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ANASDA
DEFINE OUR FUTURE

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Space Funding Growth, Trump EO For Lunar Base, Analysing Military Uses of Outer Space

SPACE INDUSTRY REPORT

NOVEMBER/DECEMBER 2025

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INTRODUCTION

As another year comes to a close, we find an opportune moment to reflect on some key developments at ANASDA, marking another challenging yet productive year. After three years, in January 2025, we made the decision to end the publication of our weekly space industry news article, opting instead to deliver a more comprehensive and analytical monthly report. This included the continuation of our industry news analysis, but we also added a new legal review article, which strives to critically analyse key developments in law, policy and governance. Furthermore, we also chose to include a monthly featured article, which takes on a wide range of subjects, such as commemorative and reflective articles, or raising awareness on key subject areas. We hope that the report can provide insights and analysis for a wide range of stakeholders, help raise awareness, and tackle the key issues in space governance.

As we enter 2026, we will be sharing some more exciting news as we continue to develop our business plan and achieve our goals. Foremost, as space industry consultants, we continue with our core aims of helping drive growth and seeking opportunities in the expanding space industry, while also aiming to build these strategies on the principles of equity, sustainability, and peaceful uses of outer space. To this end, in this month's featured article, we take a look back at some of the capacity-building events and conferences which we were honoured to attend at the United Nations, and analyse what steps were taken to enhance space governance this past year.

A Yearly Reflection: The UN World Space Forum

A year ago, we were honoured to attend the United Nations World Space Forum, in Bonn, Germany. The theme for the three-day event was "Sustainable Space for Sustainability on Earth." Space is seen as a key driver for achieving the Sustainable Development Goals (SDGs) set out in the UN 2030 Agenda, adopted in 2015. As we wrote in our January edition, space technology can provide support in achieving all 17 of the SDGs, ranging from providing Earth observation technology to assist in combating climate change and responding to natural disasters, to establishing global internet broadband connectivity and enhancing access to education. The United Nations Office for Outer Space Affairs provides a **detailed compendium** on how space technology can assist in achieving the SDGs.

Notably, the Forum widely addressed the outcomes of the seminal Summit of the Future meeting, held at the UN in New York, in September 2024. This high-level meeting aimed to

'...enhance cooperation on critical challenges and address gaps in global governance, reaffirm existing commitments including to the Sustainable Development Goals and the United Nations Charter, and move towards a reinvigorated multilateral system that is better positioned to positively impact people's lives.' This resulted in the adoption of the UN Pact for the Future (**A/RES/79/1**), a resolution that established Action Points and a Global Digital Compact on peace, security and sustainability, and more. For us, of course, the inclusion of Action 56 was a notable addition. This declares that States '...will strengthen international cooperation for the exploration and use of outer space for peaceful purposes and for the benefit of all humanity.' The Action identifies the increasing global reliance on space technology, while also noting that outer space is, as defined in the Outer Space Treaty, a 'province of humankind.' Furthermore, the delegation adheres to a full commitment to the principles of the Outer Space Treaty, and commits to enhancing discussions on new frameworks to tackle problems such as space debris, space traffic and space resources.

The Action does not directly mention the urgency surrounding key issues of security and military, but does go as far as to encourage a multi-stakeholder approach to governance, inviting '...relevant stakeholders, where appropriate and applicable, to contribute to intergovernmental processes related to the increased safety and sustainability of outer space.'

As with many such resolutions, being a non-binding approach, it will be a matter of further discussion at the national and international levels in regard to how they can be implemented. One key point, made by UNOOSA Director Aarti Holla-Maini, was the importance of 'soft law' (or non-binding) frameworks, to assist with national implementation. This could include examples such as the UN Long-Term Sustainability Guidelines, used to provide States with a set of safety and sustainability practices, or the IADC Space Debris Mitigation Guidelines. What has become clearer over the past year is that these non-binding approaches may become more common, seen as practicable and useful tools, whereas currently, engaging in binding treaty-making might be an uphill fight, given political and geopolitical strains.

UN Committee on the Peaceful Uses of Outer Space - Legal Subcommittee Meeting

In May 205, our Senior Strategist, Joseph Holden, was honoured to be invited to attend the United Nations Committee on the Peaceful Uses of Outer Space Legal Subcommittee Meeting (LSC) as an observer, as a student of Space Law (LLM) at Northumbria University. The LSC this year covered a wide range of critical discussions on the development of legal and governance mechanisms, critical to support rapidly expanding space activities.

Some key takeaways from this year's LSC included:

1. Enhancing Transparency of Space Activities - Article XI (Outer Space Treaty)

Within the LSC, the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space commenced discussions on the use and implementation of Article XI, as a means of registering mission details with the UN, enabling better transparency. Article XI itself reads:

> "In order to promote international co-operation in the peaceful exploration and use of outer space, States Parties to the Treaty conducting activities in outer space, including the moon and other celestial bodies, agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities. On receiving the said information, the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively."

The Working Group delivered a 'First Ideas for a Template on Article XI Outer Space Treaty', which includes details on the mission status, the States involved, the location of the mission, and the nature of the space activity. Article XI has been a relatively underused provision of the OST, despite States Parties' obligations to fulfil it. Nevertheless, it must also be noted that recent lunar missions have been registered, including commercial lunar landing missions from iSpace, Firefly Aerospace, Intuitive Machines and Astrobotic. Furthermore, the iSpace mission 2 registration went as far as to submit details of its planned commercial activities on the Moon, including the collection of lunar regolith, in what could be a precedent for the governance of outer space resource activities.

2. Draft Set of Recommended [Non-Binding] Principles for Space Resource Activities

In 2022, the Working Group on Legal Aspects of Space Resource Activities were given a 5-year mandate to create a work-plan, study the existing frameworks in regard to space resource activities and utilisation, and '...assess the benefits of further development of a framework for such activities, including by way of additional international governance instruments.' In 2024, the Chair and Vice Chair of the Group agreed to prepare an initial draft set of recommended principles for space resource activities, which were subsequently presented and discussed at the LSC in 2025.

The Principles represent another attempt to deliver a 'soft law' framework to govern the use of resources, and as with other non-binding approaches, this could be used as a means, for

example, of assisting States with the implementation and design of their own national legal frameworks and/or as a means of harmonising international approaches to these activities. New approaches will certainly be required, given that, for example, lunar and outer space resource exploration has already begun, and there are differing interpretations of existing international treaties, namely the OST.

In its current form, the Draft Principles have been further refined, and the latest (17 December 2025) Draft is available **here**. As a brief overview, key Principles currently include:

1. Compliance with International Law and Space Law

This includes compliance with the Charter of the United Nations, as well as the Outer Space Treaty. Notably, the current Draft excludes mention of the Moon Agreement, this being largely rejected by the international community.

2. Freedom of Exploration and Use of Outer Space

Space resource activities should be carried out in a manner which preserves free access to celestial bodies, including the Moon, and does not constitute national appropriation. Space resource activities shall be allowed in conformity with international law.

3. Sustainability

States should take steps to avoid adverse changes in the environment of Earth resulting from the introduction of extraterrestrial matter, as well as the harmful contamination of the Moon and other celestial bodies due to their exploration of them.

States should also avoid the creation of debris and hazards which could constitute a danger to human life or health, impact on the freedom of access to all areas of the Moon and other celestial bodies.

4. Scientific Research and Information-Sharing

Resource activities shall be for the benefit of all countries, and there shall be freedom of scientific exploration. States should also disseminate and publish the results of resource activities for the scientific community.

**This is just an overview of some of the themes in the current Draft. The Working Group has a mandate until 2027 to deliver a final set of Principles.*

United Nations - Conference on the Commercial Lunar Landscape and Policy Needs

In November 2025, we were honoured to attend this conference, which addressed the quickly developing needs of industry, delegates and lawmakers in the backdrop of a commercialising lunar economy. This followed the Conference on Sustainable Lunar Activities, which was held in Vienna in June 2024.

The European Space Agency (ESA) anticipates there to be more than 100 lunar missions by the end of the decade, providing a great opportunity for scientific exploration, commercial development and international cooperation. However, according to the UNOOSA, this also spells that '...the urgency to ensure the safety, sustainability, and regulatory coherence on the lunar surface and in orbit is rapidly increasing.' This conference then sought to provide a special opportunity to bring together agencies, government representatives, industry, academia and civil society, in order to address the needs and concerns surrounding the anticipated uptick in lunar activities.

Some key discussions from the conferences included:

1. **Action Team on Lunar Activities Consultation (ATLAC)**

An update was provided on the activities and work of ATLAC, a prospective consultation mechanism being developed in order to enable better safety, sustainability and data-sharing on the Moon. A work plan was agreed upon in 2025, and 2026 will focus on adding substance to the plans. The group is expected to deliver a plan in 2027, which will then be debated.

2. **Information Sharing**

This was a key area of discussion, while the UNOOSA formally announced the publication of its '**Toolkit on Good Registration Practices for Objects Launched Into Outer Space**' at the

following Space Law Conference. Regarding lunar activities, sharing information is seen as essential for safety and coordination, and could be enabled through ATLAC, as well as Article XI registrations.

3. **Interoperability**

This requires systems to be able to be compatible and work together. Discussions at the conference addressed how this is vital for safety, power solutions, sustainability and infrastructure development, and comes with a strong degree of international cooperation.

4. **Approaches to Governance: Binding vs. Non-Binding Frameworks**

This has perhaps been one of the strongest threads of discussion within the international community; how to build new governance mechanisms, either through revising or developing treaties, or building more 'soft law' approaches, built upon guidelines and best practices.

There is no doubt that the challenges are great, regarding the development of new governance for space activities. The value of opportunities is constantly increasing, while there is a growing reliance on space technologies, in an industry set to be worth $1.8 trillion by the middle of the next decade. This is also balanced with the increasing use of space in the defence domain, and the threat this might pose to stability, in the backdrop of expanding geopolitical crises. We hope to see ongoing discussions at the national and international levels in 2026 to find a means of maintaining space for all.

NEWS ANALYSIS

Illustration of HLS on the Moon (Image: NASA)

Trump EO Directs Lunar Development, Commercial Lunar Strategy, and CLPS 2.0?

In November, the UNOOSA hosted the Conference on the Commercial Lunar Landscape and Policy Needs, bringing together stakeholders from industry, State delegations, academia and civil society, to discuss and address pressing questions surrounding the growth in commercial lunar activity. Among the discussions were updates from the Action Team on Lunar Activities Consultation and the Working Group on Legal Aspects of Space Resource Activities, and panels engaging on nuclear power sources, issues in lunar orbit, frequency allocation and top priorities for safety and sustainability.

The event arrived at a pressing time for lunar economic development, as lunar missions are set to increase, and competing visions of leadership emerge from leading space powers, the US and China. As discussed in our previous report, we are set to see another flurry of lunar missions in 2026, from both commercial and agency entities, including the launch of Artemis-II in February, China's Chang'e-7 mission, and commercial landers from Astrobotic, Intuitive Machines and Firefly Aerospace.

In the previous weeks, we have also observed a number of infrastructure developments, paving the way for a sustained presence on the Moon. China have recently tested an experimental set of lunar bricks, made from synthetic lunar soil, aboard their Tiangong space station, which were exposed to the harsh space environment for one year. According to Zhou Yan, associate professor at Huazhong University of Science and Technology in Wuhan, the bricks showed impressive resilience, stating that 'Upon opening the lid, we found that the samples were in good condition. There were no dents, holes, or other visible defects that we thought they might have because of impacts by meteorites or space debris...' The research provides positive evidence supporting the prospects of future lunar construction and the Chinese International Lunar Research Station project.

In the US, on December 18, President Trump signed an **Executive Order** titled 'Ensuring American Space Superiority', a reflection of the increasingly competitive and contested nature of the space domain. Among the directives include ensuring US economic and security interests, leading the world in space exploration, landing humans on the Moon again by 2028, and '...establishing initial elements of a permanent lunar outpost by 2030...'

It is clear that new US leadership in space is increasingly relying on commercial actors, seen not least through the domination of SpaceX in the launch and satellite segments. Lunar exploration is seemingly no different. On December 17, Jared Isaacman was appointed as Trump's NASA administrator, and is also a strong supporter of ensuring that the US beats China back to the Moon. Isaacman is also pressing for further engagement with the private sector in this endeavour. In November, a 62-page document titled 'Project Athena', written by Isaacman, was leaked, which includes plans to outsource '...some of NASA's missions to the private sector and treating the government agency more like a business', **according to** analysis from Politico.

Commercial entities are already playing a leading role in US lunar exploration, yet that role could be expanding. In 2023, the US Defence Advanced Research Projects Agency (DARPA) established its Luna-10 project, aimed at researching the feasibility of an interoperable, monetizable lunar economy over the next decade. Additionally, in October this year, a guide titled 'The Commercial Lunar Economy Field Guide: A Vision for Industry on the Moon in the Next Decade' was published by Air University Press, which explores the potential for off-world economic development. Editor of the guide, **Michael Nayak**, conceded that this vision for the Moon is '...an expansive exercise and makes you realise just how much work will have to be done...'. He also stressed the challenges of the lunar environment, such as extreme temperature swings, solutions for generating power, and insurance. Indeed, operating on the Moon will provide unique challenges which require rigorous testing, investment and validation.

Nonetheless, Nayak also added, while speaking with **space.com**, 'What really came out are the potential resources on the moon', but it is to be understood what can be mined and what concentration of resources there are. Prospecting technologies are being developed in this regard, such as **Interlune's** (US) lunar helium-3 scouting mission scheduled to launch with Astrobotic in July 2026, and satellite prospecting tech being researched by Fleet Space (Australia) and Blue Origin (US). Further recent developments regarding space resource exploitation include:

- **Canadian Space Mining Corporation** (CSMC) announced it has been awarded a contract to develop a quantum atomic subsurface mapper (QASM), used for searching for resources beneath the surface, such as water and minerals.
- Lunar helium-3 mining company, **Interlune**, has been awarded a contract by AFWERX to '...separate helium-3 from domestic helium and increase the country's supply of this critical isotope.'
- Leading Japanese lunar landing company, **iSpace**, have announced a partnership with Kurita Water Industries '...to create business opportunities focused on water resources and building supply infrastructure on the lunar surface in the future.'
- Team Bremen won the **ESA Space Resources Challenge**, which called for technologies for processing lunar dust, and received a €500,000 prize.

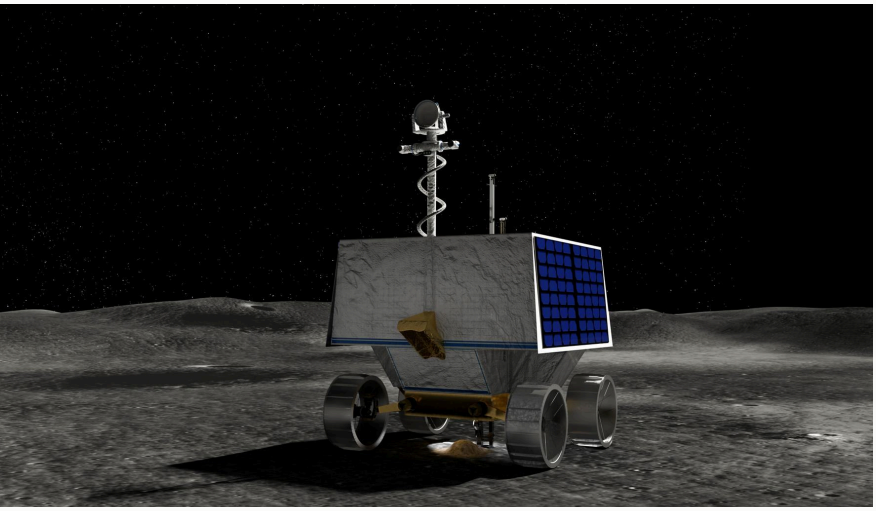


Illustration of VIPER (Image: NASA/Daniel Rutter)

> NASA '...to ensure that "utility" data...is secured before the next generation of astronauts arrives.'
>
> **SatNews**

Additionally, Blue Origin have officially received a task order to deliver the troubled NASA Volatiles Investigating Polar Exploration Rover (VIPER) to the lunar south pole in late 2027. NASA had previously cancelled VIPER, but commercial proposals were put forward to rescue the project. Furthermore, according to SatNews, the award represents a shift in NASA strategy, from the origins of their Commercial Lunar Payloads Services programme, whereby the agency funded high-risk exploratory programmes, to a more robust and reliable

architecture, '...to ensure that "utility" data—specifically the location and accessibility of lunar water ice—is secured before the next generation of astronauts arrives.'

Blue Origin is also reportedly aiming to carry out its first lunar cargo landing, using its Mk-1 lander, in early 2026. A successful landing would mean they reach that goal before rivals, SpaceX, which is under pressure to successfully demonstrate the use of its Starship as a Human Landing System (HLS) to deliver astronauts to the lunar surface for the Artemis-III mission. A trend is emerging, that is, of increased competition in the lunar segment.

Commercial Launch Development, China Attempts Reusability

Blue Origin is also proving to be a serious competitor for SpaceX in the launch market, particularly after its Novemberlaunch of New Glenn, which managed to successfully deploy NASA's Escape and Plasma Acceleration and Dynamics Explorers (ESCAPADE) mission, and land its first stage booster, on only its second ever attempt. This places New Glenn in a position to seriously challenge SpaceX, in being able to provide more cost-efficient launch services, as well as carry an impressive payload capacity of 45 tons to low Earth orbit (LEO), compared to SpaceX's New Glenn, which can carry 22.8 tons.

SpaceX, though, have a generous lead on its rivals, and is by far the largest launch service provider on the planet. Furthermore, once Starship has been fully validated, the company will be able to offer full reusability (the ability to land and reuse the booster and Starship) as well as provide a payload capacity of 100-150 tons. However, an article from **Will Locket** describes that Blue Origin can technically offer cheaper services, and cited the ESCAPADE mission costing NASA between $20-40 million, which would mean costs of $444 and $1,222 per kg to LEO. Compare this to SpaceX's most cost-efficient vehicle, Falcon Heavy, and its launch of NASA's Europa Clipper mission, which cost $178 million. This would amount to $3,122 per kg to LEO.

Blue Origin is also looking to update New Glenn, improving its propulsion and reusability, and aims to develop a super-heavy version, capable of lifting 77 tons to LEO. Considering the rapid growth in demand for space launch services, we may be set to see another disruptive moment in the space industry, driven by increasing competition.

Competition is also emerging from international rivals. Chinese private launch company, **Landspace**, carried out the first test launch of its Zhuque-3 rocket, aiming to demonstrate the landing and reusability of its booster stage. The second stage was placed into orbit, and the booster made a successful reentry. However, the booster experienced an anomaly as it approached its landing zone, and it exploded upon impact. Landspace will still, though,

celebrate much success for this debut launch, for a vehicle that will provide similar capabilities as the SpaceX Falcon-9; first stage reusability and able to lift 18.3 tons to LEO.

Before rounding off the year, China carried out a second reusable launch demonstration, this time from state-ownedentity, China Aerospace Science and Technology Corporation (CASC). The launch of its Long March 12A took place on December 23, launching from the Jiuquan Satellite Launch Center. Similar to the Zhuque-3 launch, the second stage reached its desired orbit, while the booster reentered and experienced a hard landing. Nonetheless, this will also be counted largely as a success, and opens the door to reusable launch systems in China. Once fully validated, these could give China the edge to close the gap on the US in terms of launch numbers. An article from **ARS Technica** makes a very valid point:

> "Chinese rockets have logged 89 orbital launch attempts this year, less than half the number of flights by US launch vehicles....(however) China has achieved this launch cadence with a fleet of expendable rockets, ranging from small micro-launchers to the **heavy-lift Long March 5**. With reusable rockets, China could launch more often and at lower cost, revolutionizing the country's access to space in ways similar to how SpaceX's Falcon 9 ushered in a new era of lower-cost launch services in the United States."

This comes amid an era of rapidly expanding and rivalling megaconstellations, the utilisation of space for defence, and increasing investment.

Historic ESA Funding, Conflicting Views on EU Space Act

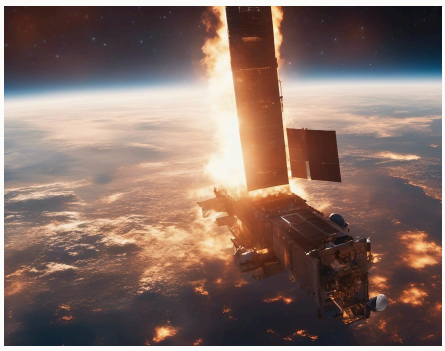
Outcomes of CM25 are announced in Bremen (Image: ESA/S. Corvaja)

This investment pattern was reflected in the European Space Agency (ESA) **November Ministerial**, where the 23 Member States met to discuss the budget of space applications, which resulted in the largest contributions in the history of ESA, €22.3 billion between 2026-2028. According to ESA, this '...confirmed support for key science, exploration and technology programmes alongside a significant increase in the budget of space applications – Earth observation, navigation and telecommunications.'

It was also a first step in the implementation of the ESA 2040 Strategy, which aims to achieve five key goals:

- **Protect our Planet and Climate.** Develop technologies to address climate change and environmental protection.
- **Explore and Discover.** Build ESA's global scientific leadership, and expand the agency's role in LEO, around the Moon and Mars.
- **Strengthen European Autonomy and Resilience.** Secure autonomous (and reusable) transport systems, next-generation connectivity.
- **Boost European Growth and Competitiveness.** Accelerate innovation in cutting-edge areas, strengthen industrial capacity and the European commercial base.
- **Inspire Europe.** Develop cooperation among key stakeholders, inspire future generations, and harness space technologies in international diplomacy and global affairs.

European nations have also been allocating more resources for defence capabilities in space, as discussed in our Legal Review, and as a result of shifting international relations and a seemingly 'isolationist' approach from the Trump administration in regard to European defence. Outer space is increasingly also being observed as a critical domain for defence, as notably seen in the Ukraine conflict, while ESA itself has allocated $1.6 billion for a 'non-aggressive' defence initiative for the first time.



(Images: Adobe)

Furthermore, on June 25, the European Commission published the first Draft of its EU Space Act, designed to focus on safety, resilience, and sustainability in the European space industry, while harmonising EU nations' frameworks and enhancing a European single market for space. However, in November, the US responded to the Draft stating that it builds barriers and could impose costly environmental requirements on companies. The Act would require any actor operating in EU nations to comply with its provisions. The US State Department went on to '...expresses deep concern regarding measures in the proposed Act that would impose unacceptable regulatory burdens on U.S. providers of space services to European customers.' Particularly, they accused the EU of taking aim at operators of large

constellations, such as Starlink. The Act places numerous requirements on constellations, such as consideration of choice of orbits regarding congestion, detailed plans for collision avoidance, and perform, on a daily basis, collision risk screenings, for example.

Major European space economies Germany and Italy have also called for a '...less restrictive legal approach, proposing the Space Act be a directive rather than a regulation, arguing that stringent rules could stifle innovation and growth in the sector', according to **Milja Liinanotko**. It may be the case that the Act does need to balance regulatory provisions with industry needs, and that there could be a case for allowing national governments to implement the provisions of the Act in their own manner.

Nevertheless, what 2025 has shown, is a world changing, old alliances shifting and multi-polarity emerging. Outer space is rapidly developing and provides great opportunities. It is also a domain which is threatened by growing competition, congestion and contamination. Going into the New Year, efforts must continue to maintain the spirit of international cooperation in the res communis of outer space.

SPACE LAW REVIEW

SPACE LAW & POLICY

SUSTAINABLE & PEACEFUL USES OF OUTER SPACE

Discussing the challenges, threats and opportunities to international space law and governance, arising out of evolving international relations, geopolitical dynamics and more

Key terms: Outer Space Treaty; Article IV; Partial Test Ban Treaty; UNGA Res 1248; 1721; 1963; 1884; WMD; Nuclear Weapons; ASAT.

Is the Outer Space Treaty Fit to Govern the Militarisation of Outer Space?

In November, French President, Emmanuel Macron, said that 'The war of today is already being fought in space, and the war of tomorrow will begin in space,' while adding that the Ukraine War has led to Russian espionage activities, and that Russian space vehicles were monitoring French satellites, there was mass jamming of GPS signals, and cyberattacks against space infrastructure.[1] Furthermore, the Ukraine War has been dubbed the 'first commercial space war',[2] with images of the Russian invasion being supplied through commercial satellite operators, and of course, the critical role that Starlink has played in supporting Ukrainian communications and battlefield operations.

Furthermore, in recent years and months, there has been an acceleration in the development of military space systems, with States now observing the opportunity, advantage and threat that the space domain poses. Not only do space services provide critical military support, but they also provide humankind with beneficial technologies,[3] which are increasingly relied upon, while the space economy itself is serving as an outlet of economic growth.[4] This article then

seeks to explore how the 'militarisation' of space is perceived and governed, and to what extent measures have been (or will be) taken in order to maintain outer space as a domain of peaceful activity.

Moreover, the research strives to analyse existing and developing legal frameworks to understand their efficacy, both historically and in the modern age. In order to do this, it will be necessary to analyse the core space treaties and the context in which they were created. Furthermore, this paper will also seek to understand what further efforts have been made in space governance, and how effective these frameworks are today. The Outer Space Treaty, in its preamble, recognises '...the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes.'[5] It is perhaps better to understand exactly what that notion now means, in an age of rapid outer space development.

A Prohibition on Arms? 1967 Outer Space Treaty

US President Lyndon B. Johnson referred to the Outer Space Treaty (OST) as '...the most important arms control development since the limited test ban treaty of 1963,'[6] while US Ambassador Golderg stated that the central issue of the Treaty '...was to ensure that outer space and celestial bodies were reserved exclusively for peaceful purposes.'[7] Indeed, the negotiations of the OST came at a time of heightened geopolitical conflict of the Cold War, and as Dempsey states, '...during the very hot war in Vietnam, during which Soviet proxies and American soldiers were killing each other and an enormous number of innocent civilians.'[8] These, then, are two of the main concepts to explore; the notions of 'arms control' and the definition of 'peaceful uses'.

In relation to arms control, examining the context of the drafting process of the OST provides considerable insight. In 1957, the Soviet Union launched Sputnik-1, alarming the United States, which saw, for the first time, an artificial satellite orbit freely around the globe and over its territory. President Eisenhower later referred to the launch, causing a wave of 'near-hysteria', with panic spreading via the media and among the public.[9] However, a memorandum of conference with the President also notes that '...the Russians have in fact done us a good turn, unintentionally, in establishing the concept of freedom of international space...'[10] Nevertheless, the legal mechanisms that were established after the Sputnik launch were an attempt, in part, to prevent nuclear weapons being placed into outer space, in the backdrop of the two leading superpowers demonstrating weapons testing, including the US 'Starfish Prime' high-altitude detonation in 1962, which reportedly disabled several satellites,[11] and 'Tsar Bomba' in 1961, which was the largest nuclear weapon ever demonstrated.

Following the launch of Sputnik-1, in 1958, the UN General Assembly (UNGA) adopted Resolution 1348, 'Questions of the peaceful use of outer space', which sought to prevent national rivalries from extending into space, among other aims. It also established an ad hoc Committee On the Peaceful Uses of Outer Space (COPUOS).[12] The COPUOS was made permanent the following year. In 1961, the UNGA adopted Resolution 1721, 'International co-operation in the peaceful uses of outer space', which recognises '...the common interest of mankind in furthering the peaceful uses of outer space...',[13] while two years later, Resolution 1963 (1963) recommended '...that consideration should be given to incorporating in international agreement form...legal principles governing the activities of States in the exploration and use of outer space.' The construction of the Outer Space Treaty was underway, which would build on the principles founded in these early Resolutions, and the binding provisions which still form the cornerstone of international space law today. Specifically, the OST Article IV writes:

> "States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.
>
> The moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the moon and other celestial bodies shall also not be prohibited."[14]

Considering the broader context of the times, the Cologne Commentary states that Article IV is '...commonly regarded as the focal point in the Outer Space Treaty...',[15] but also adds that '... as one of the first and most important provisions on arms control is complemented by other treaties of arms control.' Indeed, amid the significant geopolitical confrontation of the Cuban Missile Crisis in 1962, and in the aftermath of the nuclear weapons tests such as Starfish Prime, the US, USSR and UK signed the Partial Test Ban Treaty (PTBT) in 1963.[16] Article I(1)(a) of that Treaty requires that States undertake '...not to carry out any nuclear weapon test explosion, or any other nuclear explosion, at any place under its jurisdiction or control...in the atmosphere; beyond its limits, including outer space; or under water, including territorial waters or high seas...'[17] The Cologne Commentary notes that this provision of the PTBT then '... has to be viewed as a source of inspiration for Article IV...of the Outer Space Treaty.'[18] Furthermore, also in 1963, the UNGA adopted Resolution 1884, which calls upon States:

> "To refrain from placing in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, installing such weapons on celestial bodies, or stationing such weapons in outer space in any other manner."[19]

This principle was then included in the 1966 US Draft version of the OST, with Article 8 stating that 'In accordance with the sense of General Assembly resolution 1884...no State shall station on or near a celestial body any nuclear weapons or other weapons of mass destruction.'[20] Furthermore, the Cologne Commentary notes that Article IV of the OST '...is taken from Articles 8 and 9 of the United States draft...', with '...the last sentence of Article 9 being very similar to Article I paragraph 2 of the Antarctic Treaty.'[21] The Antarctic Treaty states it shall not '...prevent the use of military personnel or equipment for scientific research or for any other peaceful purpose',[22] while Article V prohibits 'Any nuclear explosions in Antarctica and the disposal there of radioactive waste material...'[23]

The concept of arms control was then widely discussed in these formative years of the 1950s and 60s, while the notion of military uses of space for peaceful purposes is not prohibited. Firstly, these provisions have, then, been a relative success. As the Cologne Commentary states, 'No placement of WMD in Earth orbit has occurred, and during the few human visits to the Moon, it has been used exclusively for peaceful purposes.'

This, as far as research informs, is true. It can also be said that, thus far, the Moon and other celestial bodies have been used exclusively for peaceful purposes,[24] though current geopolitical tensions are challenging this status quo, something which this article will discuss in the next Chapter.

Additionally, outer space exploration, including on the Moon, has seen the participation of military personnel, yet, arguably, for peaceful purposes and scientific research, which is not prohibited by the OST. Freeland comments that indeed it is '...clear that space has been utilized for military activities almost from the commencement of the space age.'[25]

Efforts to build upon the principles of the OST have continued. In 1981, the UNGA adopted two Resolutions which came to define discussions on the prevention of an arms race in outer space (PAROS), after a Final Report from the first special session devoted to disarmament in 1978 was published, which requested that, in order to prevent an arms race in outer space, '... further measures should be taken and appropriate international negotiations held in accordance with the spirit of the (OST).'[26] This would lead to further efforts to reduce military threats in outer space, and would ultimately build upon the guiding principles of the OST.

Considerations for Arms Control and 'Peaceful' Uses of Outer Space

However, the Cologne Commentary also notes that 'Any analysis of the State practice concerning Article IV, therefore, also has to take into account the wider picture regarding the "weaponisation" of the Earth orbit as well as the potential perspectives of other military uses...'[27] Furthermore, though Article IV of the OST prohibits nuclear weapons and WMDs, research is required to establish what is covered within these definitions, and what constitutes a 'space weapon'.

Tronchetti writes that as paragraph one of Article IV of the OST '...does not define either "nuclear weapons" or "weapons of mass destruction", the proper interpretation of these concepts is to be determined in accordance with Articles 31 to 33 of the 1969 Vienna Convention on the Law of Treaties...'[28] Article 31(1) of the Vienna Convention states that 'A treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose.'[29] Obeying this, then nuclear weapons, given the context of the making of the OST, should certainly be akin to those demonstrated, such as Starfish Prime and Tsar Bomba. Tronchetti adds that some authors tow this line, and argue that '...that only nuclear weapons which indeed cause "mass destruction" could not be placed in earth's orbit...', yet this would contradict the meaning of Article IV(1), which prohibits the placement of any nuclear weapons in outer space.[30] It is perhaps through the purposive and contextual meaning of the OST that no such weapons of any kind have since been placed or used in outer space, but it also may appear that further clarity is urgently needed, especially given that NATO have warned that Russia may be developing nuclear weapons against satellites in space,[31] a claim that Moscow has vehemently denied.[32]

There is then the definitional meaning of 'Weapons of Mass Destruction (WMD)'. According to UNGA Resolution 32/84-B in 1948, the General Assembly affirmed its view that WMD is defined as '...atomic explosive weapons, radioactive material weapons, lethal chemical and biological weapons and any weapons developed in the future which might have characteristics comparable in destructive effect to those of the atomic bomb or other weapons mentioned above...'[33]

This provides us with the notion of space WMD being those which create similar devastation to other nuclear and biological weapons,[34] and Tronchetti adds that it is evident that the present prohibition does not cover conventional weapons, such as anti-satellite weapons (ASATs), and military satellites.'[35]

However, there could be an argument to the contrary, specifically in regard to kinetic energy ASAT weapons. The US, China, India and Russia have all demonstrated this capability. To use an example, the Chinese ASAT test in 2007, carried out to destroy its own ageing Fengyun-1C weather satellite, created a cloud of thousands of pieces of both trackable and untraceable debris.[36] In a report to US Congress, Shirley Kan also observed the long-term hazard this creates, noting that the debris created from US ASAT test in 1985, despite taking place at a lower altitude, still '...took over 20 years to come down out of space and burn up in the atmosphere.'[37] Given the increased reliance on space services for civil and humanitarian purposes, and the risk of furthering the 'Kessler Syndrome'[38] in Earth orbit, one could argue that the placement of such weapons into outer space could lead to a destructive effect, affecting thousands, if not millions, of people.

It should be noted that efforts have been made within the international community to prohibit the use of kinetic ASAT weapons, which resulted in the US-led UNGA Resolution in 2022, which 'Calls upon all States to commit not to conduct destructive direct-ascent anti-satellite missile tests.'[39] However, Resolutions remain a non-binding legal instrument, and furthermore, would not necessarily address the use of non-kinetic ASAT weapons, such as cyber attacks and signal jamming.

Nevertheless, as Tronchetti argues, the OST and Article IV do not prevent the militarisation of outer space. Additionally, Article IV must also be read in conjunction with Article III, which requires that States Parties to the Treaty shall '...carry on activities in the exploration and use of outer space...in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding.' This would then invoke Article 51 of the Charter, which protects the right of '...individual or collective self-defence if an armed attack occurs against a Member of the United Nations.'[40] This would then allow States to invest in defensive space weapons, raising the pressing point that indeed space is not a non-military domain, but rather founded on the principles of non-aggression.

As a poignant example of this, in November 2025, the European Space Agency (ESA) approved a $1.6 billion budget for 'non-aggressive defence purposes.'[41] France also approved a $4.9 billion increase to its space-related defence projects in the years 2026-2030,[42] while in September 2025, Germany announced a $41 billion package in space-related defence projects.[43] Perhaps the most significant defence project to be announced this year was the Trump Administration's 'Golden Dome' Project, a '...next generation defense shield...' which will '...identify incoming projectiles, calculate trajectory and deploy interceptor missiles to destroy them mid-flight, safeguarding the homeland and projecting American Strength', according to Lockheed Martin.[44] At the same time, while States direct generous investment

into space domain defence, the aims of Resolution 1348 in 1958 hark back, which was to prevent national rivalries extending into space. This, unfortunately, may no longer be achievable.

Conclusion

It then appears that provisions of the OST, namely Article IV, were constructed in the backdrop of a world in which the threat of nuclear weapons was a clear reality. The treaty-making process, and the other non-proliferation treaties of the time, prove that unique and concerted efforts were made to address this categorical risk. In the modern age, it is also somewhat clear that the OST remains a critical piece of international law, maintaining that outer space remains free of nuclear weapons and WMDs.

However, some further definitional and purposive research on the working of the OST would be beneficial for clarity, particularly considering the proliferation of new and varied sorts of weaponisation today. There is no doubt that space was founded on, and will remain, a domain of military activity. Recent announcements have seen States deepen their engagement with space as a domain for defence, to support both defensive systems on Earth, as well as in outer space itself. What could, though, be explored deeper, is that of the definition of 'peaceful uses', and whether the role of space in offensive terrestrial operations breaches Treaty obligations. It will also be vital to oversee the increasing reliance being placed on commercial and dual-use actors in this regard.

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