EDITION 0013

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DEFINE OUR FUTURE

Iran Conflict and Blurred Lines of Dual-Use Tech, Governing a Lunar City, and Utilising Legal Obligations of 'Due Regard'

SPACE INDUSTRY REPORT

JANUARY/FEBRUARY 2026

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INTRODUCTION

When Russia invaded Ukraine in February 2022, a cyberattack targeted the modems connected to Viasat satellites, disrupting internet access for thousands of people throughout Ukraine. Following this, Elon Musk announced that SpaceX's commercial broadband Starlink network would be made available to maintain connectivity in Ukraine, which has become a pivotal tool in the war. While used for civilian applications, Starlink became essential for battlefield support and command, and according to **Mykhailo Fedorov**, Ukraine's Minister of Digital Transformation, '...Kyiv's military began applying it creatively in the battlefield, such as using it to control unmanned surveillance and reconnaissance aerial vehicles and unmanned combat aerial vehicles.'

In this capacity, Starlink is referred to as a 'dual-use' technology, providing civilian and defence services, and the war in Ukraine has become a symbol of the expanding role of commercial actors in the defence sector. Aptly, the war has also been referred to as the 'first commercial space war'. This has, of course, brought about a string of legal debates surrounding the role of these companies, and whether dual-use systems can also be legitimate targets of warfare, and begs the question as to how the laws of armed conflict, jus in bello, would be applied to such objects. While they might be supporting armed conflict, even offensive armed conflict, they may also, at the same time, be providing critical civilian support, such as in communications, humanitarian aid, and welfare.

Our previous report (**November-December 2025**) discussed this at length, highlighting different approaches to the issue and whether such activities would breach the 'peaceful' or 'non-aggressive' uses of outer space. The use of commercial defensive technology would not breach the right to self-defence, enshrined within Article 51 of the UN Charter, but **Steven Freeland** also argues that '... the existing legal and regulatory regime has not kept pace with the remarkable technological and commercial progress of space activities.'

The significant effect that these systems now have on battlefield superiority was once again shown in recent weeks, as Starlink terminals were shut down for Russian forces across Ukraine, which reportedly led to Russia's **advance slowing**. In our featured article this month, we will also observe how the use of 'dual use' technology is expanding, and what effect it is having in the latest field of conflict, Iran.

A Rise in Defence Investment: Hiding Behind the Mask of 'Dual-Use'?

Germany's '**Space Safety and Security Strategy**' recognises that 'Space technologies and their applications have inherent dual-use potential, meaning they can be used for both civilian and military purposes', and observes '...which is why they can be strategic and military targets when it comes to armed conflict.' However, the report also sees the cost-effective benefits of utilising and investing in dual-use, noting that 'Strategic space research and development is particularly important but also costly. The dual-use character can be put to profitable use through civil-military dual-sourcing...' Germany has dedicated a generous $41 billion to its space development plans, largely to counter threats from Russia and China. Germany is additionally planning to launch a constellation of 100 encrypted military satellites, known as SATCOM Stage 4.

Image: ESA

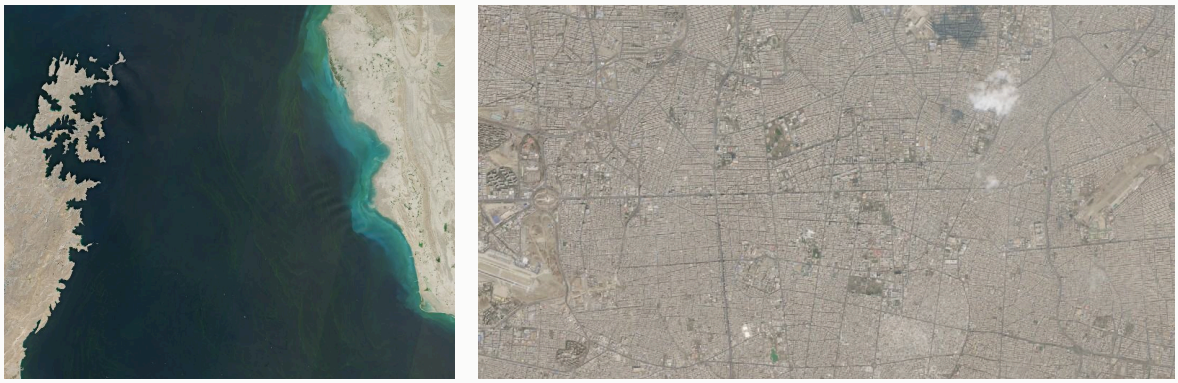
The European Union (EU) is also seeking to invest further in dual-use technologies. Firstly, Europe and ESA have made their strategy clear, in seeking to strengthen 'European Autonomy and Resilience' as a key pillar of the **ESA 2040 Strategy**, while the agency also earmarked $1.6 billion in its latest budget that, for the first time, will support defence projects for its members. Adding to this, the **European Investment Bank (EIF)** announced in March that it will provide €50 million for EU dual-use innovation in defence and space. Jan Borgstädt, Founding Partner at Berlin-based Join Capital, discussed how this approach supports both security and business, saying that 'Investments in such dual-use technologies have a doubling effect, they create both deterrence and economic growth for Europe.'

While States and companies alike can benefit from the utilisation of commercial systems, there may now be a shift in the balance of what these systems are truly representing.

Notably, since the start of the second Trump administration, there has been a significant increase in European defence focus, and an aim to establish sovereign, non-dependent space systems, and it may now need to be asked to what degree private actors can hide behind the mask of a providing commercial and civil systems. Dr Marino Fragnito, Senior Vice President at Thales Alenia Space, has argued that, for some, the 'dual-use' narrative has become single-use, stating that when Thales delivers a system, '...99% of the need comes from a defense application.' Questions must then be asked as to what the role of these systems will be in the near future, and for how long can they be protected as civilian infrastructure? Furthermore, now that the war in Iran is again highlighting how these systems provide battlefield superiority, how long can it be before dual-use satellites are attacked under the legal guise of self-defence?

Iran and the Second Commercial Space War: Are Commercial Satellites Under Attack?

An article from *The Conversation* aptly describes how the conflict in Iran has already been shaped by **commercial space systems**, noting that confirmation of the start of 'Operation Epic Fury' by the US and Israel didn't come from governments, it came from commercial satellites. Companies Planet Labs and Vantor captured images of strikes over Tehran, as well as '...ships burning at the coastal city of Konarak – evidence of strikes on naval bases, airfields and missile sites that global media confirmed within hours.' The US also targeted Iranian Space Command, while Iran reportedly also used 'spoofing' to mislead GPS satellites, by creating false signals.



(Left) Straight of Hormuz, and (right) Tehran. Both images taken from open source Copernicus satellite images in February (Credit: Copernicus Satellite)

The value of strategic space defence is clearly on display. In January, Iran had also tageted Starlink, amid its internet blackout when facing internal upheaval and demonstrations. Despite Starlink and satellite internet being an alternative during such shutodowns, the use of GPS spoofing did **gradually degrade** the network.

But does Iran have legitimate cause to attack these systems? Artcile 51 of the UN Chater states that:

> "Nothing in the present Charter shall impair the inherent right of individual or collective selfdefense if an armed attack occurs against a Memher of the United Nations, until the Security Council has taken the measures necessary to maintain international peace and security."

Now, this is an argument which both sides of the conlfict can utilise. Israel's President, Isaac Herzog, **told the BBC** that it was necessary for self-defence in the face of Tehran's nuclear and military ambitions. Iran also argues that it is also asserting its right to self-defence, while European States, such as the UK, are limiting their military actions in the region to defensive manouevres. This then places the use of dual-use systems in uncertain territory (if it weren't already).

Planet Labs did choose to delay the release of imagery by two weeks for non-governemtnal users, but did so in order to limit the risk of misuse of the data and to ensure the imagery '...is not tactically leveraged by adversarial actors to target allied and NATO-partner personnel and civilians.' The US military still has immediate access, meaning the argument surrounding the legitimate targeting of dual-use systems remains.

Legal solutions surrounding this issue seem unlikely, such as a new treaty, given the current state of geoplitics and international relations. Furthermore, it would also appear that leading nations will maintain their respective positions on the matter. Russia, for example, **has proposed** that States and private entities should '...refrain from conducting activities that... give rise to concerns of other space players with regard to the use of civil space systems, space technology and services for purposes other than their intended peaceful ones.' On the other hand, adversaries of this position can interpret the 'peaceful' provision can also be interpreted as 'non-aggressive' and not 'non-military'.

While the US and its allies lead the way in the deployment of commercial dual-use systems, and take significant advantage of them, it seems there is currently little room for any kind of compromise.

NEWS ANALYSIS

Can Starship kick-start cities on the Moon? (Image: SpaceX)

Musk Shifts Focus to the Moon, Artemis Schedule Updates

Elon Musk's announcement in February that SpaceX will now shift focus to establishing a self-growing lunar city has added yet more significant momentum to a segment which has become increasingly competitive in recent years, but specifically in recent weeks and months. The SpaceX CEO described his ambition as 'securing the future of humanity', which would be done faster on the Moon, by being able to launch there every 10 days (as opposed to every 26 months to travel to Mars). Musk also announced plans to utilise Starship to deliver mass amounts of cargo to the Moon, and to utilise lunar resources to build satellites on the Moon. He then described how his plans entail using an electromagnetic mass driver to launch these satellites, adding that '...it is possible to put 500 to 1000 TW/year [terawatts per year] of AI satellites into deep space...'

Musk is well known for his often overly optimistic outlooks and grand statements on his plans for space infrastructure development. However, as discussed in our legal review this month, the achievements of SpaceX should be taken seriously, especially given the ongoing growth of competition in lunar development. NASA Administrator, Jared Isaacman, has announced

further changes to the Artemis schedule, but ones which still embrace competition between leading commercial leaders, Blue Origin and SpaceX. Artemis-III, which was supposed to be the first crewed landing within the Artemis framework, will now be brought forward to 2027, but will instead carry out testing of the crewed human landing system (HLS) in Earth orbit, which is to be delivered by either Blue or SpaceX. A crewed landing is still scheduled for 2028, but will now be part of the Artemis-IV mission.

The revised plan doesn't disrupt the timeframe for returning humans to the Moon, and could still put the US ahead of Chinese competition. However, it does still bring to light the fact that a HLS is still not ready. Any landing system will also still need to carry out critical testing, as well as demonstrations for on-orbit refuelling. Nonetheless, NASA may be hoping that the renewed competition between the two commercial giants can expedite these processes. According to **SpaceflightNow**, 'As it now stands, NASA plans to use whichever lander is ready when it's needed.'

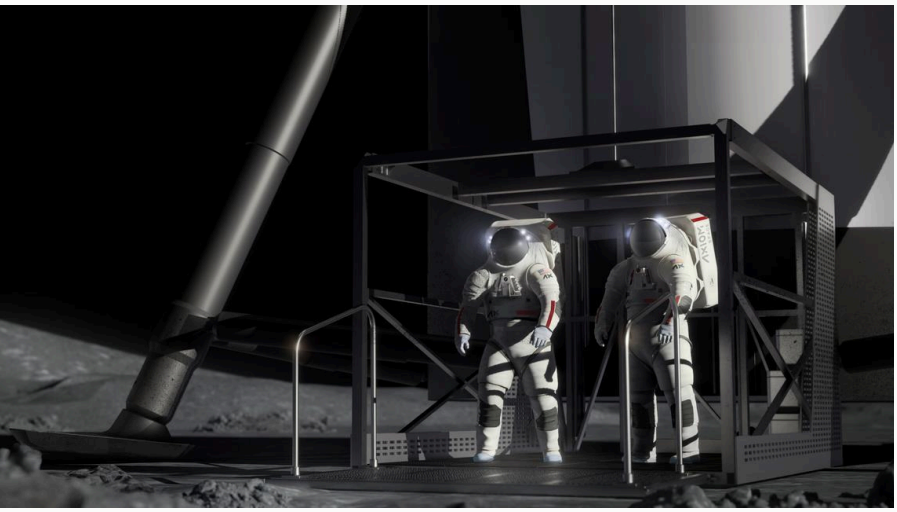


Illustration of NASA HLS system from SpaceX (Image: SpaceX)

> As it now stands, NASA plans to use whichever lander is ready when it's needed
>
> **Spaceflight Now**

Lunar and Space Resources Development

Musk directly referred to the necessity to utilise local resources on the Moon, which again raises questions surrounding the increasingly competitive nature of space in situ-resource utilisation (ISRU), which is being pursued by the US and the Artemis nations, while China's upcoming Chang'e missions will soon begin ISRU testing. China Aerospace Science and Technology Corporation (CASC) also announced in January that it would be stepping up its research on space resources and extracting materials from other celestial bodies, according to **CGTN**. In 2025, China launched its Tainwen-2 asteroid exploration mission, which will carry out a sample return, while also last year, researchers at the China University of Mining and

Technology developed China's first space mining robot. The robot is designed to function in low-gravity environments and traverse surfaces of asteroids by utilising wheeled and clawed limbs.

Similar technology is being developed by Asteroid Mining Corporation (UK), which is creating its SCAR-E robot, while Astroforge (US) have recently announced that it is developing an in-house **laser testing** facility to enhance its asteroid mining technology. Astroforge focuses solely on retrieving resources from asteroids, such as platinum group metals (PGMs), and has highlighted the finite supply of such resources on Earth. It aims to carry out its third mission this year, named Vestri, which will travel to an M-Type asteroid and prospect for resources such as PGMs.

However, much focus has been on lunar resources exploitation in recent weeks. US lunar rover developer, Astrolab, has announced that it will partner with lunar helium-3 mining company, Interlune, to integrate the latter's excavator technology into its Flexible Logistics and Exploration Vehicle (FLEX) rover. **According to Interlune** CEO, Rob Meyerson, 'Reliable, autonomous mobility is crucial to the Interlune harvesting system and broader lunar infrastructure development', and added that 'Astrolab's FLEX is the right vehicle for the job.' Prototyping and testing are due to take place in Houston, while Interlune is already working with Vermeer Corporation on excavator development. Earlier in February, Inerlune also announced details of a NASA Small Business Technology Transfer Phase 1 contract to demonstrate its excavator technology to support infrastructure development. The company has also raised an additional $5 million in January, and is aiming to deliver its first helium-3 prospecting mission to the Moon this summer.

Lunar Infrastructure Development

The dual-use aspect of Interlune's excavator technology also highlights a broader vision of lunar infrastructure development. In February, Astrolab announced the conclusion of its demonstration in cooperation with Astroport Technologies. The **collaboration** used a prototype lunar excavation payload and seeks to integrate Atroport's autonomous technology into the FLEX rover. According to the CEO of Astroport, Sam Ximenes 'This is the first of many implements in development that will turn Astrolab's FLEX rover into the 'Swiss Army Knife' of lunar construction. To meet the infrastructure needs of the emerging lunar economy, we must build the 'Port' before the 'Ship' arrives. By leveraging the FLEX platform, we are providing the Space Force, NASA, and commercial partners with a 'Shovel-Ready' construction capability to secure the lunar high ground.'

Indeed, constructing a 'self-growing' lunar presence will require the use of local resources, but it will also need key elements of infrastructure to be established in the foundational stages, not least a sufficient supply of energy. Solar energy can be utilised, but early settlers and robotics on the Moon will face the prospect of two-week-long lunar nights. NASA has already **announced plans** to deliver a nuclear fission power system for the Moon by 2030, while Russia aims to deliver a similar project by 2036 as part of the International Lunar Research Station (ILRS) project. However, a Latvian startup has also entered this field, and might be able to provide Europe with its own solution. **Deep Space Energy** aims to use heat from the self-decay of radioisotopes - materials from nuclear waste - to support lunar exploration and resource utilisation, as well as the defence sector.

According to the founder, Mihails Ščepanskis, his innovation will make it possible to unlock the Moon's economy, and '...to explore faster and to begin resource utilization of the Moon sooner.' The company has also raised €930k '...to further develop a radioisotopic generator toward commercialisation, in a bid to strengthen the European sovereign space and defense industry and power Moon surface exploration,' according to EU-Startups.

Commercial space station developer, Voyager Space Technologies (US), has also announced a multi-million dollar investment and partnership with Max Space (US) toward the development of the latter's expandable space habitats to support lunar operations and deep space exploration. According to **Voyager** 'Max Space's expandable habitat technology launches compactly and expands up to 20 times its stowed volume at its destination. The architecture enables significantly more usable floor area per kilogram delivered, optimizing human productivity and operational flexibility in a gravity environment.' Similarly, Vast Space (US) have raised an additional **$500 million in funding**, towards the development of its 'Haven' space station, due to launch next year, while the company is also developing habitats for use on the Moon, Mars and beyond.

Lastly, previous weeks have also seen Europe and Germany take a more decisive step into the lunar economy, as OHB founded the **European Moonport Company**. Based in Bavaria, this enterprise is to consolidate OHB's lunar activities, and according to Josef Aschbacher, head of ESA, 'The Moon is the next major step for Europe's spaceflight efforts. Initiatives like the European Moonport Company show how industrial strength, regional expertise, and a clear European vision can come together.' According to OHB, '...Together with Munich Airport International, OHB has developed an initial concept for a central launch and landing facility on the lunar surface...' Marco Fuchs, CEO of OHB SE, added that '...With the founding of the European Moonport Company, we are supporting Europe's ambition to establish a long-term presence on the Moon under its own power and to create the foundation for future scientific missions and economic activities.'

Should Europe truly emerge as establishing its own leadership in lunar exploration, the competition dynamics on the Moon and within the lunar economy may be set to expand further. Speaking in 2023, Josef Aschbacher warned that Europe could 'miss the train' on the space and lunar economy, saying that if they do, the '...same will happen as happened in chips, or in IT.'

European Launch Development

In striving for non-dependent and sovereign European space and lunar technologies, leaders will be aware that Europe still lags behind its competitors, particularly in regard to launch capacity. After the retirement of the Ariane-5, Europe faced a 'launcher crisis' and had to rely on foreign powers to deliver European payloads. This ended with the debut launch of the Ariane-6 in July, 2024, and additionally, in February this year, the rocket flew for the first time in its Ariane-64 capacity, utilising four boosters instead of two. The launch carried a batch of 32 LEO satellites for the 'Amazon Leo' broadband constellation (formerly 'Amazon Kuiper').

Ariane-64 launch (Image: ESA)

> This launch was the sixth Ariane 6 flight, the first to fly with four boosters
>
> **ESA**

Furthermore, Ariane has made proposals to improve the efficiency of the vehicle, notably after being selected under the ESA Boosters for European Space Transportation (BEST!) initiative, which aims to support the development of reusable launch technology. In January, Ariane proposed using the boosters being developed for its subsidiary, Maiaspace. Under a project named 'SkyHopper', Ariane is developing boosters that could be recovered and reused for the Maiaspace first stage, while ESA is also continuing work on its 'Themis' reusable rocket demonstrator.

Nevertheless, Europe still trails, notably in being able to harness an operational, commercial launch provider landscape. Isar Aerospace (Germany) is due to carry out its second launch

attempt this March, with its Spectrum rocket, while Rocket Factory Augsburg is aiming for the debut launch of its RFA One in summer this year. However, last month saw a notable casualty with the **bankruptcy of Orbex** (UK), despite promising the debut launch of its Prime rocket later this year. This comes as a stark reminder of the difficulty of getting launch providers 'off the ground' and the reliance they have on gaining government support as anchor customers. Nevertheless, Spain's PLD Space provided more positive updates in March, announcing it has raised an additional €180 million, and aims to carry out 30+ launches per year by the end of the decade.

Expanding Constellations, Data Centres and Utilisation of Earth Orbit

In our previous report, we discussed the rapidly increasing planned number of objects to be launched into LEO and beyond, building on the increasingly competitive and congested nature of space domain development, which included the SpaceX application to launch 1 million AI orbital data centres, as well as China's application to launch 200,000 satellites. Though this may immediately raise concerns about the functional capacity of Earth orbit, and the spiralling risk of debris and threat of collisions, more applications have been made in recent weeks.

In February, Amazon was granted approval by the Federal Communications Commission (FCC) to launch an additional 4,500 Amazon Leo broadband internet satellites, bringing its planned total constellation size to around 7,700. The company has so far launched 150 satellites, and is **required to launch** 1,600 of its first-generation satellites by July, 2026. Amazon is currently trying to extend that deadline. Also in February, Logos Space (US) were given permission from the FCC to launch a 3,960 satellite megaconstellation, which is to provide connectivity for both enterprise and government, and will provide 'dual use' commercial and defence services. Furthermore, amid the growing interest in space-based data centres, Starcloud (US) have also applied for FCC permission to launch a constellation of 88,000 orbital AI data centres. According to Starcloud, 'These satellites will utilize the unique advantages of space: near-constant solar power, radiative cooling, and the ability to scale sizes and power levels not possible on Earth.'

India is also entering this segment, with commercial launch provider Agnikul Cosmos (India) announcing a project with AI cloud provider NeevCloud to launch **600 orbital data centres** over the next three years. Also, not to miss out on this emerging new 'race', state-owned China Aerospace Science and Technology Corporation (CASC) has announced that it will also develop space-based AI data centres, as part of the broader **5-year plan** to expand Chinese space activities further.

In Europe, Spanish satellite 5G direct-to-device company, Sateliot, has announced that it will work with PLD Space on satellite launches, representing '…national and European autonomy and sovereignty, according to Sateliot CEO, Jaume Sanpera. The company plans to launch 100 satellites and '…aims to reach €1 billion in revenue by 2030.' PLD carried out the debut launch of its Miura-1 rocket in October 2023, while it expects to launch its larger Miura-5 for the first time in 2026.

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; Registration Convention; Artemis Accords; ILRS; Article XI; Article IX; Due Regard; Information-Sharing; LTS Guidelines; Working Group on Space Resources; ATLAC; UNOOSA; COPUOS; Space Treaty Project; Consultation Agreement.

Governing a 'Self-Sustaining' Lunar Presence - The Case for Transparency and Operationalising Article XI of the Outer Space Treaty

On 8 February, SpaceX CEO, Elon Musk, announced that his company has shifted focus, towards plans to establish a 'self-growing city' lunar city.[1] Musk added that achieving this goal could take less than ten years, and that the Moon provides for more rapid development opportunities.

While one must always remain dubious about some of the optimistic and grandiose announcements made by Musk, it should also be observed just what SpaceX has achieved and made possible within only the past 15-20 years of spaceflight. In 2025, the company set a new record, carrying out 165 orbital launches,[2] accounting for around half of all global launches,[3] and up from just 25 in 2020. Furthermore, of the estimated 14,200 active satellites in orbit,[4] SpaceX Starlink accounts for almost 10,000.[5]

This phenomenal growth is largely attributed to its workhorse and partially reusable rocket, the Falcon-9, which brought about a revolution in cost-efficiency and accessibility to Earth orbit.

However, the company is also moving forward with the development of its fully-reusable Starship, which promises to once again disrupt the market, potentially driving down launch costs and providing a payload capacity of up to 100-150 tons (full reusable).[6] Beyond Earth orbit, Musk claims that Starship will enable this vision of a lunar city to happen, stating that 'Starship will be capable of landing massive amounts of cargo on the moon. Once there, it will be possible to establish a permanent presence for scientific and manufacturing pursuits.'

Musk's shift in focus could then be another driver in accelerating growth of the nascent lunar economy, and will be further galvanised with growing competition, namely from Blue Origin, which aims to deliver its first lunar lander this year, and is developing lunar infrastructure projects through its Blue Alchemist (in-situ resource utilisation technology)[7] and Project Oasis (lunar resource prospecting satellites) programmes.[8] Geopolitical tensions must also be taken into consideration, particularly in regard to fragmented interpretations of international space law, in the backdrop of, for example, the US and China seeking broadly similar objectives and crossover landing sites at the lunar south pole.[9]

What this paper then seeks to explore is just how the use and utilisation of the Moon can be governed, considering such potential short-term technical advances, and the transposition of the rapid development of Earth orbit to the Moon. In this regard, existing law and governance frameworks will be explored to assess means to deconflict lunar activities and maintain the safety and sustainability of the lunar environment through the use of transparency frameworks and mechanisms.

Problem vs Solution - Alignment and Fragmentation on International Space Law

In a little over a decade, the shape and scope of lunar exploration and utilisation have changed drastically, from being viewed as primarily a scientific endeavour, to one of commercial opportunity and leadership. In 2020, President Trump signed the Executive Order (EO) on '...Encouraging International Support for the Recovery and Use of Space Resources.'[10] This sought to enable US citizens' rights to '...engage in commercial exploration, recovery, and use of resources in outer space...', and stated that the US does '...not view it as a global commons.' It is here that a major source of international fragmentation emerges.

In contrast to this position, in 2024, the Chinese Delegation provided a submission to the Working Group on Legal Aspects of Space Resource Activities (hereafter the 'Working Group') of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (COPUOS),[11] which requested the Working Group to '...mitigate any potential negative impact of those concerning commercial space resource activities on such activities with a scientific investigation purpose', and should furthermore '...consider formulating initial recommended principles to prevent depletive exploitation of space resources which fails the requirements of sustainability.' Furthermore, China has made clear its opposing view on outer space as a province of humankind,[12] for example, in response to a draft Security Council Resolution on space security in April 2024, Ambassador Fu Cong stated that outer space '...is a global commons that bears on the security and well-being of all humankind', and that, as a global commons, outer space is '...where the interests of all countries are intertwined with a common stake.'

The issue is not only related to outer space (and lunar) resources, but also to sovereignty and security. Regarding the Moon, the US has taken a position through its non-binding framework for lunar and deep space exploration, the Artemis Accords.[13] While Section 10(2)[14] of the Accords permits resource activities by Signatories, Section 11 calls for the implementation of 'safety zones' around active sites on the Moon. Though this may be seen as a means of operationalising the obligation to prevent harmful interference and to give 'due regard' to others, as a provision within Article IX of the OST, China and Russia have opposed it. China has criticised these provisions in the Accords as '...unilateral and exclusive',[15] instead calling for a more multilateral approach to lunar governance through COPUOS. Additionally, Chinese space commentator, Song Zhongping, has likened the use of safety zones to colonial 'enclosure movements',[16] while Roscosmos director, Dmitry Rogozin, described the Accords as a 'coalition of the willing' used for bypassing the UN.[17]

This fragmentation of approaches to space and lunar governance is perhaps also galvanised due to the increasing 'race' rhetoric developing between the US, China and Russia, and the view that leadership in outer space is inextricably linked to geopolitical power and global leadership on Earth.[18] This great power competition is further compounded by the policies of the second Trump Administration, as seen in the President's EO in December 2025, which states that space superiority is a 'national vision' to '...secure the Nation's vital economic and security interests.' It further commits to a crewed lunar landing by 2028,[19] directly competing with China's vision of a crewed landing by 2030, and aims to develop lunar infrastructure by the 2030s.

Alignment on some basic principles of lunar governance will be essential, yet the pace of lawmaking can surely not keep pace with these developments. A solution, in the short-term at least, will then need to be sought from the existing frameworks, and also align with both

China's preference for commitments to binding 'hard law'[20] principles, and the US Artemis approach of utilising non-binding, 'soft law' guidelines.[21] Writing for The Space Review, Rachel Williams and Jatan Mehta aptly argue that '...in such low-trust environments...it's critical that operating parties share minimum viable information and coordinate their activities...' for coordinating activities and avoiding '...operational overlaps and disputes over lunar areas and its resources.'[22]

Article XI to Support Due Regard and Transparency (TCBMs)

Firstly, it is important to recognise that the leading space superpowers do share some alignment on international space law. All are Parties to the Outer Space Treaty,[23] Article VI of which requires States to bear responsibility for activities carried out by both '...governmental agencies or by non-governmental entities', and to ensure that '...national activities are carried out in conformity with the provisions set forth in the present Treaty.'[24] Furthermore, the US, Russia and China are members of the developing body the Action Team on Lunar Activities Consultation (ATLAC), which is mandated to '...to have focused, expert-level exchanges to develop recommendations aimed at improving consultations related to lunar activities...', and explore the '...whether to recommend the establishment of an international mechanism.'[25]

ATLAC is due to finalise its recommendations by 2027,[26] while Dennis O'Brien suggests that a new international 'consultation agreement' could be necessary in order to implement any kind of new framework or mechanism to implement a consultation platform.[27] O'Brien continues to add that '...the best vehicle or context for any new agreement will be as a Consultation Agreement under Article IX of the Outer Space Treaty',[28] and recommends a 'Model Consultation Agreement' developed by The Space Treaty Project.[29] The Agreement would provide provisions on adherence to the space treaties (not the Moon Agreement), shared access to and licensing of resource activities, and agreement to create an 'Agency' to '... facilitate ongoing consultation and to administer the provisions...' of the agreement, among other provisions.

However, formally drafting a new international agreement would likely be an arduous process, aptly summed up by Ely Sandler, research fellow at Harvard Kennedy School, who recently stated that '...the era of treaty-making is definitely over.'[30] Furthermore, the second Trump Administration appears to take a strong policy position on commitments to international agreements, seen recently in the EO, titled 'Withdrawing the United States from International Organizations, Conventions, and Treaties that Are Contrary to the Interests of the United States',[31] and in space, it may appear that the US prefer an 'soft law' approach, using instead

'high-level non-binding principles...'[32] Yet even so, a set of multilaterally agreed-upon, non-binding principles on safe and transparent activities may not be agreed upon quickly enough. The process of drafting and adopting the Guidelines for the Long-term Sustainability of Outer Space Activities took nine years, and a similar timescale for crafting guidelines for lunar activities would significantly overlap with the highly ambitious timelines of the Artemis and ILRS projects.

A compromise must then be found, one that utilises the legal frameworks already available and ratified, and one that respects the fragmented approaches to governance by the leading space superpowers. Article IX of the Outer Space Treaty (OST) calls for actors to conduct their activities '...with due regard to the corresponding interests of all other States Parties to the Treaty',[33] and that:

> "If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment."

Such consultations could provide a means of enabling transparency, and are a feature of the ATLAC mechanism, which is being explored at COPUOS, but it is still unclear what that will look like and when it would come into effect. Article IX also aligns with O'Brien's suggestion of negotiating a Consultation Agreement, yet there is perhaps an underused hard-law principle that could operationalise the concept of 'due regard' much sooner, enabling transparent and safe operations. Article XI of the OST states that:

> "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...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."

Firstly, this aligns with key provisions set out in the Artemis Accords. Section 4 of the Accords calls for Signatories to commit to transparency '...in the broad dissemination of information regarding their national space policies and space exploration plans...',[34] consistent with Article XI, while Section 11 calls for the use of 'safety zones' to enable 'due regard' and to prevent harmful contamination, in line with both Article IX and XI. Utilising the binding

obligation of Article XI could also, theoretically, align with Chinese approaches, given their preference for adhering to international law, and perhaps also as a means of monitoring resource exploitation and quelling their concerns over commercial depletion.[35]

Additionally, utilising Article XI could provide a means to operationalise the US-favoured soft law approach of establishing normative approaches through Transparency and Confidence Building Measures (TCBMs) regarding safety, and as a means of preventing conflict and weaponisation. UN Resolution adopted in December 2010 discussed the use of TCBMs in order to '...search for agreements to prevent an arms race in outer space, including the weaponization of outer space...', and established the Group of Governmental Experts (GGE) on Transparency and Confidence-Building Measures in Outer Space Activities. The US endorsed the findings of the GGE, stating in 2013 that '...the United States welcomes the achievement of consensus of the UN Group of Governmental Experts (GGE) on Transparency and Confidence-Building Measures (TCBMs)...', which provide '...a unique opportunity to advance consensus on the importance and priority of voluntary and pragmatic measures to ensure the sustainability and safety of the space environment as well as to strengthen stability and security in space for all nations.[36] The final GGE Report found that TCBMs are:

> "...a means by which Governments can share information with the aim of creating mutual understanding and trust, reducing misperceptions and miscalculations and thereby helping both to prevent military confrontation and to foster regional and global stability."[37]

Seemingly, then, utilising Article XI could provide a means of operationalising TCBMs, while also strictly adhering to principles of binding international law, and appease those approaches from both the US and China. Furthermore, registrations have been made under Article XI, which, demonstrably, include registrations of recent lunar activities. This includes the registration of iSpace-Europe's planned deployment of a rover and 'details of...the exploration and use of space resources for commercial purposes...'[38] Also, the US provided registration details regarding the commercial lunar missions from Firefly Aerospace,[39] Astrobotic and Intuitive Machines.[40] Article XI is then already being demonstrated as a means of providing transparency and enhancing safety on the Moon.

Furthermore, the COPUOS Working Group on the Status and Application of the Five United Nations Treaties on Outer Space is currently carrying out an exchange of views on further enhancing and implementing Article XI, and provided its first draft registration template in 2025.[41] This would include submissions of details regarding mission location, licensing obligations and results of activities, among others.

However, operationalising Article XI may also present some challenges. It is still a significantly underused registration mechanism, as Lyall and Larsen aptly write, '...a little - but not much - information has been published in compliance with Art XI on the nature of things we cannot know the impacts of the tests of feasibility and practicability.'[42] Furthermore, the lex lata of the Article shies away from a robust legal obligation, in that it requests States to provide information '...to the greatest extent feasible and practicable...', leaving open a sense of voluntary action and the possibility of omitting certain details. Conversely, though, the vague wording also provides room for deeper regulatory application and wider scope. Nonetheless, as described in the Cologne Commentary, 'Member States may deem the disclosure of information as unfeasible or impracticable in particular with regard to strategic or commercial considerations.'[43]

Concerns may also arise as to the timely delivery of registrations to the United Nations, and how swiftly the information can be disseminated and made available to all actors. The UNOOSA is also still in the process of digitising paper registrations,[44] those submitted under the Registration Convention, and the Office may also be facing a lack of resources, amid a UN-wide financial crisis,[45] in order to keep pace with the rapidly growing number of objects being launched into space, as well as coordinate the timely delivery and publication of Article XI data. Nonetheless, operationalising Article XI does provide a clear opportunity for enhancing information-sharing, and therefore safety and cooperation. Perhaps technology solutions could provide a means of expediting the delivery and sharing of this data.

Conclusion

A problem has therefore been identified, that the pace of making both binding and non-binding legal frameworks cannot keep pace with innovation and the rivalling Artemis and ILRS projects. The efforts being made at ATLAC and within the Working Group on space resources represent pioneering work on enhancing consultations and enabling safer operations, yet, as seen with the LTS Guidelines, any outcomes from these could significantly overlap with a projected increase in lunar mission cadence, the development of infrastructure, and utilisation of resources.

However, operationalising Article XI can be a means of implementing the principle of 'due regard', and provide a mechanism to share the initial information requirements to mitigate harmful interference, deconflict activities and maintain safe and peaceful uses of the Moon and outer space. The Article harmonises with key principles of the Artemis Accords and also aligns with the concept of TCBMs, while complying with Chinese preferences to align with the frameworks of international law. Challenges will, of course, remain. Article XI is still an

underused registration mechanism, resources would need to be assigned in order to ensure the timely delivery and dissemination of data, while the Article itself could still be interpreted as a voluntary principle with vague terminology.

However, there could also be a case that a ‘minimum viable’ set of deliverables is agreed to, to at least maintain the safety of operations. Furthermore, through consistent practice and multilateral agreement for the need of a legal practice, States could establish Article XI registrations as a form of customary international law. This will, of course, still require agreement among the space powers, but a positive outcome would serve to protect the interests of all actors.

Joseph Holden | Senior Strategist
13 March 2026

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ANASDA GmbH Monthly Space Report January/February 2026

www.anasda.de
@anasda_gmbh
@ANASDA
info@anasda.de

Anasda GmbH
Herzog-Carl-Str. 2
73760 Ostfildern
Germany

Research & Analysis - Joseph Holden
Project Supervisor - Ching-Te Yen

Cover image: 'The Persian Gulf' by Copernicus Sentinel-3 Satellite

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ISSN 3052-217X