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ASIAN-AFRICAN LEGAL CONSULTATIVE ORGANIZATION

LEGAL ISSUES IN OUTER SPACE

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LEGAL ISSUES IN OUTER SPACE

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I. INTRODUCTION

A. AALCO and Legal Issues in Outer Space

1. The topic "Legal Issues in Outer Space" was introduced into agenda of Asian-African Legal Consultative Organization (AALCO) following a proposal by the Republic of India during its Sixty-first Annual Session, which took place in Bali, Republic of Indonesia.

2. The proliferation of orbital debris presents an escalating and formidable challenge to the sustained utilization of outer space. The current orbital environment is increasingly congested, with estimates from early 2025 indicating more than 30,000 artificial objects larger than 10 cm and approximately 1,000,000 objects larger than 1 cm are in orbit.[1] This population of non-functional objects, commonly referred to as space debris or "space junk", ranges from defunct satellites and spent rocket stages to fragments from explosions and collisions.[2] Launch traffic has significantly increased, compounding the issue. The inherent risks posed by this debris, travelling at hypervelocities, include damage to operational spacecraft, threats to human spaceflight, and the potential initiation of a cascading collision scenario known as the Kessler Syndrome, which could render certain orbital regions unusable.[3]

3. This brief provides a detailed analysis of the international legal and regulatory dimensions of orbital debris. It will examine the foundational international treaties, notably the Outer Space Treaty (OST) and the Liability Convention, with respect to their provisions on State responsibility and liability for debris. The brief also discusses the role and impact of key voluntary international frameworks, specifically the UNCOPUOS Space Debris Mitigation Guidelines and the IADC Space Debris Mitigation Guidelines. Finally, the brief covers contemporary deliberations within UNCOPUOS and the evolution of norms pertaining to space

[1] UNCOPUOS, 'IADC Report on the Status of the Space Debris Environment' (2025) UN Doc A/AC.105/C.1/2025/CRP.10 <https://www.unoosa.org/res/oosadoc/data/documents/2025/aac_105c_12025crp/aac_105c_12025crp_10_0_html/AC105_C1_2025_CRP10E.pdf> accessed 13 May 2025.

[2] NASA, 'Space Debris' (*NASA*) <https://www.nasa.gov/headquarters/library/find/bibliographies/space-debris/> accessed 13 May 2025.

[3] Frans G von der Dunk, 'Space Law and Hazardous Space Debris' (*Oxford Research Encyclopedias*, 2021) <https://oxfordre.com/planetaryscience/oso/viewentry/10.1093$002facrefore$002f9780190647926.001.0001$002facrefore-9780190647926-e-70> accessed 13 May 2025.

debris and the long-term sustainability of outer space activities. The objective is to present a comprehensive overview of the issue.

B. DELIBERATIONS AT THE SIXTY-SECOND ANNUAL SESSION OF AALCO (BANGKOK, THE KINGDOM OF THAILAND, 11 SEPTEMBER 2024)

4. Mr. Yong Zhu, Deputy Secretary-General of AALCO in his introductory remark recalled that the topic "Legal Issues in Outer Space" was proposed by the Republic of India during AALCO's Sixty-First Annual Session in Bali (2023), in response to the growing complexity of legal challenges arising from the rapid expansion of space activities by both state and non-state actors. While existing international legal instruments, particularly the 1967 OST, provide a foundational framework, they face increasing pressure from emerging technologies, the rise of private sector participation, and potential threats of space militarization.

5. Emphasizing the urgency of addressing these developments, Mr. Zhu highlighted AALCO's role in promoting legal dialogue and cooperation among Asian and African nations. He welcomed the inclusion of this topic in AALCO's agenda and presented three key areas identified by the Secretariat for focused discussion: the peaceful uses and exploration of outer space, the utilization of space resources, and capacity-building in space law. These priorities reflect the Organization's commitment to shaping a robust, inclusive, and future-ready legal regime for outer space governance. The delegates of the following Member States and Observers delivered statements on the agenda item: the United Republic of Tanzania, Islamic Republic of Iran, the Kingdom of Thailand, Malaysia, the Republic of India, the Republic of Kenya, People's Republic of China, Republic of Uganda, Japan, Republic of Türkiye, Republic of Korea, the People's Republic of Bangladesh, the Republic of South Africa, and the Republic of Indonesia and the Asian Academy of International Law (AAIL).

6. **The Delegate of the United Republic of Tanzania** stated that the issue of outer space is a growing global concern, touching on both the safety and security of all nations. They commended AALCO for choosing such a timely and important topic, emphasizing that Member States have a vital role to play in shaping international space law. They highlighted how the

landscape has changed since the OST was first adopted in 1967, with many more actors now involved in space activities beyond just states.

7. The delegate acknowledged that although they have not yet signed the OST, the government is actively working on the internal processes needed to join. They expressed its commitment to the treaty's principles and called for greater capacity-building in space law across Asia and Africa. They requested support from AALCO Member States, and the UNOOSA to help develop its own national space law and policy, as well as to train a new generation of space law experts. The delegate reaffirmed Tanzania's dedication to ensuring that outer space remains a peaceful domain and a shared heritage for all humanity, and pledged to continue working closely with the international community to achieve this goal.

8. **The Delegate of the Islamic Republic of Iran** stated that access to outer space is essential for global security, economic development, and the well-being of all nations, particularly developing countries such as Iran. Reaffirming its commitment to international law and the UN Charter, the delegate emphasized that outer space must remain a peaceful domain accessible to all, regardless of economic or scientific capability, and that major spacefaring nations bear a special responsibility to prevent its militarization. Expressing concern over the growing weaponization of outer space, including anti-satellite weapon tests and unauthorized satellite internet operations like Starlink within its territory, Iran called for enhanced international cooperation, legal oversight, and the development of new frameworks to address emerging challenges. Referring to ongoing discussions within the UNCOPUOS, the delegate stressed that space resource activities must be conducted peacefully and equitably, advocating for an inclusive international legal regime to ensure fair distribution and sustainability. Iran urged AALCO to contribute actively in resolving legal uncertainties and promoting equal access to the benefits of outer space.

9. **The Delegate of the Kingdom of Thailand** stated that as space activities expand rapidly, it is essential for legal frameworks to evolve accordingly. They emphasized their commitment to ensuring that space is used peacefully and for the benefit of all humanity, and highlighted ongoing efforts to develop a national space law that aligns with international standards while addressing the specific needs of Thailand's emerging space sector. Their approach to space law

centres on three main areas: aligning national laws with international treaties like OST and ensuring that both current and future legal instruments are interpreted in accordance with international law, including the UN Charter. The delegate also stressed the importance of promoting responsible and sustainable use of space to support economic and social development while protecting the space environment for future generations. Finally, the delegate highlighted the value of international cooperation, aiming to work with other countries and organizations to share knowledge, technology, and the benefits of space activities. In closing, they reaffirmed their dedication to collaborating internationally to build a peaceful, sustainable, and equitable future in outer space.

10. **The Delegate of Malaysia** stated that discussions within AALCO should avoid duplicating those already taking place in the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (LSC COPUOS). Instead, AALCO should focus on making distinct contributions and utilizing its resources effectively. Malaysian delegate emphasized the need for robust governance frameworks as space activities grow, with increased involvement from both states and private actors. In affirming its support for the UNOOSA and relevant UN General Assembly resolutions, Malaysia particularly stressed the importance of long-term sustainability and the prevention of the militarization of outer space. The delegate underscored the significance of the non-appropriation principle under the OST, advocating for equal rights of all nations, regardless of economic or scientific capabilities, to explore and benefit from outer space.

11. The delegate further highlighted Malaysia's commitment to inclusive international cooperation through reference to its national efforts and regional engagements. Citing the Malaysian Space Board Act 2022 and the successful launch and registration of two satellites, Malaysia presented its alignment with international space law standards. The country's active role in capacity-building was demonstrated through hosting UNOOSA-led seminars and technical missions, as well as collaborative initiatives with ASEAN states to enhance regional expertise. Through these measures, Malaysia reiterated its dedication to equitable access to space, the promotion of transparency, and the strengthening of global partnerships in space governance.

12. **The Delegate of the Republic of India** stated that space is vital for the social and economic development of any nation, and emphasized that all space activities must be carried out in accordance with international law to maintain peace, security, and cooperation. They highlighted their status as a party to all major international space treaties and its implementation of non-legally binding instruments, including the UN Space Debris Mitigation Guidelines. Recognizing the growing number of manmade objects in space, India underscored the importance of developing dedicated Space Situational Awareness (SSA) capabilities and enhancing these through data sharing and collaborations.

13. The delegate stressed the crucial role of Transparency and Confidence Building Measures (TCBMs) in ensuring peaceful uses of outer space, and pointed to the usefulness of the UN and IADC Space Debris Mitigation Guidelines, as well as procedures like Space Object Proximity Awareness (SOPA) and Collision Avoidance (COLA) Analysis in addressing sustainability issues. They called for further legally binding measures to meet new challenges, especially as private sector participation grows. India also outlined its major space reform in 2020, which enabled private sector participation through the Indian National Space Promotion and Authorization Centre (IN-SPACe), ensuring proper authorization and monitoring of space activities. Finally, the Indian delegate emphasized the importance of capacity building in space law and expressed confidence that AALCO will continue to be an important platform for discussing legal issues, enhancing transparency, and ensuring the safety and sustainability of all space-based activities.

14. **The Delegate of the Republic of Kenya** stated that space exploration has significantly advanced since the launch of Sputnik 1, noting Kenya's early involvement through a partnership with Italy that led to the establishment of a satellite launch and tracking facility in Malindi, now operating as the Luigi Broglio Space Station. Emphasizing the integral role of space technology in daily life, ranging from communication and navigation to agriculture and disaster management, the delegate highlighted Kenya's view of space as a catalyst for economic growth and sustainable development. Kenya's progress includes the creation of the Kenya Space Agency in 2017, the deployment of its first satellite, 1KUNS PF, in 2018, and the 2023 launch of Taifa 1, its first operational earth observation satellite, providing critical data for national planning.

The delegate noted that the Kenya Space Policy 2015 provided the foundation for these efforts, with the updated 2024 policy and forthcoming Space Bill aimed at aligning national regulations with international obligations. Kenya reaffirmed its commitment to international cooperation and invited partnerships to strengthen capacity in the peaceful use of outer space.

15. **The Delegate of the People's Republic of China** emphasized that maintaining outer space for peaceful purposes is the core objective of the OST, which prohibits the placement of nuclear or other weapons of mass destruction in space. Any action that undermines this, such as weaponization or forming military alliances in outer space, runs counter to the Treaty's intent. To address these concerns, China and the Russian Federation jointly proposed the draft Treaty on the Prevention of the Placement of Weapons in Outer Space (PPWT), offering a practical legal path to prevent an arms race in space and uphold the OST's objectives. The delegate also stressed the importance of establishing clear legal frameworks for space resource activities, pointing out that while the OST provides a general foundation, there is a need for more specific rules. In this regard, China's submission to the COPUOS Working Group reaffirmed key principles, including non-appropriation, coordination, sustainability, supervision, and the equitable use of space resources for the benefit of all humanity.

16. The delegate highlighted China's recent progress in its space industry, underscoring the country's commitment to international cooperation, especially with developing nations. China promotes the idea of a shared future for humankind and supports collaboration based on equality, mutual respect, and peaceful development. The delegate noted that several AALCO Member States have partnered with China on missions such as Chang'e 6 and 7, and that China has also signed agreements with countries on the International Lunar Research Station project. Additionally, China contributes to global space capacity-building through organizations like the Asia-Pacific Space Cooperation Organization and educational initiatives led by Beihang University. Concluding the statement, they reiterated their willingness to work closely with Asian and African nations to advance peaceful uses of outer space and promote inclusive and cooperative global space governance.

17. **The Delegate of the Republic of Uganda** expressed appreciation to the AALCO Secretariat for its comprehensive brief, which laid a solid foundation for discussions on legal

developments in outer space, particularly concerning peaceful use and exploration, space resource utilization, and capacity-building in space law. Uganda, a State Party to the OST since 1968, reaffirmed its commitment to the treaty's principles, emphasizing the importance of maintaining outer space as a peaceful and demilitarized domain. The delegate called for the international community to develop ethical standards to prevent the weaponization of space, suggesting that AALCO revisit related UN discussions to help shape future regulatory frameworks. Uganda also stressed the urgent need to bridge capacity gaps in Asia and Africa, highlighting that without sufficient technological and institutional support, these regions may not fully benefit from space activities. Referencing the words of former UN Fourth Committee Chair Mr. Semakula Kiwanuka, the delegate underlined the role of space technologies in addressing challenges like resource management and disaster response. Uganda urged AALCO to play a leading role in supporting its Member States in creating robust legal and regulatory structures to ensure that outer space remains a peaceful and inclusive global commons.

18. **The Delegate of Japan** emphasized the significance of upholding the rule of law in outer space to maintain the safety, security, sustainability, and stability of space activities. Recognizing the value of international cooperation, particularly in the area of capacity-building, the delegate highlighted the importance of information sharing and the exchange of national space legislation to support the development of legal frameworks in accordance with international norms. Japan drew attention to the National Space Legislation Initiative (NSLI) under the Asia-Pacific Regional Space Agency Forum (APRSAF), which serves as a regional platform for promoting these goals. As the host of APRSAF, Japan expressed its commitment to actively support the initiative and help strengthen national space laws across the region.

19. Japan also outlined its efforts to assist emerging spacefaring nations through the UNOOSA-led "Space Law for New Space Actors" initiative, supporting countries in aligning their space laws with international standards. In January 2024, Japan co-hosted a capacity-building program in Tokyo for officials from seven Asia-Pacific nations, focusing on key aspects such as authorization, licensing, and supervision of space activities. Regarding space resource governance, Japan noted its participation in the Artemis Accords, which reflect a political commitment to principles guiding the peaceful exploration and use of outer space. The delegate

suggested that elements of the Accords could inform the development of a broader international framework that supports both sustainability and innovation in future space exploration.

20. **The Delegate of the Republic of Türkiye** expressed appreciation to the AALCO leadership and Secretariat for their efforts in organizing the session and emphasized the dynamic and evolving nature of outer space exploration. Türkiye reaffirmed its support for inclusive and gradual development of responsible norms and behaviours in space activities, noting its status as a party to the core UN space treaties, particularly the OST. The delegate highlighted Türkiye's co-sponsorship of key UN General Assembly resolutions on preventing destructive anti-satellite missile testing and reducing space threats through responsible behaviour. Türkiye has been actively engaged in the open-ended working group in Geneva established under UNGA Resolution 76/231 and extended through Resolution 78/20, and expressed continued support for the initiative. The delegate also noted Türkiye's commitment to peaceful uses of outer space through bilateral cooperation agreements and reiterated that discussions within AALCO should complement, not duplicate or override, positions maintained in ongoing UN processes.

21. **The Delegate of the Republic of Korea** thanked the AALCO Secretariat for preparing the agenda and emphasized the importance of international norms, treaties, and cooperative efforts as the foundation for the sustainable exploration and use of outer space. Highlighting the significance of ongoing discussions within the UN Committee on the Peaceful Uses of Outer Space and the UN Group of Governmental Experts, the delegate identified the governance of space resources as a pressing legal issue and welcomed efforts to develop recommended principles for their equitable and sustainable use. The Republic of Korea stressed the need for all nations to faithfully implement existing agreements, particularly the OST, including its prohibition on the weaponization of outer space under Article IV, to prevent an arms race. The delegate shared that Korea has recently established the Korea Airspace Administration (KASA) to coordinate its space activities and foster international collaboration. Korea's current lunar exploration efforts, including the Danuri orbiter and plans for a lunar lander by 2032, are being pursued in alignment with international law, and the country expressed appreciation for global capacity-building efforts in space law.

22. **The Delegate of the People's Republic of Bangladesh** expressed appreciation to the AALCO Secretariat for its detailed brief and highlighted Bangladesh's growing engagement in space activities, including the successful launch of its first geostationary communication satellite in 2018. Bangladesh firmly supports the peaceful use of outer space and opposes its weaponization, advocating for stronger international legal instruments to address emerging challenges, including increasing private sector participation. The delegate reaffirmed the importance of Article IV of the OST, which prohibits the placement of weapons of mass destruction in space, and reiterated Bangladesh's support for negotiations on a legally binding instrument to prevent an arms race in outer space. Bangladesh also emphasized the significance of the non-appropriation principle, welcoming the work of the UNCOPUOS Working Group on space resource activities. Stressing the importance of space environment protection, the delegate called for transparency, information sharing, and space debris mitigation, especially to safeguard small satellites from developing countries. Bangladesh acknowledged the critical role of regional and international cooperation platforms such as APSCO and UN-SPIDER and concluded by supporting AALCO's efforts to complement UN-OOSA's initiatives in building the legal capacity of developing countries, particularly in formulating national legislation aligned with international space law.

23. **The Delegate of the Republic of South Africa** marked the 25th anniversary of the country's first satellite launch, reaffirming its commitment to the peaceful and responsible use of outer space. With 12 satellites currently in orbit and efforts underway to develop domestic launch capabilities, South Africa underscored the role of space activities in supporting sustainable development, earth observation, communication, and resource management. The delegate stressed the importance of adherence to international space law, particularly the UN space treaties, and called for legally binding instruments to address existing legal gaps. Highlighting the responsibility of states under Article VI of the OST to regulate non-governmental space activities, South Africa is currently revising its national space legislation to reflect evolving technologies and legal principles. The delegate emphasized the urgent need for a legal framework governing space resource extraction, aligning with the principle of non-appropriation in Article II of the OST, and suggested the Moon Treaty as a useful foundation for equitable benefit-sharing. South Africa raised concerns about the impact of mega-constellations

on astronomical research, particularly the Square Kilometre Array, and stressed the need to address space debris and ensure long-term sustainability. The country welcomed the establishment of the African Space Agency and called for greater African and Asian participation in COPUOS. Finally, South Africa reiterated its opposition to the weaponization of space and supported the establishment of a legally binding instrument under the Conference on Disarmament to prevent an arms race in outer space, while also endorsing AALCO's proposal to further study legal issues and promote regional cooperation through capacity-building initiatives.

24. **The Delegate of the Republic of Indonesia** expressed appreciation for the opportunity to contribute to AALCO's deliberations and underscored the critical role of space technology in supporting the needs of Indonesia, particularly as the world's largest archipelagic state. Emphasizing the importance of remote sensing, telecommunications, and navigation, the delegate noted Indonesia's commitment to advancing its satellite programme and establishing a spaceport in the equatorial region. Indonesia is in the process of strengthening its national space regulations, particularly with regard to spaceport operations. The delegate outlined key legal issues requiring attention, including the need for a clear definition and delimitation of outer space to avoid sovereignty disputes and enhance legal clarity; the equitable governance of geostationary orbit (GSO), which Indonesia believes warrants a sui generis regime to reflect its limited and critical nature; and the lack of regulation over satellite mega constellations in non-geostationary orbits, which could pose challenges to equitable access and orbital sustainability.

25. On space security, Indonesia expressed concern over the increasing weaponization of outer space and advocated for a legally binding multilateral instrument to prevent an arms race in outer space (PAROS). Regarding space resource utilization, the delegate stressed the need for an interdisciplinary legal approach rooted in the OST and other UN frameworks, with clarity on the scope and boundaries of outer space being fundamental. Recognizing the complexity of legal and technical challenges in space activities, Indonesia called for regular capacity-building programmes under AALCO, expert exchanges, and youth engagement in both scientific and legal aspects of space. Highlighting its own success in student-led satellite development,

Indonesia reaffirmed its commitment to advancing the legal discourse on outer space and supported the continuation of this agenda item in future AALCO sessions.

26. **The Delegate of the Asian Academy of International Law** expressed strong appreciation for the inclusion of outer space issues on AALCO's agenda, emphasizing that from the very start of the space age, it was envisioned that outer space exploration and use should benefit all humankind, regardless of a state's economic or scientific advancement, a principle enshrined in the OST. However, the delegate voiced concern that over the past five decades, the inclusive intent of the treaty has been threatened by actions prioritizing the exclusive interests of a few states, particularly undermining the principle of non-appropriation. Stressing that the rule of law should foster cooperative rather than zero sum outcomes, the delegate warned against the risk of outer space becoming a new arena for domination, drawing parallels to colonial land grabs. Highlighting AALCO's roots in the Bandung Conference and its legacy of decolonization, the delegate underscored the Organization's unique role in safeguarding the interests of developing countries in space governance. Citing climate change as a cautionary example of delayed action, the delegate urged the international community to act decisively to uphold the principle that outer space remains the province of all humankind and a global commons, free from distortion or disregard.

C. Topics for Focussed Deliberations at the Sixty-Third Annual Session

27. Following the deliberations on the topic at the previous Annual Session, the current brief will focus on the following aspects of Space Law:

(a) The Foundational International Treaties and Orbital Debris Liability
(b) Contemporary Deliberations and the Evolution of Norms within UNCOPUOS

II. THE FOUNDATIONAL INTERNATIONAL TREATIES AND ORBITAL DEBRIS LIABILITY

28. The foundational legal framework governing activities in outer space, including issues related to orbital debris, is primarily established by two key international treaties: the Outer

Space Treaty of 1967[4] and the Liability Convention of 1972.[5] These instruments articulate principles of State responsibility, liability, jurisdiction, and cooperation that are central to addressing the challenges posed by space debris.

A. The Outer Space Treaty (1967)

29. The OST lays down fundamental principles that, while visionary for their era, possess an inherent generality. This generality can create interpretative and applicative challenges when addressing the specific, technical, and rapidly evolving problem of orbital debris, a gap not entirely bridged by the subsequent Liability Convention, particularly concerning in-space incidents.

30. Article VI of the OST establishes that space activities are conducted by governmental agencies or by non-governmental entities. Importantly, it mandates that the activities of non-governmental entities require authorization and continuing supervision by the appropriate State Party. This provision is fundamental to the governance of orbital debris, as it extends State responsibility to the burgeoning private space sector, whose activities are increasingly contributing to the debris population. The requirement for "continuing supervision" implies an ongoing duty for States, which could be interpreted to encompass the oversight of debris mitigation measures and post-mission disposal practices adopted by their national actors.[6] The efficacy of this provision, however, hinges on the consistency and rigor of national authorization and supervision regimes, which can vary significantly among States.

31. Article VII stipulates that each State Party that launches or procures the launching of an object into outer space, and each State Party from whose territory or facility an object is launched, is internationally liable for damage caused by such object or its component parts to another State Party or to its natural or juridical persons. This article forms the general basis for

[4] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (adopted 27 January 1967, entered into force 10 October 1967) 610 UNTS 205.
[5] Convention on International Liability for Damage Caused by Space Objects (adopted 29 March 1972, entered into force 1 September 1972) 961 UNTS 187.
[6] Christopher D Johnson, *Legal Aspects of Space Debris* (Secure World Foundation, 9 September 2021) <https://swfound.org/media/207257/legal-aspects-of-space-debris-9-sept.pdf> accessed 13 May 2025.

the more detailed provisions on liability elaborated in the Liability Convention. While broadly establishing the principle of international liability, Article VII of the OST does not itself define "damage" or the specific modalities and procedures for liability claims, necessitating the subsequent Liability Convention. Its direct applicability to incidents involving orbital debris is contingent upon such debris being considered a "space object" or its "component parts," a linkage that is generally accepted but faces practical challenges in identification and attribution.

32. According to Article VIII, a State Party on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Further, ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. This principle is central to the legal complexities surrounding orbital debris. It reinforces the notion that even non-functional space objects, which constitute debris, legally remain under the jurisdiction and ownership of the State of registry. This jurisdiction and ownership issue legally complicates unilateral debris removal efforts by other States or private entities, as such actions could be construed as infringing upon the sovereign rights of the State of registry.[7] This aspect is particularly critical in the context of discussions on active debris removal (ADR).

33. The retention of jurisdiction and ownership over space objects, including debris, as stipulated by Article VIII, when combined with the liability provisions of Article VII and the Liability Convention, creates a somewhat paradoxical situation. A State is internationally responsible and potentially liable for damage caused by its debris, yet it also holds sovereign rights over that same debris. This means that the State responsible for the debris also possesses the primary legal authority to permit its removal. Consequently, efforts by third parties to undertake remediation activities could be hindered or delayed if the State of registry does not provide consent, even if such removal is in the collective interest of preserving the space

[7] UNOOSA, 'Space Debris Mitigation and Remediation: Policy and Legal Challenges' (2025) UN Doc A/AC.105/C.2/2025/CRP.24 <https://www.unoosa.org/res/oosadoc/data/documents/2025/aac_105c_22025crp/aac_105c_22025crp_24_0_html/AC105_C2_2025_CRP24E.pdf> accessed 13 May 2025.

environment.[8] This is indicative of a potential conflict between individual State rights over their space objects and the collective international need for effective debris management.

34. Article IX of the OST mandates that States Parties shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space with "due regard to the corresponding interests of all other States Parties to the Treaty". It further requires States to pursue studies of outer space and conduct exploration so as to avoid their "harmful contamination" and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter. If a State Party has reason to believe that an activity or experiment planned by it or its nationals in outer space would cause "potentially harmful interference" with activities of other States Parties in the peaceful exploration and use of outer space, it must undertake appropriate international consultations before proceeding with the activity or experiment.

35. This article is pertinent to the issue of orbital debris. The generation of excessive or long-lived space debris could be argued as a failure to act with "due regard" for the interests of other spacefaring nations, as it increases collision risks and impedes safe access to and use of outer space. The term "harmful contamination" could also be interpreted to encompass the pollution of the orbital environment with debris. However, the OST does not provide precise legal definitions for "due regard," "harmful contamination," or "harmful interference," leading to significant interpretative ambiguities and challenges in their application and enforcement in the context of orbital debris.[9] For example, what constitutes "excessive" debris or "harmful" contamination lacks an agreed-upon threshold. Moreover, the consultation mechanism stipulated for activities causing potentially harmful interference has rarely been invoked in relation to debris-generating events, particularly those with national security implications, leading to questions about the development of customary practice in this area. The inherent generality of these principles, while allowing for adaptability, makes their direct application to the specific,

[8] Ibid.

[9] James Listner, 'The Paradox of Article IX and National Security …' (2020) Air University <https://www.airuniversity.af.edu/Portals/10/AEtherJournal/Journals/Volume-1_Number-4/Listner_The_Paradox.pdf> accessed 13 May 2025.

cumulative, and often unintentional nature of debris creation challenging without further clarification or supplementary agreements.

B. The Convention on International Liability for Damage Caused by Space Objects (1972)

36. The Liability Convention was negotiated to elaborate upon the general principle of liability established in Article VII of the OST. It provides a detailed framework of rules and procedures concerning liability for damage caused by space objects, including their component parts. The Convention defines "damage" as loss of life, personal injury or other impairment of health, or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations.

37. The term "launching State" refers to:

(i) a State which launches or procures the launching of a space object; and

(ii) a State from whose territory or facility a space object is launched.[10]

This broad definition means that multiple States can be considered "launching States" for a single space object and thus share liability.[11] While the definition of "damage" is comprehensive for direct physical harm, its application to indirect consequences of orbital debris, such as the costs incurred for collision avoidance manoeuvres or the economic loss associated with the degradation of particular orbital regions, is not explicitly settled and remains a subject of legal interpretation.[12]

38. Article II of the Liability Convention establishes a regime of absolute liability. It provides that a launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft in flight. Under this standard, the claimant

[10] Convention on International Liability for Damage Caused by Space Objects (adopted 29 March 1972, entered into force 1 September 1972) 961 UNTS 187 (Liability Convention), Art I(c).
[11] Liability Convention, Art V.
[12] See Frans G von der Dunk, 'The Law Applicable to Private Space Activities and the Role of National Space Legislation' (2011) 36 Air and Space Law 259, 271; Fabio Tronchetti, *Fundamentals of Space Law and Policy* (Springer 2013) 93-95.

State does not need to prove any fault on the part of the launching State; the mere occurrence of damage triggers liability. This strong liability standard was notably applied in the aftermath of the Cosmos 954 incident in 1978, where a Soviet satellite carrying a nuclear reactor disintegrated over Canadian territory, and the USSR ultimately paid compensation to Canada for clean-up costs.[13] While generally considered effective for incidents involving identifiable space objects causing damage on Earth, its direct utility for damage caused by unidentified debris fragments re-entering the atmosphere is significantly hampered by the practical challenges of attribution.[14]

39. Article III stipulates that for damage caused elsewhere than on the surface of the Earth (i.e., in outer space) to a space object of one launching State or to persons or property on board such a space object by a space object of another launching State. This provision introduces a fault-based liability regime for space-to-space incidents and is the most critical and problematic article concerning collisions involving orbital debris.

40. The primary challenge with Article III is the ambiguity and difficulty associated with proving "fault." The Convention itself does not define "fault", leaving its interpretation to be determined potentially by reference to general principles of international law, including negligence, a breach of an international obligation (such as those under Article IX of the OST), or a failure to adhere to widely accepted standards of conduct, such as debris mitigation guidelines. The practical difficulties in establishing fault in the remote and often unobserved orbital environment are immense. This includes identifying the debris, tracing it to a launching State, reconstructing the collision event, and demonstrating a specific act of negligence or intentional wrongdoing. The 2009 collision between the operational Iridium 33 satellite and the defunct Russian Cosmos 2251 satellite, both of which were non-manoeuvring at the time of impact, starkly illustrated these challenges, as establishing fault on either side proved exceedingly complex.[15]

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[13] See Eva Cullen, 'Starry Skies and Legal Ties: Navigating the Complexities of Space Debris Liability' (*Columbia Undergraduate Law Review*, 19 September 2023) <https://www.culawreview.org/journal/starry-skies-and-legal-ties-navigating-the-complexities-of-space-debris-liability> accessed 13 May 2025.

[14] Tronchetti (n 12), 96-98; Frans G von der Dunk, 'Too-Close Encounters of the Fourth Kind: Liability for Damage Caused by Space Debris' (1999) 2 ISPL 3, 5–6.

[15] David Wright, 'The collision between the Iridium satellite and the defunct Cosmos 2251 satellite' (*Union of Concerned Scientists*, 2009).

41. The concept of "fault" in Article III of the Liability Convention is a critical unresolved variable. Its interpretation could, in theory, evolve to encompass a failure to adhere to widely accepted, albeit non-binding, debris mitigation guidelines, thereby creating a de facto standard of care for space operations. If a State or an entity under its jurisdiction demonstrably failed to implement these broadly recognized guidelines, and this failure proximately caused a debris-generating event or collision, such an omission could arguably constitute "fault."[16] However, the development of such customary interpretations is significantly hindered by the consistent lack of state practice in formally invoking the Liability Convention for in-space collisions.[17] States have historically preferred to settle such incidents through diplomatic channels or other means, outside the formal mechanisms of the Convention.[18] This absence of adjudicative practice or consistent state claims based on breaches of mitigation guidelines means that the potential for these guidelines to inform and clarify the definition of "fault" under Article III remains largely theoretical and untested. This, in turn, impedes the evolution of a clearer and more predictable liability standard for debris-creating actions in space.

42. Article IV provides that whenever two or more States jointly launch a space object, they shall be jointly and severally liable for any damage caused. This means that a State suffering damage can claim the full amount of compensation from any one of the launching States involved, or from all of them collectively or individually.[19] This provision is advantageous for claimant States, particularly in complex international missions, as it simplifies the process of seeking redress.[20] However, it also underscores the complexities that arise when multiple actors are involved in a single launch or space project, necessitating clear agreements.[21]

C. Voluntary International Frameworks for Debris Mitigation

43. In response to the growing threat of orbital debris and the limitations of the existing treaty-based liability regime, the international space community has developed voluntary, non-binding

[16] Jinyuan Su, 'Liability for Space Debris Collisions' (*The Space Review*, 2023).
[17] Steven Freeland, 'State Liability for Space Object Collisions' (2018) 29 European Journal of International Law 281, 293.
[18] James A Lewis, *Addressing the Liability Regime in the Space Convention* (2023).
[19] Ibid.
[20] Frans von der Dunk, 'International Space Law' in Frans von der Dunk (ed), *Handbook of Space Law* (Edward Elgar Publishing 2015) 89.
[21] Freeland (n 17), 295-297.

guidelines aimed at mitigating the creation of new debris. These "soft law" instruments, principally from UNCOPUOS and the IADC, represent a consensus on best practices and have significantly influenced national policies and operational procedures.[22]

i. The UNCOPUOS Space Debris Mitigation Guidelines (2007)

44. The Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space were the outcome of extensive work within its Scientific and Technical Subcommittee (STSC) and were subsequently endorsed by the United Nations General Assembly in Resolution 62/217 of 22 December 2007.[23] These guidelines were significantly informed by the pre-existing technical guidelines developed by the IADC.

45. A crucial characteristic of the UNCOPUOS Guidelines is their voluntary nature; they are not legally binding under public international law.[24] General Assembly Resolution 62/217 invites Member States to implement these guidelines "to the greatest extent feasible" through relevant national mechanisms, such as policies, laws, and regulations. This non-binding approach was intended to foster broader acceptance and allow for flexibility in implementation according to national capabilities and circumstances. However, it also means that there are no international enforcement mechanisms to ensure compliance, relying instead on the goodwill of States and the persuasive power of an internationally endorsed standard.

46. The UNCOPUOS Guidelines consist of seven core measures aimed at covering the full lifecycle of a space mission, from initial planning and design through to operational phases and end-of-life disposal:

(a) **Limit debris released during normal operations:** Spacecraft and launch vehicle orbital stages should be designed to minimise or, if feasible, avoid the release of debris during routine mission activities.

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[22] Secure World Foundation, *Global Space Governance and the Prevention of Orbital Debris* (2021).
[23] UNOOSA, *Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space* <https://www.unoosa.org/pdf/publications/st_space_49E.pdf> accessed 11 May 2025.
[24] UNOOSA, 'Space Debris Mitigation and Remediation: Policy and Legal Challenges' (2025) UN Doc A/AC.105/C.2/2025/CRP.24.

(b) **Minimize the potential for break-ups during operational phases:** Measures should be taken to reduce the likelihood of accidental explosions or fragmentations of spacecraft and orbital stages while they are operational.

(c) **Limit the probability of accidental collision in orbit:** Mission planning should assess and limit the probability of collisions with known space objects.

(d) **Avoid intentional destruction and other harmful activities:** Intentional destruction of on-orbit spacecraft or launch vehicle stages, or other activities that generate long-lived debris, should be avoided. If such actions are deemed necessary, they should be conducted at altitudes that ensure the resulting fragments have short orbital lifetimes.

(e) **Minimize potential for post-mission break-ups resulting from stored energy:** At the end of a mission, all onboard sources of stored energy (e.g., residual propellants, batteries) should be depleted or rendered safe (passivation) to prevent accidental post-mission explosions.

(f) **Limit the long-term presence of spacecraft and launch vehicle orbital stages in the low-Earth orbit (LEO) region after the end of their mission:** This typically refers to the "25-year rule," recommending that objects in LEO be deorbited within 25 years of mission completion.

(g) **Limit the long-term presence of spacecraft and launch vehicle orbital stages in the geosynchronous Earth orbit (GEO) region after the end of their mission:** This involves manoeuvring objects to a "graveyard orbit" sufficiently above or below the operational GEO region.

47. These seven guidelines represent a high-level technical and policy consensus on prudent practices for mitigating the generation of new space debris.

48. Despite their voluntary nature, the UNCOPUOS Guidelines have had a discernible impact on State practice and the development of national regulatory frameworks. Many spacefaring nations and international organizations have adopted national policies, laws, technical standards,

and operational procedures that are consistent with, or directly incorporate, these guidelines.[25] The UNOOSA maintains a Compendium of Space Debris Mitigation Standards adopted by States and international organizations, which documents these national implementation efforts.[26] This demonstrates a widespread recognition of the guidelines as a baseline for responsible space activities. The guidelines have influenced major space agencies like the European Space Agency (ESA) and numerous national space agencies, fostering a degree of international harmonization in debris mitigation approaches. However, the extent and rigour of implementation vary among States, reflecting different priorities and capacities.[27]

ii. The Inter-Agency Space Debris Coordination Committee (IADC) Mitigation Guidelines

49. The IADC is an international governmental forum comprising major space agencies, established to facilitate coordination on activities related to both natural and man-made debris in space. As a technical body, its guidelines reflect the operational consensus and expertise of its member agencies.[28]

50. The IADC Space Debris Mitigation Guidelines (original 2002, revised 2007, updated Revision 4 January 2025) provide detailed technical recommendations and are periodically updated to reflect advancements in understanding and technology, as well as new challenges posed by evolving space activities. The core focus areas include:

(a) **Limitation of debris released during normal operations.**

(b) **Minimization of the potential for on-orbit break-ups (both during operational phases and post-mission due to stored energy).** This includes detailed guidance on passivation techniques for residual propellants, batteries, high-pressure vessels, and other energy

[25] Brian Weeden and Bob Preston, *Space Debris Congress Report* (Secure World Foundation, 2011) <https://swfound.org/media/34814/space%20debris%20congress_report-15feb2011.pdf> accessed 11 May 2025.
[26] UNOOSA, 'Space Debris Mitigation Standards Compendium – Update' <https://www.unoosa.org/oosa/de/ourwork/topics/space-debris/compendium.html> accessed 11 May 2025.
[27] See UNOOSA, *2024 UN Conference on Space Law and Policy* <https://www.unoosa.org/documents/pdf/spacelaw/workshops/SLC2024/2024_Compilation_of_Bios_and_Abstracts_rev.2.pdf> accessed 11 May 2025.
[28] IADC, 'IADC' <https://www.iadc-home.org/what_iadc> accessed 11 May 2025.

sources.[29]

(c) **Post-mission disposal (PMD).** This section provides specific technical parameters for disposal from LEO and GEO regions. For LEO, it supports the 25-year deorbit lifetime rule and sets a recommended upper limit for human casualty risk from re-entering debris at less than 1 in 10,000.[30] For GEO, it specifies formulae for calculating the minimum reorbit altitude to ensure objects remain clear of the protected region for at least 100 years.

(d) **Prevention of on-orbit collisions.** This includes recommendations for estimating and limiting collision probability and considering avoidance manoeuvres.

51. The most recent publicly available version, Revision 4 (dated January 16, 2025), notably incorporates a new section addressing the specific challenges posed by **large constellations**.[31] This includes recommendations on ensuring physical separation of constellation components and individual spacecraft orbits, managing in-orbit commissioning phases, assessing cumulative re-entry risk, and enhancing the trackability of small space objects within these constellations. These updates demonstrate the IADC's responsiveness to the changing orbital landscape. The "soft law" character of both the UNCOPUOS and IADC guidelines, while crucial for achieving broad consensus and facilitating adoption by a diverse range of actors, inherently limits their capacity to compel universal adherence.[32] This is particularly true when mitigation measures impose substantial financial or operational burdens on new entrants to the space domain or on commercial ventures striving for cost efficiency. An enforcement gap thus emerges, which purely voluntary measures may struggle to bridge effectively.[33] This reliance on voluntary adoption can lead to inconsistencies in implementation, as entities might opt for minimal compliance if not rigorously

[29] UNOOSA, *IADC Space Debris Mitigation Guidelines* <https://www.unoosa.org/documents/pdf/spacelaw/sd/IADC-2002-01-IADC-Space_Debris-Guidelines-Revision1.pdf> accessed 13 May 2025.
[30] IADC, 'Documents' (*IADC*) <https://www.iadc-home.org/documents_public/file_down/id/5836> accessed 13 May 2025.
[31] Inter-Agency Space Debris Coordination Committee, 'IADC Space Debris Mitigation Guidelines' (IADC-02-01, Revision 4, 16 January 2025) <https://www.iadc-home.org/documents_public/file_down/id/5648> accessed 2 June 2025.
[32] Yannick Radi, 'Clearing up the Space Junk – On the Flaws and Potential of International Space Law to Tackle the Space Debris Problem' (2023) 12(2) ESIL Reflections <https://esil-sedi.eu/esil-reflection-clearing-up-the-space-junk-on-the-flaws-and-potential-of-international-space-law-to-tackle-the-space-debris-problem/> accessed 2 June 2025.
[33] *Global Space Governance and the Prevention of Orbital Debris* (n 22).

overseen at the national level, potentially undermining global mitigation efforts.[34]

52. The IADC guidelines have a foundational relationship with the UNCOPUOS guidelines.[35] The technical content and basic definitions of the IADC guidelines served as the primary basis for the development of the UNCOPUOS Space Debris Mitigation Guidelines. The IADC continues to provide technical expertise and presentations to the STSC of UNCOPUOS, ensuring that the UN-level discussions are informed by the latest technical understanding and operational experience of space agencies.[36] This synergy ensures that the broader policy guidelines endorsed by the UN are technically sound and grounded in practical realities.[37]

53. The evolution of the IADC guidelines, such as the recent Revision 4 addressing large constellations,[38] showcases the adaptability of technical bodies to new operational challenges. However, a potential issue arises from the time lag between the development of these evolving technical standards and their reflection in broader international legal discussions or national regulatory frameworks. This delay can be significant, as UNCOPUOS operates by consensus among States,[39] and national legislative processes also require considerable time. During this interim period, new forms of space activity, such as the rapid deployment of mega-constellations, may proliferate under older or less specific guidance, potentially creating new debris risks before tailored governance measures are widely adopted and institutionalized.

[34] Ibid.
[35] IADC Space Debris Mitigation Guidelines (n 31).
[36] V. Shildin and others, 'The Importance of the UN COPUOUS in the Space Debris Mitigation' (2015) AMOS Conference <https://conference.sdo.esoc.esa.int/proceedings/sdc8/paper/194/SDC8-paper194.pdf> accessed 11 May 2025.
[37] *Global Space Governance and the Prevention of Orbital Debris* (n 22).
[38] UNOOSA, 'IADC Report on the Status of the Space Debris Environment' (2025) UN Doc A/AC.105/C.1/2025/CRP.9 <https://www.unoosa.org/res/oosadoc/data/documents/2025/aac_105c_12025crp/aac_105c_12025crp_9_0_html/AC105_C1_2025_CRP09E.pdf> accessed 11 May 2025.
[39] Irmgard Marboe, 'Applicability of Space Debris Mitigation Guidelines; New Legal Developments in the Protection of the Space Environment' (2007) Eleven Journals <https://www.elevenjournals.com/tijdschrift/iisl/2007/3%20New%20Legal%20Developments%20in%20the%20Protection%20of%20the%20Space%20Environment/IISL_2007_050_003_002.pdf> accessed 11 May 2025.

III. CONTEMPORARY DELIBERATIONS AND THE EVOLUTION OF NORMS WITHIN UNCOPUOS

54. The UNCOPUOS along with its Scientific and Technical Subcommittee (STSC) and Legal Subcommittee (LSC), serves as the primary international forum for discussing and developing norms, guidelines, and legal principles related to outer space activities,[40] including the challenges posed by orbital debris and the pursuit of long-term sustainability.[41]

A. Legal Subcommittee (LSC): Recent Discussions on Legal Mechanisms for Debris Mitigation and Remediation

55. The LSC has consistently addressed the legal aspects of space debris. A standing agenda item, currently titled "General exchange of information and views on legal mechanisms relating to space debris mitigation and remediation measures, taking into account the work of the Scientific and Technical Subcommittee," ensures ongoing attention to this critical issue.[42]

56. Discussions during recent sessions, such as the 63rd session in 2024 (with its procedural report)[43] and as anticipated for the 64th session in 2025[44], have centred on several key themes. These include the national implementation of the UN Space Debris Mitigation Guidelines and the Guidelines for the Long-term Sustainability of Outer Space Activities (LTS Guidelines). States often share updates on their national regulatory developments; for example, Brazil reported new national space legislation with provisions for debris monitoring and mitigation/removal[45], the Republic of Korea highlighted its regulatory status[46], the Philippines detailed progress on acceding

[40] UNCOPUOS, 'About Us' (United Nations Office for Outer Space Affairs) <https://www.unoosa.org/oosa/en/ourwork/copuos/index.html> accessed 2 June 2025.
[41] UNCOPUOS, 'Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space' UN Doc A/AC.105/2018/CRP.20 (2018) <https://www.unoosa.org/oosa/en/ourwork/topics/long-term-sustainability-of-outer-space-activities.html> accessed 2 June 2025.
[42] UNOOSA, 'LSC <https://www.unoosa.org/oosa/en/ourwork/copuos/lsc/2024/index.html> accessed 13 May 2025.
[43] A/AC.105/1311
[44] Agenda A/AC.105/C.2/L.334
[45] UNCOPUOUS, 'Research on space debris, the safety of space objects with nuclear power sources on board and problems relating to their collision' UN Doc A/AC.105/C.1/2025/CRP.8 (2025) <https://www.unoosa.org/res/oosadoc/data/documents/2025/aac_105c_12025crp/aac_105c_12025crp_8_0_html/AC105_C1_2025_CRP08E.pdf> accessed 13 May 2025.
[46] UNOOSA, *2024 UN Conference on Space Law and Policy* (2024) <https://www.unoosa.org/documents/pdf/spacelaw/workshops/SLC2024/2024_Compilation_of_Bios_and_Abstracts_rev.2.pdf> accessed 13 May 2025.

to the Liability and Registration Conventions and developing national protocols for debris re-entry, and the United States reiterated its adherence to its Orbital Debris Mitigation Standard Practices (ODMSP) and its view on the continued voluntary nature of international guidelines, expressing reservations about codifying specific standards into binding international law at this time.[47]

57. The LSC also serves as a forum to discuss challenges within the current legal framework, particularly concerning liability, attribution of debris, and the legal implications of active debris removal (ADR).[48] The growing interest in ADR and its relationship with Space Traffic Management (STM) are increasingly prominent topics. The main COPUOS Committee report[49] summarizes the work of the LSC.[50] While the LSC is a crucial venue for dialogue and information exchange, progress towards new binding legal instruments on space debris has been cautious, with a continued emphasis on national implementation of existing voluntary guidelines and the sharing of best practices.[51]

B. Scientific and Technical Subcommittee (STSC): Insights on Debris Characterization, Mitigation Effectiveness, and Long-Term Sustainability

58. The STSC provides the essential scientific and technical foundation for the legal and policy discussions within COPUOS. Its work encompasses the characterization of the space debris environment, mathematical modelling of its evolution, risk assessment, evaluation of mitigation techniques, and monitoring of the space environment.[52]

59. The STSC regularly receives technical presentations and reports from the IADC concerning the state of the debris environment and the effectiveness of mitigation guidelines. For

[47] US Mission to International Organizations in Vienna, 'U.S. Statement - Agenda Item 9 - 64th Session of the COPUOS LSC - May 2025' (*U.S. Mission*, 6 May 2025) <https://vienna.usmission.gov/u-s-statement-agenda-item-9-64th-session-of-the-copuos-lsc-may-2025/> accessed 13 May 2025.
[48] UNCOPUOS Legal Subcommittee, 'Report of the Legal Subcommittee on its sixty-third session' (A/AC.105/1307, 2024) paras 44-52 <https://www.unoosa.org/res/oosadoc/data/documents/2024/aac_105/aac_1051307_0_html/AAC1051307E.pdf> accessed 2 June 2025.
[49] A/79/20 for the 2024 session
[50] UNCOPUOS, 'Report of the Committee on the Peaceful Uses of Outer Space, Sixty-seventh session, 2024' UN Doc A/79/20 (2024) <https://www.unoosa.org/oosa/en/ourwork/copuos/2024/index.html> accessed 2 June 2025.
[51] von der Dunk (n 20) 101-104.
[52] UNCOPUOS Scientific and Technical Subcommittee, 'Report of the Scientific and Technical Subcommittee on its sixty-first session' UN Doc A/AC.105/1288 (2024) paras 38–49 <https://www.unoosa.org/res/oosadoc/data/documents/2024/aac_105/aac_1051288_0_html/AAC1051288E.pdf> accessed 2 June 2025.

instance, the IADC Report on the Status of the Space Debris Environment, Issue 3 (January 2025), presented to the STSC,[53] highlighted the significant increase in LEO traffic, ongoing fragmentation events, and concluded that while compliance with mitigation measures is improving, it is not yet sufficient to ensure long-term environmental sustainability, thereby underscoring the potential need for ADR.[54]

60. Discussions within the STSC often focus on compliance rates with the UN and IADC guidelines and acknowledge the consensus that mitigation measures alone, while crucial, will not be sufficient to stabilize the debris environment in the long term due to the existing debris population and the potential for future collisions.[55] The STSC also plays a vital role in the development and review of the technical aspects of the LTS Guidelines that are relevant to space debris.[56] The report of the STSC's 61st session in 2024,[57] which superseded the earlier reference[58] summarized these discussions, noting concerns about the increasing amount of debris, ongoing national and international mitigation actions, research and development in debris tracking and removal technologies, and the expressed need for remediation efforts.[59] Some delegations at the STSC voiced concerns about debris generated by destructive direct-ascent anti-satellite missile tests and emphasized the importance of providing developing countries with access to debris mitigation technology and expertise. The findings of the STSC consistently underscore the severity of the debris problem and the limitations of current mitigation strategies, implicitly supporting the exploration of more robust solutions, including the technical feasibility and operational aspects of ADR.[60]

[53] Document AC105_C1_2025_CRP10E
[54] UNCOPUOS, 'IADC Report on the Status of the Space Debris Environment' (January 2025) UN Doc A/AC.105/C.1/2025/CRP.10E (2025).
[55] UNCOPUOS Scientific and Technical Subcommittee, 'Report of the Scientific and Technical Subcommittee on its sixty-first session' UN Doc A/AC.105/1307 (2024) paras 40–45 <https://www.unoosa.org/res/oosadoc/data/documents/2024/aac_105/aac_1051307_0_html/AAC1051307E.pdf> accessed 2 June 2025.
[56] UNCOPUOS, 'Questionnaire on Space Debris Mitigation' UN Doc A/AC.105/1307 (2024) <https://www.unoosa.org/res/oosadoc/data/documents/2024/aac_105/aac_1051307_0_html/AC105_1307E.pdf> accessed 13 May 2025.
[57] A/AC.105/1307
[58] COPUOS, Report on the United Nations/Austria Symposium on Space for Climate Action, A/AC.105/1299.
[59] IADC Report on the Status of the Space Debris Environment (n 1) paras 46-53.
[60] IADC Report on the Status of the Space Debris Environment (n 1) paras 55-57.

C. The Working Group on the Long-Term Sustainability of Outer Space Activities (LTS WG): Outcomes and Future Directions

61. The LTS WG was established by COPUOS to develop voluntary guidelines aimed at ensuring the safety, security, and sustainability of outer space activities for all nations. The initial set of 21 LTS Guidelines was adopted by consensus in 2019 and subsequently endorsed by the UN General Assembly.[61] These guidelines cover a wide range of topics, including policy and regulatory measures, safety of space operations, international cooperation, capacity-building, and scientific and technical research, many of which are directly relevant to mitigating orbital debris.[62]

62. Following the adoption of the initial guidelines, a new five-year work plan for the LTS WG (referred to as LTS 2.0) commenced in 2023. This work plan is structured around three main objectives: (a) identifying and studying challenges to the long-term sustainability of outer space activities and considering possible new guidelines; (b) sharing experiences, practices, and lessons learned from the voluntary national implementation of the existing LTS Guidelines; and (c) raising awareness and building capacity, particularly for emerging spacefaring nations and developing countries. UNOOSA supports these efforts by maintaining an open-source Information Repository where States and other relevant entities can share information regarding their implementation of the LTS Guidelines and related practices.[63]

63. Recent deliberations within the LTS WG,[64] indicate an ongoing focus on several key areas.[65] There are proposals for further study of recurring themes and challenges, including specific consideration of space debris mitigation and on-orbit servicing missions.[66] The development of

[61] UNCOPUOS, 'Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space' UN Doc A/74/20 (2019) paras 163–164 <https://www.unoosa.org/oosa/en/ourwork/topics/long-term-sustainability-of-outer-space-activities.html> accessed 2 June 2025.
[62] Guidelines for the Long-term Sustainability (n 55), annex II.
[63] UNOOSA, 'Long-term Sustainability of Outer Space Activities: Information Repository' <https://www.unoosa.org/oosa/en/ourwork/topics/long-term-sustainability-of-outer-space-activities/information-repository.html> accessed 2 June 2025.
[64] As reflected in documents such as AC105_C1_2025_CRP14E (a conference room paper on the way forward for the Working Group).
[65] UNCOPUOS, 'Conference Room Paper: The Way Forward for the Working Group on the Long-term Sustainability of Outer Space Activities' UN Doc A/AC.105/C.1/2025/CRP.14E (2025) <https://www.unoosa.org/res/oosadoc/data/documents/2025/ac105_c1/2025/ac105_c1_2025_crp14e_0_html/AC105_C1_2025_CRP14E.pdf> accessed 2 June 2025.
[66] Ibid, paras 6-8.

recommendations for States includes encouraging ongoing monitoring and regular reporting on the effectiveness of debris mitigation measures, providing incentives for the development of new mitigation technologies, and fostering public-private partnerships to accelerate the adoption of innovative solutions.[67] The formation of expert groups to delve into specific thematic areas, such as space situational awareness (SSA) and potentially new guidelines, is also under consideration.[68] Capacity-building remains a strong emphasis, with proposals to enhance international cooperation and share insights to assist emerging space nations.[69] There is also a suggestion to establish a new Working Group after the conclusion of the current mandate to ensure that discussions on long-term sustainability continue within UNCOPUOS.[70]

64. The LTS WG is a critical driver for the evolution of international norms of behaviour in space. Although its outputs are voluntary guidelines, they represent a significant international consensus on best practices. The dynamic nature of its work, focusing on implementation, capacity-building, and the proactive identification of new challenges (including those posed by orbital debris), indicates a commitment to adapting governance approaches to the evolving space environment. The discussions concerning potential new guidelines for SSA and on-orbit activities are particularly relevant to the future management and remediation of space debris.

65. The parallel yet interconnected discussions within the LSC (focusing on legal mechanisms), the STSC (providing technical assessments), and the LTS WG (developing comprehensive guidelines) demonstrate a multi-pronged approach by UNCOPUOS to the complex issue of orbital debris.[71] A significant challenge, however, lies in effectively translating the technical consensus achieved in the STSC and the voluntary guidelines developed by the LTS WG into universally adopted practices or, where deemed necessary, binding legal obligations.[72] The consensus-based decision-making process of COPUOS, while ensuring broad support for its outcomes, can also mean that progress towards more stringent or legally binding measures is often

[67] Ibid, paras 10-13.
[68] Ibid, para 14.
[69] Ibid, paras 15-17.
[70] Ibid, para 18.
[71] von der Dunk (n 20) 101-104.
[72] Guidelines for the Long-term Sustainability (n 55), annex II.

incremental and requires extensive deliberation.[73] This creates a potential "implementation gap" where what is scientifically understood as necessary for environmental protection (e.g., very high compliance with post-mission disposal rules, the eventual need for active debris removal) may not yet be mandated at a global legal level.[74]

66. The increasing focus within all UNCOPUOS bodies on proactive measures like Active Debris Removal (ADR) and Space Traffic Management (STM) signals a clear recognition that passive mitigation of new debris, while essential, is insufficient to address the existing and future risks. However, these emerging areas bring forth their own set of complex legal challenges. For instance, ADR operations directly engage with Article VIII of the OST concerning jurisdiction and control over space objects, as well as Article IX regarding due regard and potentially harmful interference, not to mention the liability for any damage caused during removal operations. Similarly, establishing a comprehensive STM system necessitates extensive international data sharing, coordination protocols, and agreement on "rules of the road" in space, which can intersect with national security interests, commercial sensitivities, and questions of sovereignty, all within a domain that currently lacks a dedicated international legal framework for such traffic management. This shift towards proactive environmental management requires a corresponding evolution in legal thinking within UNCOPUOS, potentially moving beyond the established principles that were primarily designed for an era of fewer space actors and less congested orbits.[75]

67. Furthermore, the strong emphasis on the national implementation of voluntary international guidelines, such as the LTS Guidelines[76] and the Space Debris Mitigation Guidelines,[77] is leading to the development of a diverse array of national space laws and regulations. While this demonstrates a positive uptake of international recommendations and

[73] Steven Freeland, 'Up, Up and … Back: The Emergence of Space Debris and the Challenges for (International) Space Law' (2020) 36(1) Utrecht Journal of International and European Law 6, 16-18.
[74] UNCOPUOS Scientific and Technical Subcommittee, 'Report of the Scientific and Technical Subcommittee on its sixty-first session' UN Doc A/AC.105/1307 (2024) paras 40–45 <https://www.unoosa.org/res/oosadoc/data/documents/2024/aac_105/aac_1051307_0_html/AAC1051307E.pdf> accessed 2 June 2025.
[75] Freeland (n 66) 16–19; Outer Space Treaty (adopted 27 January 1967, entered into force 10 October 1967) 610 UNTS 205 (Outer Space Treaty), Arts VIII, IX; Guidelines for the Long-term Sustainability (n 55), annex II.
[76] Guidelines for the Long-term Sustainability (n 55).
[77] UNCOPUOS, 'Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space' (2010) <https://www.unoosa.org/pdf/publications/st_space_49E.pdf> accessed 2 June 2025; UNOOSA, 'Compendium of Space Debris Mitigation Standards Adopted by States and International Organizations' (2023).

contributes to responsible space behaviour at the national level (as seen in the Compendium of Space Debris Mitigation Standards), the inherent variations in these national standards, licensing requirements, and enforcement capabilities could lead to an uneven global regulatory landscape. If some States adopt significantly less stringent regulations or are less rigorous in their "authorization and continuing supervision" (as required by Article VI of the OST),[78] there is a potential risk of creating "flags of convenience" where operators might choose to license their activities in jurisdictions with lower compliance burdens. This could inadvertently undermine global debris mitigation efforts unless addressed through enhanced international cooperation, capacity-building initiatives to ensure a more consistent baseline of responsible practice worldwide, and robust national oversight.[79]

D. Developments at the Sixty-Eighth Session of Committee on the Peaceful Uses of Outer Space (COPUOS)[80]

68. The Sixty-Eighth Session of the COPUOS took place in Vienna from June 25 to July 2, 2025. This session comprehensively addressed various aspects of COPUOS's mandate, with a strong emphasis on the maintenance of outer space for peaceful purposes, a discussion that also highlighted the critical issue of space debris.[81] The agenda included the review of reports from its subsidiary bodies:

(i) the Sixty-Second session of the Scientific and Technical Subcommittee[82] and

(ii) the Sixty-Fourth session of the Legal Subcommittee.[83]

69. The Scientific and Technical Subcommittee expressed concern at the increasing amount of space debris and encouraged States, agencies, industries and academic institutions to consider voluntarily implementing the Space Debris Mitigation Guidelines and the Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee and to work to preserve the space

[78] Outer Space Treaty, Art VI.
[79] Global Space Governance and the Prevention of Orbital Debris (n 22).
[80] As of the date of this publication, the Draft reports were utilized as the final report of the Sixty-Eighth Session of COPUOS (25 June-2 July 2025) was not released.
[81] A/AC.105/L/340/Add.1
[82] A/AC.105/L.340/Add.2
[83] A/AC.105/L.340/Add.3

environment.[84] The Sixty-Third Session of the Subcommittee is scheduled to be held from 2 to 13 February 2026 where the proposed agenda will include space debris as well as Long-term sustainability of outer space activities.[85]

70. The Legal Subcommittee's sixty-fourth session report was reviewed and the COPUOS endorsed its decisions and recommendations. Key discussions included information exchange on space law activities by international organizations, the status and application of the five UN outer space treaties, with a focus on promoting their implementation and capacity-building. Discussions also covered legal mechanisms for space debris mitigation, non-legally binding UN instruments on outer space, and the legal aspects of space traffic management. The Legal Subcommittee noted that the compendium of space debris mitigation standards adopted by States and international organizations was being continuously updated by the Office for Outer Space Affairs.

71. For future work, the Committee agreed on the substantive agenda for the Subcommittee's sixty-fifth session, which will include work under multi-year plans such as the legal aspects of space resource activities, and single discussion items like space debris mitigation, non-legally binding instruments, space traffic management, and small-satellite activities. It also agreed to reconvene the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space and the Working Group on Legal Aspects of Space Resource Activities, and endorsed holding a symposium during the sixty-fifth session of the Subcommittee.

72. A proposal for a fourth UN Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE IV) was also deliberated upon.[86] The Conference is planned to be held in Vienna from 12 to 23 July 2027. The objectives for the Conference are to deliver concrete results in the areas of:

- Safe and sustainable exploration and use of outer space (in particular space situational awareness and space traffic, lunar activities, space debris, space resources and long-term sustainability of outer space activities)

[84] A/AC.105/L.340/Add.2
[85] COPUOS, Report of the Scientific and Technical Subcommittee on its sixty-second session, held in Vienna from 3 to 14 February 2025, A/AC.105/1338.
[86] A/AC.105/L.340/Add.16

- International cooperation and space for development to identify existing and future opportunities and evolving needs and challenges with respect to benefit-sharing of the exploration and use of outer space specifically for developing and emerging spacefaring nations.

- International cooperation and the role of the COPOUS as the central multilateral body for cooperation in the peaceful uses of outer space and to improve the Committee's methods of work.

73. Other key topics included space exploration and innovation, the implementation of the Space2030 Agenda[87], which is believed to be a crucial framework for translating space innovations into tangible actions. The draft provisional agenda for the sixty-ninth session[88] with topics such as sustainable development, spin-off benefits of space technology, space and water, climate change, use of space technology in the United Nations system were proposed to be included. The work plan for the action team on lunar activities consultation for 2025-2026 was also deliberated upon.[89] The Action Team's focus would be on consultation mechanisms for information exchange on lunar exploration activities and recommending the establishment of an international mechanism with a view to build capacity and for the continuation of peaceful, safe and sustainable lunar activities for the benefit of all humankind.[90]

IV. COMMENTS AND OBSERVATIONS OF THE AALCO SECRETARIAT

74. The escalating challenge of orbital debris necessitates a concerted and evolving international response. The existing legal and regulatory framework, rooted in the foundational principles of the OST and the Liability Convention, provides essential, albeit general, rules for State responsibility and liability.[91] These treaties, conceived in the early decades of space exploration, establish that States are responsible for their national space activities, including those

[87] A/AC.105/L.340/Add.18
[88] A/AC.105/L.340/Add.10
[89] A/AC.105/L.340/Add.4
[90] Ibid, p. 2.
[91] Outer Space Treaty (adopted 27 January 1967, entered into force 10 October 1967) 610 UNTS 205, Arts VI-VII; Convention on International Liability for Damage Caused by Space Objects (adopted 29 March 1972, entered into force 1 September 1972) 961 UNTS 187, Arts II-III.

of private entities, and are liable for damage caused by their space objects.[92] However, their application to the nuanced and complex problem of orbital debris reveals significant limitations, particularly concerning the attribution of damage caused by small or unidentified fragments and the high threshold for proving "fault" in the event of in-space collisions.[93]

75. The international community has responded to these limitations primarily through the development of voluntary, non-binding "soft law" instruments. The UNCOPUOS Space Debris Mitigation Guidelines (2007)[94] and the more technically detailed IADC Space Debris Mitigation Guidelines (most recently revised in January 2025)[95] represent a broad international consensus on best practices for preventing the creation of new debris. These guidelines have demonstrably influenced national policies and operational standards, fostering a degree of harmonization in mitigation efforts worldwide. Nevertheless, their voluntary nature means that universal adherence and rigorous enforcement cannot be guaranteed, and their primary focus on mitigation does not address the risks posed by the substantial population of existing debris.[96]

76. Persistent challenges endure within the international liability regime.[97] The difficulty in identifying the origin of countless debris fragments often renders the Liability Convention's provisions moot.[98] The ambiguity surrounding the definition and proof of "fault" for in-space incidents further complicates the assignment of liability.[99] Moreover, gaps in the current framework, such as the "liability loophole" concerning third-party interference (including cyber threats), the lack of explicit coverage for environmental damage to space itself, and the

[92] Ibid.
[93] Frans von der Dunk, 'International Space Law' in Frans von der Dunk (ed), Handbook of Space Law (Edward Elgar Publishing 2015) 90-92.
[94] UNCOPUOS, 'Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space' (2010) https://www.unoosa.org/pdf/publications/st_space_49E.pdf accessed 2 June 2025.
[95] IADC Space Debris Mitigation Guidelines (n 31).
[96] Radi (n 32).
[97] Frans von der Dunk, 'International Space Law' in Frans von der Dunk (ed), Handbook of Space Law (Edward Elgar Publishing 2015) 90-97.
[98] Freeland (n 66) 13-16.
[99] Jinyuan Su, 'Liability for Damage Caused by Space Debris' (2019) 18 Chinese Journal of International Law 1, 13-16.

complexities of applying liability to the rapidly expanding commercial space sector, underscore the need for ongoing legal and policy development.[100]

77. Contemporary deliberations within UNCOPUOS, across its Legal Subcommittee, Scientific and Technical Subcommittee, and the Working Group on the Long-Term Sustainability of Outer Space Activities, reflect a dynamic international effort to grapple with these issues.[101] There is a growing recognition that passive mitigation measures, while indispensable, are insufficient to ensure the long-term viability of critical orbital regions.[102] Consequently, discussions are increasingly turning towards the technical feasibility, operational modalities, and legal implications of more proactive measures, such as active debris removal and comprehensive space traffic management.[103] These discussions, however, also bring to the fore new legal questions related to jurisdiction, ownership, liability for remediation activities, and the sharing of sensitive data, all of which require careful consideration within the established principles of international space law.

78. The governance of orbital debris appears to be at a critical juncture. One path involves continued reliance on the evolution of "soft law," voluntary measures, and incremental national uptake of best practices. While this approach fosters consensus, it may prove insufficient to curb the escalating debris threat in a timely manner. The alternative, moving towards more robust or binding international rules, faces significant hurdles in achieving universal agreement within the consensus-based framework of UNCOPUOS.[104] The risk is that inaction or insufficient action could lead to a future where a major debris-related catastrophe or the realization of the Kessler Syndrome forces a more crisis-driven, and potentially less deliberative, shift in international legal approaches.[105]

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[100] Fabio Tronchetti, 'The Space Debris Mitigation Regime: Is the Liability Convention an Effective Tool for Damage Caused by Space Debris?' (2013) 42 Denver Journal of International Law and Policy 321, 327–329.
[101] UNCOPUOS, 'Report of the Committee on the Peaceful Uses of Outer Space, Sixty-seventh session, 2024' UN Doc A/79/20 (2024) <https://www.unoosa.org/oosa/en/ourwork/copuos/2024/index.html> accessed 2 June 2025.
[102] UNCOPUOS Scientific and Technical Subcommittee, 'Report of the Scientific and Technical Subcommittee on its sixty-first session' UN Doc A/AC.105/1307 (2024) paras 40–45 <https://www.unoosa.org/res/oosadoc/data/documents/2024/aac_105/aac_1051307_0_html/AAC1051307E.pdf> accessed 2 June 2025.
[103] Freeland (n 66) 16-19.
[104] Freeland (n 66) 16-18.
[105] *Global Space Governance and the Prevention of Orbital Debris* (n 22).

79. The path forward towards enhanced governance of the orbital environment will likely necessitate a multifaceted and adaptive strategy. This would integrate continuously evolving technical standards from expert bodies like the IADC, widely adopted international guidelines emanating from UNCOPUOS,[106] and strengthened national regulatory and licensing regimes that mandate compliance with these standards for all space actors. Furthermore, targeted international agreements or protocols addressing specific pressing issues, such as establishing clear legal principles for active debris removal, clarifying the definition and application of "fault" in the space context, or closing the identified liability loopholes-may prove more achievable and effective than attempts at comprehensive reform of the existing treaties. The critical role of international cooperation, capacity-building, and the equitable transfer of technology must also be emphasized to empower all States, including emerging spacefaring nations and developing countries, to contribute effectively to a safe and sustainable space environment. Ultimately, preserving outer space for peaceful purposes and for the benefit of current and future generations is a shared responsibility that demands sustained international commitment and a proactive evolution of its governance.[107]

[106] IADC Space Debris Mitigation Guidelines (n 31).
[107] Frans von der Dunk, 'International Space Law' in Frans von der Dunk (ed), Handbook of Space Law (Edward Elgar Publishing 2015) 110-113.