements for a coherent national space activities statute. The research argues that a balanced future framework must integrate clarified treaty interpretation, stronger global norms on sustainability and security, and detailed domestic regulation that can safeguard both national interests and the collective interests of humankind.

II. Keywords

Outer space regulation, international space law, commercialisation and space resources, space security and sustainability, Indian space policy.

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III. INTRODUCTION AND RESEARCH FRAMEWORK

A. Background of Research

Outer space has moved from symbolic cold war rivalry to an essential infrastructure layer for the global economy, security and climate monitoring, yet its legal regime still rests on a small cluster of United Nations treaties negotiated in the 1960s and 1970s. These instruments, centred on the Outer Space Treaty, articulate core principles such as freedom of exploration and use, non appropriation, peaceful purposes and cooperation, but they did not anticipate mega constellations, private launch markets, on orbit servicing or large scale resource extraction, which now test the elasticity of the original bargain and expose normative gaps in outer space regulation.[3]

The contemporary space economy relies on satellite communications, navigation and Earth observation for banking, transport, agriculture and disaster management, so any disruption in orbit carries cascading socio economic consequences on Earth. International space law has expanded through General Assembly principles, institutional practice and national legislation, yet it remains fragmented across liability, registration, frequency management, export controls and environmental rules, making it harder for States and private actors to predict how different bodies of law will interact in a complex incident involving debris, cyber interference or contested space operations.[4]

India's trajectory illustrates the shift from a largely state centric, scientific programme to a diversified ecosystem that seeks stronger private and commercial participation while preserving strategic autonomy and developmental priorities. The Indian Space Policy 2023 announces an overarching framework to authorise non governmental entities, redistribute roles among ISRO, IN-SPACe and NewSpace India Limited, and align national practice with international obligations, but it also highlights the need for a

[3] U.N. Office for Outer Space Aff., United Nations Treaties and Principles on Outer Space, U.N. Doc. ST/SPACE/11/Rev.2 (2002), https://www.unoosa.org/pdf/publications/STSPACE11E.pdf (last visited 8 Mar. 2026).
[4] U.N. Office for Outer Space Aff., Space Law, https://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html (last visited 8 Mar. 2026).

comprehensive statute that addresses licensing, liability, insurance, environmental safeguards and dispute settlement in a coherent manner.[5]

This research situates the evolving Indian framework within the broader architecture of international space law and asks how global governance of outer space can respond to pressures from commercialisation, securitisation and the claim that outer space forms part of the global commons. Scholarly work underscores that existing rules only partially deal with issues like space traffic management, equitable access, resource utilisation, dual use technologies and long term sustainability, so there is a pressing need to re examine foundational principles and to explore new doctrinal tools and institutional designs that can better balance State interests, private innovation and the collective interest of humankind in a safe and open space environment.[6]

B. Research Questions

1. How adequate is the existing corpus of United Nations space treaties and related soft law in regulating contemporary outer space activities involving commercialisation, dual use technologies and security driven operations?
2. In what ways do the current international liability and registration regimes address, or fail to address, risks arising from mega constellations, space debris, resource utilisation and complex public private mission architectures?
3. How do emerging national space resources laws, plurilateral instruments and commons based narratives shape the governance of space mining and benefit sharing in relation to the global commons and the interests of the Global South?
4. How can India's evolving space governance framework, including the Indian Space Policy 2023, be aligned with international legal standards to create a

[5] Gov't of India, Indian Space Policy 2023 (2023), https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf (last visited 8 Mar. 2026).
[6] Maria Manoli, Book Review, Handbook of Space Law (Frans von der Dunk & Fabio Tronchetti eds., 2015), 32 Rev. Québécoise De Droit Int'l 199 (2019), https://www.persee.fr/doc/rqdi_0828-9999_2019_num_32_1_2459 (last visited 8 Mar. 2026).

coherent national regime on licensing, liability, sustainability and security in outer space?

C. Research Objectives

1. To examine and critically evaluate the normative architecture of international space law, including core treaties and soft law, in light of rapid commercial and strategic use of outer space.
2. To analyse the structure and operation of the international liability and registration regimes and to identify specific doctrinal and practical gaps exposed by new technological and market developments.
3. To assess competing legal and policy approaches to space resource utilisation, commons claims and benefit sharing, with particular focus on equity concerns of Global South States.
4. To map and appraise India's emerging space law and policy framework and to formulate recommendations for a comprehensive national space activities statute that operationalises international obligations while safeguarding national and collective interests.

D. Research Methodology

The study adopts a doctrinal and analytical research methodology that relies on a close reading of primary legal materials, including United Nations space treaties, General Assembly resolutions, COPUOS documents, national legislation and policy instruments, with particular attention to Indian space policy texts. Secondary sources such as leading space law treatises, journal articles, institutional reports and travaux préparatoires are used to interpret contested provisions, trace the evolution of principles and highlight competing scholarly views. A limited comparative approach is employed to examine selected foreign space resources and licensing laws and to contrast them with the Indian framework. Throughout the research, case studies on liability incidents, ASAT testing, commercial constellations and resource initiatives serve as illustrative examples to

ground the doctrinal discussion and to draw out concrete implications for future regulatory design.

IV. NORMATIVE ARCHITECTURE OF INTERNATIONAL SPACE LAW

A. Evolution of Space Law and Foundational Principles

The first phase of space law grows out of Cold War rivalry and early United Nations practice after Sputnik, when States started to treat outer space as a distinct legal environment rather than an extension of airspace. The General Assembly's 1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space crystallises basic ideas like peaceful purposes, benefit of all humankind, and due regard for the interests of other States, and it functions as a bridge between political resolutions and treaty law.[7]

That declaration feeds directly into the core United Nations treaty system, which many scholars describe as the backbone or constitutional layer of international space law. The Outer Space Treaty of 1967 is complemented by four specialised agreements on rescue of astronauts, liability, registration and the Moon, together forming a coherent, though incomplete, framework for activities in outer space and on celestial bodies.[8]

Across these instruments, certain foundational principles repeat and acquire normative authority over time. Freedom of exploration and use for all States, non appropriation of outer space by claims of sovereignty, the treatment of outer space as the province of all humankind, the obligation to conduct activities for the benefit and interests of all countries and in accordance with international law, and the requirement of international

[7] G.A. Res. 1962 (XVIII), Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (Dec. 13, 1963), https://digitallibrary.un.org/record/203965 (last visited 8 Mar. 2026).
[8] U.N. Office for Outer Space Affairs, United Nations Treaties and Principles on Outer Space, ST/SPACE/11/Rev.2 (2002), https://www.unoosa.org/pdf/publications/STSPACE11E.pdf (last visited 8 Mar. 2026).

cooperation, together form a set of baseline rules that still anchor debates on commercial exploitation, military uses and global equity today.[9]

B. Outer Space Treaty Regime and Core Obligations

The Outer Space Treaty operates like a constitutional charter for outer space since it fixes the status of the environment and sets broad obligations that bind both traditional and emerging space powers. Articles I and II secure freedom of exploration and use on a basis of equality, prohibit national appropriation by sovereignty claims or other means, and insist that activities must benefit all countries irrespective of their economic or scientific development, which is crucial for Global South arguments on distributive justice in space.[10]

The treaty creates a distinctive responsibility and liability structure that departs from classical territorial jurisdiction. Article VI makes each State internationally responsible for governmental and non governmental space activities and requires authorisation and continuing supervision, while Article VII links that responsibility to liability for damage caused by space objects, a rule that the 1972 Liability Convention later develops into an absolute liability regime on the surface of the Earth and fault based liability in outer space.[11]

States also exercise quasi territorial control through jurisdiction and control over registered space objects and personnel, which ties the Outer Space Treaty to the Registration Convention and to national licensing laws. Contemporary commentary underlines that this mix of freedom, responsibility, liability and jurisdiction norms still

[9] U.N. Office for Outer Space Affairs, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html (last visited 8 Mar. 2026).

[10] U.N. Treaty Collection, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, https://treaties.un.org/pages/showdetails.aspx?objid=0800000280128cbd (last visited 8 Mar. 2026).

[11] U.N. Office for Outer Space Affairs, Convention on International Liability for Damage Caused by Space Objects, Introductory Note, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html (last visited 8 Mar. 2026).

governs mega constellations, satellite broadband networks, remote sensing and commercial lunar missions, even though private actors, complex supply chains and new insurers now dominate implementation and push for clearer standards on risk allocation and traffic management.[12]

C. Soft Law, UN Resolutions and Emerging Governance Norms

Alongside binding treaties, the General Assembly and the Committee on the Peaceful Uses of Outer Space have produced a wide body of non binding but influential soft law. Principle based instruments on remote sensing, direct broadcasting and use of nuclear power sources in outer space build on the 1963 Declaration and adapt core ideas such as peaceful purposes, benefit of all countries, protection of the space environment and respect for State consent in data gathering to specific technologies and practices.[13]

More recent governance efforts focus on transparency, confidence building and sustainability, which respond to congestion, debris and security risks without waiting for a comprehensive arms control treaty. Resolutions on transparency and confidence building measures, together with the 2019 Guidelines for the Long Term Sustainability of Outer Space Activities adopted by COPUOS, encourage States to develop national regulatory frameworks, share information, avoid harmful interference and integrate space sustainability into planning, all on a voluntary and non binding basis that still shapes expectations and national policy design.[14]

Parallel political arrangements such as the Artemis Accords translate these multilateral principles into cooperative practice for lunar and deep space exploration. The Accords reaffirm the Outer Space Treaty, endorse interoperability, open scientific data,

[12] FRANCIS LYALL & PAUL B. LARSEN, SPACE LAW: A TREATISE (3d ed. 2024), https://www.taylorfrancis.com/books/mono/10.4324/9781003496502/space-law-francis-lyall-paul-larsen (last visited 8 Mar. 2026).
[13] U.N. Office for Outer Space Affairs, Legal Principles and Agreements, https://www.unoosa.org/oosa/en/ourwork/spacelaw/principles/legal-principles.html (last visited 8 Mar. 2026).
[14] U.N. Office for Outer Space Affairs, Long-term Sustainability of Outer Space Activities, https://www.unoosa.org/oosa/en/ourwork/topics/long-term-sustainability-of-outer-space-activities.html (last visited 8 Mar. 2026).

deconfliction of activities and responsible resource extraction, yet they also highlight the risk of normative fragmentation between like minded coalitions and States that favour more universal processes, a tension that India and other space capable Global South countries must navigate while protecting open access, security interests and their long term stake in the space commons.[15]

V. COMMERCIALISATION, RESOURCE UTILISATION AND THE SPACE COMMONS

A. Private Actors, Licensing and State Responsibility

Private operators do not escape public international law because Article VI of the Outer Space Treaty attributes all national activities in outer space to the launching State, whether carried out by governmental agencies or non governmental entities. It also requires authorisation and continuing supervision, so every licence to a private launch provider, satellite operator or space mining company functions as a technique to ensure treaty compliance and to manage international responsibility and liability exposure.[16]

Scholars read this authorisation duty as a due diligence obligation that demands ex ante scrutiny of technical reliability, safety, environmental impact and debris mitigation, and ex post monitoring through reporting and oversight. In practice, licensing systems in spacefaring States combine administrative screening, financial guarantees, insurance requirements and conditions on data sharing or traffic management, so that private contracts and risk allocation clauses still sit inside an outer shell of State responsibility under international space law.[17]

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[15] U.S. Dep't of State, Artemis Accords, https://www.state.gov/bureau-of-oceans-and-international-environmental-and-scientific-affairs/artemis-accords (last visited 8 Mar. 2026).
[16] U.N. Office for Outer Space Aff., Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html (last visited 8 Mar. 2026).
[17] Frans G. von der Dunk, Article VI of the Outer Space Treaty and International Space Law, in National Space Legislation in Europe (Frans G. von der Dunk ed., 2011), https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1068&context=spacelaw (last visited 8 Mar. 2026).

India's regulatory trajectory reflects this model but remains in transition, since the Indian Space Policy 2023 designates IN-SPACe as a single window agency for authorising space activities by government entities and non governmental entities, while comprehensive primary legislation is still under discussion. The policy empowers IN-SPACe to frame norms and guidelines, assess safety, national security and treaty compliance, and thereby translate the Article VI responsibility standard into concrete licensing decisions affecting launch services, satellite constellations and commercial remote sensing by Indian private actors.[18]

B. Space Mining, Appropriation Debates and the Global Commons

Domestic space resources laws mark a sharp turn toward commercial exploitation, because provisions like Title IV of the U.S. Commercial Space Launch Competitiveness Act recognise that United States citizens may obtain property rights over asteroid or space resources they extract, while asserting that such recognition does not amount to sovereignty over celestial bodies and therefore remains consistent with Article II of the Outer Space Treaty. Legal commentary accepts that the treaty is silent on private ownership of extracted resources but warns that broad, unilateral recognition of property could undermine the non appropriation norm and fuel regulatory races to the bottom.[19]

Luxembourg's 2017 Law on the Exploration and Use of Space Resources adopts a similar approach by declaring that space resources are capable of being owned, yet it also builds a mission authorisation scheme to supervise operators and align national practice with international obligations. The law conditions exploration and use on prior written authorisation and supervision by competent ministers, so it embeds commercial certainty

[18] Gov't of India, Indian Space Policy 2023 (2023), https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf (last visited 8 Mar. 2026).
[19] Fabio Tronchetti, Title IV – Space Resource Exploration and Utilization – Of the U.S. Commercial Space Launch Competitiveness Act: A Legal and Economic Analysis, 41 Air & Space L. 143 (2016), https://kluwerlawonline.com/journalarticle/Air%2Band%2BSpace%2BLaw/41.2/AILA2016012 (last visited 8 Mar. 2026).

for investors within a regime that still accepts space as a shared environment and ties extraction to regulatory control by the authorising State.[20]

The Artemis Accords extend this trend into a plurilateral governance template because participating States jointly affirm that extraction and use of space resources do not in themselves constitute prohibited national appropriation and call for coordination, interoperability and the use of safety zones around operational sites. While the Accords insist on consistency with the Outer Space Treaty, critics fear that expansive interpretations of resource rights and de facto exclusion zones could gradually erode the spirit of open access to the lunar and asteroid commons for non

C. Equity, Benefit Sharing and Interests of the Global South

The language of outer space as the "province of all humankind" and as part of the global commons has acquired renewed importance because it frames commercialisation debates in distributive terms, not only in market or security terms. Recent empirical work on global commons narratives shows that States and private actors use this framing strategically, sometimes to justify restraint and sustainability, sometimes to justify open access for those with launch capacity, which means that without explicit legal mechanisms, the commons idea can coexist with widening material inequalities in access to orbits and resources.[21]

Global South scholarship highlights how existing governance structures mirror terrestrial power imbalances, as technologically advanced States and their corporations dominate launch infrastructure, standard setting and early claims to economically attractive orbits and sites. Proposals grounded in environmental law and common heritage thinking

[20] Luxembourg, Contribution of the Grand Duchy of Luxembourg on the Working Group on Legal Aspects of Space Resource Activities (2022), https://www.unoosa.org/documents/pdf/copuos/lsc/space-resources/LSC2023/StatesResponses/Luxembourg_-_20221216_WG_SR_LU_Contribution.pdf (last visited 8 Mar. 2026).

[21] XS Yap & P. Pic, Outer Space as a Global Commons: Competition, Contestation, and Regulation, Int'l J. Commons (2023), https://www.chaire-epi.ulaval.ca/sites/chaire-epi.ulaval.ca/files/publications/space.pdf (last visited 8 Mar. 2026).

therefore call for stronger benefit sharing, technology transfer, capacity building and inclusive decision making so that outer space remains a global commons serving all humanity, not only a projection of Global North capital and military power.[22]

India's position illustrates this tension because it has signed, but not ratified, the Moon Agreement, which envisages the lunar resources regime as part of the common heritage of mankind, even as it now promotes a dynamic commercial space sector under the Indian Space Policy 2023. Commentators argue that India can use its dual identity as a major space power and a leading voice of the Global South to press for a resource governance framework that respects non appropriation, permits regulated commercial use, and embeds concrete arrangements for benefit sharing with developing States that currently lack independent access to space.[23]

VI. SECURITY, MILITARISATION AND DUAL USE TECHNOLOGIES IN OUTER SPACE

A. Demilitarisation, Non-weaponisation and Existing Constraints

Article IV of the Outer Space Treaty prohibits placing nuclear weapons or other weapons of mass destruction in orbit, or on celestial bodies, and it requires that the Moon and other celestial bodies are used only for peaceful purposes, but it does not ban all military uses of space. States still operate military communication, navigation and reconnaissance satellites, as long as they do not carry prohibited weapons, so demilitarisation in the strict sense applies mainly to celestial bodies and not to Earth orbit itself.[24]

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[22] S. Palit, Rebalancing Space Governance: A Global South Perspective on Outer Space as a Global Commons, Frontiers in Space Tech. (2025), https://discovery.researcher.life/article/rebalancing-space-governance-a-global-south-perspective-on-outer-space-as-a-global-commons/69f60d9277fd3541ac22fd3cae894f39 (last visited 8 Mar. 2026).

[23] Bharat Dahiya, As the First Country to Land on the Moon's South Pole, Should India Also Be the First Space Power to Ratify the Moon Agreement, EJIL: Talk! (Sept. 13, 2023), https://www.ejiltalk.org/as-the-first-country-to-land-on-the-moons-south-pole-should-india-also-be-the-first-space-power-to-ratify-the-moon-agreement/ (last visited 8 Mar. 2026).

[24] U.N. Office for Outer Space Aff., Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies art. IV (1967), https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html (last visited 8 Mar. 2026).

The General Assembly's resolutions on the Prevention of an Arms Race in Outer Space repeatedly stress that existing treaties are not sufficient to prevent new weapons and hostile acts in orbit. These instruments call on States, especially those with major space capabilities, to avoid actions contrary to peaceful use and to negotiate further measures, yet they remain politically binding only, so the legal constraint on deployment of conventional counterspace systems stays weak and fragmented.[25]

India's disarmament diplomacy links its security interests with support for a negotiated, legally binding instrument on PAROS, while it continues to expand national space capabilities. In its statement to the First Committee in 2023, India affirmed that outer space should remain an arena for cooperation and backed a treaty on PAROS in the Conference on Disarmament, which shows an attempt to reconcile strategic autonomy with a principled stand against weaponisation of space.[26]

B. ASAT Testing, Space Debris and Strategic Stability

Anti-satellite tests reveal the gap between formal non weaponisation promises and actual military practice in orbit, because they demonstrate kinetic capability against space objects without openly stationing weapons of mass destruction there. The 2007 Chinese ASAT test against the Fengyun-1C satellite and later tests by the United States and India signalled that major powers view space assets as legitimate military targets and are willing to accept escalatory risk to preserve deterrence options.[27]

Kinetic ASAT tests generate large clouds of long lived debris that threaten all spacecraft in similar orbital bands and increase collision probabilities in already congested orbits. UNIDIR's space security work notes that destructive counterspace technologies,

[25] G.A. Res. 62/20, Prevention of an Arms Race in Outer Space (Jan. 10, 2008).
[26] Anupam Ray, Statement by India at the 78th U.N. Gen. Assemb. First Comm., U.N. Doc. A/C.1/78/PV.3 (Oct. 6, 2023), https://docs-library.unoda.org/General_Assembly_First_Committee_-Seventy-Eighth_session_%282023%29/Statement_by_India_-_78th_UNGA_-_First_Committee-_General_Debate.pdf (last visited 8 Mar. 2026).
[27] Kelsey Davenport, Indian ASAT Test Raises Space Risks, Arms Control Today (May 2019), https://www.armscontrol.org/act/2019-05/news/indian-asat-test-raises-space-risks (last visited 8 Mar. 2026).

particularly direct ascent interceptors, currently form some of the most destabilising capabilities because they multiply debris and create uncertainty about intent, which undermines confidence and increases crisis instability among rivals.[28]

India's Mission Shakti test in 2019, conducted at a relatively low altitude, was framed by the government as a responsible demonstration that minimised long term debris, yet international commentary still underlined the negative precedent for other States and the challenge it poses to India's own advocacy of PAROS. Comparative analysis of the Chinese and Indian tests argues that both events strengthened national prestige and deterrence narratives but also increased pressure for clearer behavioural norms, debris mitigation commitments and test bans that could stabilise the strategic environment.[29]

C. Gaps in Arms Control and Emerging Security Norms

Space security debates now focus on dual use systems, because many satellites and on orbit technologies serve both civilian and military functions, which blurs the line between legitimate military support and offensive counterspace use. UNIDIR research notes that dual use and multi use systems complicate threat perceptions, since the same rendezvous or inspection capability can support debris removal or hostile interference, so traditional arms control focused on hardware categories struggles to capture these risks.[30]

Proposals such as the draft treaty on the prevention of the placement of weapons in outer space, the so called PPWT sponsored by Russia and China, seek to fill legal gaps by prohibiting weapons in orbit and the threat or use of force against space objects, but critics highlight serious verification problems and the omission of ground based ASAT systems. Western States often view the PPWT as insufficiently comprehensive and as silent on

[28] U.N. Inst. for Disarmament Research, Outer Space Security Conference 2022 Report 7–10 (2023), https://unidir.org/files/2023-02/UNIDIR_2022_Outer_Space_Security_Conference_Report.pdf (last visited 8 Mar. 2026).
[29] Dimitrios Stroikos, Still Lost in Space? Understanding China and India's Anti Satellite Tests, 19 Astropolitics 1 (2023), https://www.tandfonline.com/doi/full/10.1080/14777622.2023.2277253 (last visited 8 Mar. 2026).
[30] Aaron Boley & Michael Byers, Shared Risks: An Examination of Universal Space Security Challenges 5–9, U.N. Inst. for Disarmament Research (2018), https://unidir.org/files/publication/pdfs/shared-risks-an-examination-of-universal-space-security-challenges-en-775.pdf (last visited 8 Mar. 2026).

subtle forms of interference, while its supporters argue that it still offers a starting point for codifying non weaponisation norms beyond the narrow WMD ban in the Outer Space Treaty.[31]

The United Nations Open Ended Working Group on reducing space threats through norms, rules and principles of responsible behaviour represents a shift toward behaviour based governance rather than hardware bans alone. Recent General Assembly resolutions, including A/RES/79/22, welcome these deliberations and encourage development of voluntary norms such as responsible proximity operations, notification of potentially hazardous manoeuvres and political commitments not to conduct debris generating ASAT tests, although they still stop short of binding prohibitions and robust verification, leaving significant work for future space security law making.[32]

VII. LIABILITY, REGISTRATION AND DISPUTE RESOLUTION MECHANISMS

A. International Liability Regime and Standards of Fault

The liability framework for space activities rests on Article VII of the Outer Space Treaty and the 1972 Liability Convention, which together make the launching State internationally liable for damage caused by its space objects, regardless of whether the operator is public or private.[33]

The Liability Convention adopts a dual standard. It imposes absolute liability for damage caused on the surface of the Earth or to aircraft in flight, and a fault based standard for

[31] Nuclear Threat Initiative, Proposed Prevention of an Arms Race in Space (PAROS) Treaty / PPWT (2024), https://www.nti.org/education-center/treaties-and-regimes/proposed-prevention-arms-race-space-paros-treaty (last visited 8 Mar. 2026).
[32] G.A. Res. 79/22, Reducing Space Threats Through Norms, Rules and Principles of Responsible Behaviours (Dec. 9, 2024), https://docs.un.org/en/A/RES/79/22 (last visited 8 Mar. 2026).
[33] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies art. VII, Jan. 27, 1967, 610 U.N.T.S. 205.

damage occurring in outer space, which requires proof that the launching State or persons for whom it is responsible acted wrongfully.[34]

Scholars underline that this regime is inter State and leaves private victims to rely on their own government to espouse a claim, while it also struggles with cyber operations, shared control, and complex contractual chains in the new commercial space economy.[35]

B. Registration, Jurisdiction and Control over Space Objects

Registration of space objects implements Article VIII of the Outer Space Treaty, which allows the State of registry to retain jurisdiction and control over objects launched into outer space and over any personnel thereof.[36]

The 1975 Registration Convention requires each launching State to maintain a national register and to furnish basic orbital and identification data to the UN, so that objects can be traced and linked to a responsible State in case of harmful interference or damage.[37]

Contemporary commentary treats registration as both a jurisdictional hook and a confidence building measure, since it supports transparency, traffic management and collision avoidance, yet it also notes that mega constellations, re registries and foreign operated satellites complicate the neat link between one State of registry and effective control.[38]

[34] Convention on International Liability for Damage Caused by Space Objects arts. II–III, Mar. 29, 1972, 961 U.N.T.S. 187.
[35] Jack M. Beard, The Liability Convention and the Future of Conflict in Space, 14 Chi. J. Int'l L. 1 (2013), https://cjil.uchicago.edu/print-archive/closing-liability-loophole-liability-convention-and-future-conflict-space (last visited 8 Mar. 2026).
[36] Outer Space Treaty, supra note 1, art. VIII.
[37] Convention on Registration of Objects Launched into Outer Space arts. II–IV, Nov. 12, 1974, 1023 U.N.T.S. 15.
[38] Irmgard Marboe, Registration of Space Objects, in Soft Law in Outer Space 111 (Irmgard Marboe ed., 2023).

C. Dispute Settlement, Compliance and Enforcement Challenges

The Liability Convention provides a special claims procedure that obliges States to first attempt diplomatic settlement and, if unsuccessful, to establish an ad hoc Claims Commission whose decisions become binding only if the parties so agree in advance.[39]

Practice shows that States prefer informal negotiation or ex gratia settlements to formal use of this mechanism, and commentators point out that no claim has proceeded to a fully binding decision, which weakens legal certainty for future large scale incidents involving debris, collisions or re entry damage.[40]

Analysts also emphasise a structural gap for non State actors, because private operators and individuals have no direct standing under the UN space treaties and must rely on diplomatic protection, while at the same time commercial contracts increasingly channel disputes to arbitration or specialised courts that apply both national law and general international law.[41]

Emerging proposals call for stronger use of institutionalised arbitration, such as the Permanent Court of Arbitration Optional Rules for Space Related Disputes, and for closer coordination between national space regulators, insurers and arbitral tribunals, but these ideas remain soft law and depend heavily on party consent, which leaves compliance and enforcement in space law still fragmented and quite fragile.[42]

VIII. FINDINGS & CONCLUSION

The international regime on outer space still rests on a compact set of UN treaties adopted between 1967 and 1979, which operate like a constitutional layer but leave many

[39] Liability Convention, supra note 2, arts. VIII–XIX.
[40] Kai Schmalenbach, The Convention on International Liability for Damage Caused by Space Objects, in The New Space Law 225 (2022).
[41] Kartikeya Sinha, Dispute Resolution in International Space Law: A Dearth of Relief for Non State Actors, NLIU Ctr. for Research in Int'l L. Blog (Mar. 13, 2025), https://cril.nliu.ac.in/2025/03/13/dispute-resolution-in-international-space-law-a-dearth-of-relief-for-non-state-actors/ (last visited 8 Mar. 2026).
[42] Stephen C. Kilgore, Arbitration Rules for Disputes Arising from Outer Space Activities, 24 Air & Space Law. 3 (2018), https://www.fedbar.org/wp-content/uploads/2018/03/Outerspace-pdf-1.pdf (last visited 8 Mar. 2026).

operational questions to later soft law and national practice. The study finds that the Outer Space Treaty and its companion agreements continue to frame core principles such as non appropriation, freedom of use and State responsibility, yet they do not provide detailed guidance on commercial mega constellations, resource extraction or cyber interference with space systems, so interpretation and gap filling now occur largely through practice and policy rather than formal treaty reform.[43]

Scholarship and institutional reports show a growing disjuncture between this treaty core and the complexity of the contemporary space economy, where dual use technologies, public private partnerships and transnational supply chains dominate. Analytical work on space law increasingly describes the field as a dense web of international, regional and domestic rules, with fragmentation across liability, registration, spectrum management, environmental protection and trade controls, and this research confirms that such fragmentation produces uncertainty about applicable standards and fora when incidents cut across several regulatory domains at once.[44]

The examination of India's emerging space governance framework reveals a decisive move from a state centric, ISRO dominated model to one that encourages non governmental entities across the value chain while still keeping strategic control with the Union. The Indian Space Policy 2023 assigns authorisation functions to IN-SPACe and clarifies institutional roles, but it does not yet constitute a comprehensive space activities statute, so key issues such as private liability allocation, mandatory insurance, environmental obligations and dispute resolution remain dispersed across policy documents, sectoral regulations and general private law, which this study identifies as a serious structural gap.[45]

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Work within the United Nations on long term sustainability and responsible behaviour in outer space underlines the need to link classical principles with concrete operational norms on debris mitigation, transparency, information sharing and capacity building, especially for developing States. By situating Indian reforms within this wider debate, the research concludes that effective outer space regulation now requires a combination of clarified treaty interpretation, more ambitious soft law on sustainability and security, and detailed national legislation that can translate global standards into enforceable obligations for both State agencies and commercial operators, while still honouring the commitment that outer space remains the province of all humankind.[46]

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