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Mitigating Space Debris, US-China Space Resources Race, and Analysing Cooperation in the New Space Age

SPACE INDUSTRY REPORT

JULY 2025

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CONTENTS

INTRODUCTION

At the end of July, we look back on a year which has so far seen the space sector redefined by shifting dynamics of international relations, a growing determination by States to achieve independant space capabilities, and an increased urgency to utilise and secure space for defence. In this month's report, however, we discuss some areas that perhaps do not often reach mainstream headlines, but are undoubtedly having a significant geopolitical impact on international relations: lunar exploration, the appropriation of the Moon, and space mining. Furthermore, a recent announcement from the acting NASA head, Sean Duffy, places the agency on a path to developing a nuclear power source for the Moon, challenging not only technical hurdles, but also questioning the legal principles upon which all leading space nations are bound.

However, our introduction this month aims to address a matter, perhaps the most urgent, that of protecting the space environment and the mitigation of space debris. Recently, I listened back to an interview on the Space Café Podcast with the former director of the UNOOSA, Nicklas Hedman, discussing the issue of space debris and the utilisation of binding and non-binding legal frameworks to address it. In the article below, we discuss this notion, particularly the principle of 'due regard', enshrined within the Outer Space Treaty, as well as the efficacy of supportive 'soft law' principles, in combatting the spiralling problem of debris in orbit.

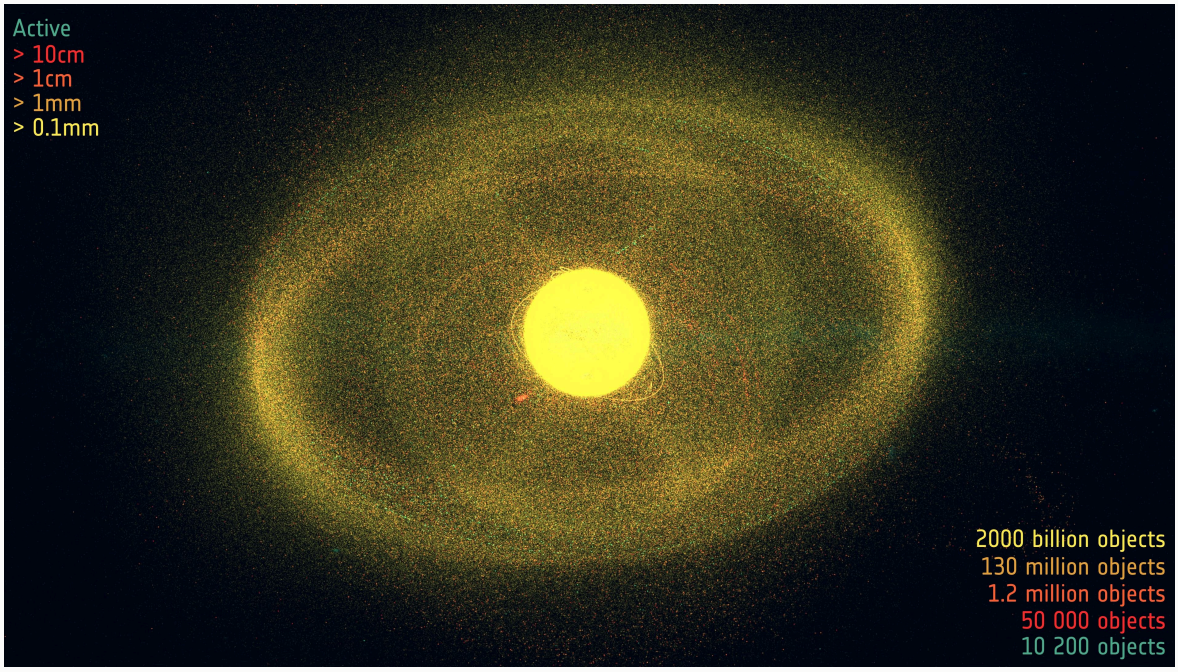
Utilising space for defence, sustainable development, and even for resource mining, all require that the space environment is maintained for safe and operational use.

Due Regard and Responsibility for Space Debris Mitigation: Hard Law Provision for Protecting the Space Environment?

(This article was was written by Joseph Holden, and originally published in the Socio-Legal Studies Association)

According to the European Space Agency's **Annual Space Environment Report**, there are 54,000 pieces of orbital debris greater than 10cm, and 130 million objects between 1 mm and 1 cm in Earth's orbits. The causes of debris stem from a legacy of discarded space vehicles left in orbit since the dawn of the space age, exemplified recently by the uncontrolled **reentry to Earth of failed Russian Venusian exploration probe**, Kosmos 482, on 10 May this year, after spending five decades in orbit. Human-generated debris ranges from spent rocket stages and unused satellites, to vehicle parts and flecks of paint. In Low Earth Orbit (LEO) debris can move at speeds of up to 8 km per second (28,800 km/h), meaning even the smallest piece could pose a significant risk to space systems or human life.

The crisis has also been accelerated by kinetic anti-satellite (ASAT) demonstrations, such as that carried out by Russia on 15 November 2021 on one of their own satellites in LEO, which subsequently created **1500 pieces of debris**. Similar tests have also been conducted by **India**, **the US** and **China**, demonstrating a disturbing normative behaviour, resulting in a **2022 UN resolution** calling on States to halt carrying out such tests. It has also been predicted that the increasing number of debris could render Earth orbit unusable, in a scenario consisting of spiralling collisions, defined as the **'Kessler Syndrome'**. The problem is further compounded by rapidly increasing satellite numbers and the birth of satellite mega constellations, leading to an orbital environment described as **congested, contaminated and contested** by Peter Martinez (Secure World Foundation).



Applying the Principle of 'Due Regard' for Debris Mitigation

The issue also raises questions about the responsibility for managing the creation of debris. Remediation of existing 'legacy' debris, that which has largely been created by the leading space powers of the US, China and Russia (and the Soviet Union), presents a significant political challenge, exacerbated by geopolitical conflicts. This article will however explore the binding principle of 'due regard', sat within Article 9 of the cornerstone of international space law, the **Outer Space Treaty 1967 (OST)**, and how that could be applied in order to bind States to the currently more feasible approach of debris mitigation, supplemented by existing non-binding frameworks.

The OST makes no mention of debris, and according to **Lyall and Larsen** 'it remains fact that...the mitigation of space debris is a matter of voluntary action, not of clear legal duty...'

Furthermore, it appears that a hard law treaty to tackle debris may not be a likely outcome in the near future. However, the OST does carry considerable weight, not least because it currently has **116 State Parties**, including all leading space nations, but also carries with it the provision for States to administer responsibility for increasingly active non-state and private actors, under **Article 6**. In addition, the 'due regard' principle within the OST has been applied elsewhere, such as in the US-led, non-binding framework for space exploration, the **Artemis Accords**, as well as the **Moon Agreement 1979**, and was the topic of discussion at a **symposium** help by the IISL at last month's Legal Subcommittee meeting of the United Nations Committee on Peaceful Uses of Outer Space (UN COPUOS).

However, taking a closer look at due regard in relation to the principles of the OST itself can provide insight into its applications for debris mitigation. Firstly, consider **Article 9** itself, which requires States to conduct their activities '...with due regard to the corresponding interests of all other States Parties to the Treaty...' and outlines that they shall conduct exploration of space and other celestial bodies '...so as to avoid their harmful contamination...' It also gives provision for States to request consultation with other States, should they believe their activities '...would cause potentially harmful interference with activities in the peaceful exploration and use of outer space.' Due regard is then complemented by, as Goehring describes, '...three additional obligations...', to avoid harmful contamination in space, adverse changes to Earth, and to have capacity for consultations. We can also interpret the principle as being due regard for others and the environment.

To mitigate debris, States would then be obliged to take measures to avoid the debris contamination of space, and the potential of uncontrolled debris reentry, which can be achieved by the implementation of existing non-binding principles, such as the **Space Debris Mitigation Guidelines (SDMGs)**. These guidelines advise actors to implement dedicated design efforts for launch and spacecraft designers to reduce the probability of debris creation, to avoid intentional destruction of vehicles, and to remove vehicles from LEO after the end of their missions within 25 years, among other recommendations. The US went further to implement a much shorter, **5-year satellite deorbiting rule** in 2022. Furthermore, the **Space Safety Coalition** provide a best-practice guide on space operations, including measures such as vehicle design to enable on-orbit servicing (OOS) and refuelling through incorporating dockable interfaces on space objects.

The **UN Long-Term Sustainability (LTS) Guidelines** also provide guidance, which could assist in supporting the principle of consultations and data-sharing, among others, through guideline B1, requiring States to 'provide contact information and share information on space objects and orbital events, and guideline B3 to 'promote collection, sharing and dissemination of space debris monitoring information.'

Due regard can also be applied to additional principles within the OST. **Article 1** designates outer space as a province of humankind, and that it '...shall be free for exploration and use by all States without discrimination of any kind.' This principle therefore can be interpreted, as written by Goehring, as not encroaching '...on the freedoms of others, just as others may not encroach upon your freedoms.' Therefore, States can be obliged to give due regard in not

limiting the freedom of access through the creation of debris. This could also be applied, arguably, to Article 2, which states that space is '... not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.' Due regard may also then be paid in preventing the occupation of orbital slots with inactive and defunct vehicles, and therefore be guided by the non-binding principles on end-of-life removal. The international regulator for distributing spectrum and orbital slots, the **International Telecommunications Union (ITU)**, provides similar provision within their Constitution. **Article 44(2)** requires that States shall bear in mind that frequencies and orbits are '...limited natural resources and that they must be used rationally, efficiently and economically...so that countries or groups of countries may have equitable access...'

Special attention should also be paid to the due regard principle within the Artemis Accords. Though non-binding, the Accords now have 55 members, which include leading European nations, the UK, India and Japan. Firstly, the Accords base themselves on the principles of the OST, '...including those provisions relating to due regard and harmful interference.' Section 5 also encourages States to adopt transparency and interoperability standards, which could align with debris mitigation practices for OOS for more sustainable vehicle design. Furthermore, the Accords apply the use of **Article 11** of the OST, which requires States to submit information to the UN on '...the nature, conduct, locations and results...' of space activities. Although this has been a largely underused Article, with only **74 registrations since 1967**, its further implementation was discussed at the **Working Group on the Status and Application of the United Nations Treaties** on Outer Space at the UN COPUOS legal subcommittee this year. These yielded an **initial draft of registration requirements**, which includes providing information on mission management, such as on 'space debris mitigation & collision avoidance' and 'mission disposal plans', which would satisfy the provision to provide due regard to others and the environment through transparency and information-sharing.

It must also be mentioned that the Accords make direct provision for the mitigation of debris through **Section 12**, requiring the '...the safe, timely, and efficient passivation and disposal of spacecraft at the end of their missions, when appropriate, as part of their mission planning process.' They can therefore also be utilised as an additional non-binding mechanism to support the due regard principle for the mitigation of debris.

Conclusion

It can therefore be interpreted that due regard, in the context of debris mitigation, should be extended to others and the environment by preventing harmful interference and contamination, and maintaining free access. This can be achieved through consultation and information sharing, as well as through mission-planning and vehicle design processes, guided by soft law frameworks. Further research, though, could explore due regard within other frameworks, such as the law of the sea, as well as considerations of how it could be applied as customary international law.

Space actors are facing increasing challenges, also within a fragmented geopolitical environment. Discussions must be ongoing, using both hard and soft law to face these threats, but also be complemented by mitigation norm-setting and support of nascent industries that are developing mitigation technologies. The outcomes will not only affect space actors, but an increasing set of stakeholders, as space provides a growing list of benefits for humankind and the planet.

NEWS ANALYSIS

Image generated by OpenAI's DALL·E via ChatGPT.

US Accelerating Lunar Commercialisation; 'Race' with China Develops

Interim NASA administrator Sean Duffy, has announced that the agency will expedite plans to place a nuclear fission reactor on the Moon by 2030, in a move which presents the growing US strategy to develop a sustained lunar infrastructure, and also the developing 'race' with China, which has already announced similar plans in cooperation with Russia.

The reactor is designed to generate 100 kilowatts of energy, the same amount of energy a 2,000-square-foot home uses every three and a half days, according to Duffy. NASA has already funded research into this area, under the Fission Surface Power Project, and completed the initial phase in January 2025, after awarding $5 million research contracts for '...developing concept designs for a small, electricity-generating nuclear fission reactor that could be used during a future demonstration on the Moon and to inform future designs for Mars.' (NASA) Rolls-Royce are also developing a 10-foot (3 metre) reactor, and in March made a call for partners to place it on the Moon. The company claim it will be ready for operations by the early 2030s.

The second Trump administration, along with the new NASA administrator, is seemingly looking to increase reliance on the commercial sector in order to stay ahead of their competition, reflected in slashing NASA science budgets, and strategies such as cutting the Artemis SLS rocket programme after the Artemis-III mission, and instead utilising commercial vehicles, such as the SpaceX Starship. In July, Lockheed Martin further emphasised this stronger turn towards commercialisation, suggesting that they may in future provide the Orion spacecraft, which will be used to transport astronauts to the Moon, as a commercial service, or as a 'fixed-price commercial service.' (Lockheed Martin)

Orion spacecraft (Image: NASA)

> Orion could be provided as a 'fixed-price commercial service.'
>
> **Lockheed Martin**

The Artemis programme is supported by multiple commercial partners already, such as SpaceX, who are developing a 'human landing system' (HLS) variant of Starship, which will deliver astronauts to the lunar surface as part of Artemis-III. Private lunar exploration companies, such as Astrobotic and Intuitive Machines, are also already delivering multiple payloads, which are carrying out exploratory projects, such as testing key technologies and searching for volatiles, such as water.

On 29 July, Firefly Aerospace, whose historic mission successfully landed on the Moon in March, were awarded another contract under NASA's Commercial Lunar Payloads (CLPS) programme, worth $176.7 million. The Firefly Blue Ghost Mission 4 is to launch in 2029, to the lunar south pole. The lander will deliver two NASA rovers and three scientific instruments to search for hydrogen, water, and other minerals.

Search for Lunar Resources and Helium-3 Amid Growing Geopolitical Tensions

The announcement from Duffy, though, also reaffirmed heightening competition with China in regards to establishing a permanent lunar presence. Speaking at the press conference, Duffy

said, 'We're in a race to the moon, in a race with China to the moon. And to have a base on the moon, we need energy,' referring to the urgency of placing a nuclear reactor on the lunar surface. That urgency, though, may also be in relation to securing lunar resources and areas believed to be rich in those resources, especially ice. Locating and utilising lunar water is a key component needed to support a sustained presence on the Moon, and within his announcement, Duffy added that 'There's a certain part of the moon that everyone knows is the best...we have ice there. We have sunlight there. We want to get there first and claim that for America.'

This could be a reference to the use of the Artemis Accords, a US-led non-binding legal framework for activities in outer space, which provides a 'safety zone' principle, to exclude other actors from entering and preventing harmful contamination. However, speaking to the BBC, Dr Simeon Barber, planetary science specialist at the Open University, added that this principle could also be inferred by others as ''we own this bit of the moon, we're going to operate here and and you can't come in'. (This strategy is also discussed more in this month's Legal Review article). Geopolitical tensions regarding securing the south pole of the Moon were also brought to light back in 2022, when it was realised that the US and China had identified overlapping landing sites, where resources are believed to be abundant.

A race to secure resources may not only be in relation to water ice and other ISRU (in-situ resource utilisation) materials, such as metals and silicon. The prospect of extracting and retrieving the isotope, helium-3 (H3), remains an intriguing prospect, especially given its extreme rarity on Earth, and the apparent abundance of it on the Moon. US private company, Lunar Helium-3 Mining, LLC (LH3M), is exploring the H3 retrieval for 'future global nuclear fusion reactors and quantum computing', and in July announced it had secured its fifth patent for 'the company's end-to-end architecture for H3 detection, extraction, and refinement on the Moon' (LH3M).

Further intensifying the 'race for helium-3', US startup, Interlune, also provided a significant update in July, announcing that they will send a multispectral camera onboard Astrolab's FLIP lunar rover, as early as the end of this year. The camera is designed to prospect for H3 and estimate quantities of the isotope in lunar regolith. The rover will launch as a payload with Astrobotic's Griffin lunar landing mission. Interlune have also already secured their first customers for H3 delivery; Maybell Quantum 'has agreed to purchase thousands of liters of helium-3 for yearly delivery from 2029 to 2035' for quantum cooling.

China has also expressed interest in securing H3, with Professor Ouyang Ziyuan, the chief scientist of the Chinese Lunar Exploration Program, estimating that lunar Helium-3 could solve the world's energy crisis for around 10,000 years. Furthermore, in August 2024, scientists from China's Shanghai Institute of Satellite Engineering (SAST) '... detailed how a magnetic launcher on the lunar surface could provide a cost-effective means of sending resources back to Earth.

Securing territory on the Moon is becoming a more contentious geopolitical matter, especially as more value is placed on lunar resources. There will likely be a 'first-mover' advantage in

arriving ahead of any competition, and demonstrating the technologies and strategies necessary to achieve these goals. At the same time, discussions at the intergovernmental forums, such as the UN COPUOS, will need to consider the evolving and growing 'race' dynamic between the space superpowers, and how new and existing frameworks can be utilised to ensure lasting peaceful and equitable uses of the Moon.

Commercial Space Launch: The Flagship of Private Enterprise

The space launch market perhaps best reflects the expanding reach of commercialisation in space. Since the first successful landing of the reusable Falcon-9 booster in 2015, SpaceX has gone on to demonstrate how reusability has revolutionised almost the entire industry. The SpaceX fleet drastically reduced the cost of launching payloads into space, from approximately $10,000 p/kg to as low as $1,500 p/kg.

SpaceX Falcon-9 booster landing (Image: SpaceX)

> SpaceX carried out the 500th Falcon-9 launch, carrying 27 Starlink satellites into low-Earth orbit (LEO).
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On 2 July 2025, SpaceX carried out the 500th Falcon-9 launch, carrying 27 Starlink satellites into low-Earth orbit (LEO). The launch market is now becoming an increasingly competitive space, and the US Federal Aviation Administration now believe there could be several daily launches by the year 2034. Orbital launches have been increasing, with 90 taking place in 2017, growing to 263 in 2024. Space is also becoming an increasingly contested domain, through new national strategies, commercial endeavours and defence imperatives.

Launch companies are emerging in order to meet the growing demand to access space. UK launch company, Skyrora, have become the first British company to receive a vertical launch license from the Civil Aviation Authority (CAA), The company have received permission for up to 16 launches, with their Skylark L due to carry out its debut launch in 2026. The rocket has a small payload mass of 50kg, but it is the precursor to the Skylark XL, which will be able to

lift 315kg. French company, Latitude, have also announced that they will expand their facilities, working towards the debut launch of their Zephyr launch vehicle, also as soon as next year.

European space launch received another boost in July, as the European Space Agency (ESA) announced that five companies will be selected under its European Launcher Challenge, an initiative aimed at supporting European commercial rocket developers. The selected companies are Rocket Factory Augsburg (Germany), Isar Aerospace (Germany), Orbex (UK), Maiaspace (France), and PLD Space (Spain). Funding for the Challenge will be decided in November this year, with a first successful launch to take place by 2027.

In June, Honda also demonstrated their capabilities in this sector, with the successful demonstration launch and landing of its small (6.3m) reusable rocket. According to the company, 'this test marked the first launch and landing test conducted by Honda with an aim to demonstrate key technologies essential for rocket reusability…'. However, while no decision has yet been made about the commercialisation of the technology, the company aims to realise '…technological capability to enable a suborbital launch by 2029.'

The space industry and ecosystem are defined by growing competition, from space launch services to the ultimate downstream services of resource retrieval. Space is also becoming more closely aligned with national strategies and is observed as a key economic enabler. As such, we expect to see the continued development of these technologies in the near future.

SPACE LAW REVIEW

Key terms: Non-dependant Space; Artemis Accords; ILRS; Outer Space Treaty; Moon Agreement; Lunar Resources; Non-Appropriation

Sovereignty vs Cooperation in Space: Factors Pushing States Closer or Further Apart?

Space has long been a bastion of international cooperation, often rising above geopolitical tensions and providing a platform for neutral, scientific relations to prosper. The International Space Station (ISS), constructed in 1998, is the finest example of this, giving leading States an opportunity to rebuild relations in the wake of the Cold War. Writing for the Smithsonian, Daniel Oberhaus describes the ISS as '...a triumph of diplomacy and an unprecedented experiment in the use of science and technology as instruments of soft power...',[1] supporting the very principle enshrined in the Outer Space Treaty; Article I, which requests that '...States shall facilitate and encourage international cooperation...' in scientific exploration.[2]

Following its invasion of Ukraine, Russia found itself at the brunt of international sanctions and isolation from the West. Cooperation in space was not immune this time, with Russia barred from projects such as ExoMars, a planned Mars mission between the European Space Agency (ESA) and Roscosmos, which was due to launch in 2022.[3] However, cooperation onboard the ISS continued, with a SpaceX Dragon launching on 1 August, carrying crew from the US,

Russia and Japan to the station. Furthermore, on 31 July, the heads of both NASA and Roscosmos met for the first time since 2018, agreeing to continue operations on the ISS until 2028.[4]

It must, though, be questioned how long this form of cooperation can remain above Earthly disputes, especially within a space domain which is increasingly contested as a sphere of strategic defence, and set to be valued at $1.8 trillion by 2035.[5] This article aims to analyse recent global developments and understand whether space can be preserved as a sphere of cooperation, or face a new reality of expanding contestation and competition.

Political and Geopolitical Factors

The foreign policy agenda of the second Trump administration has pushed States towards establishing independent space capabilities, as part of a broad push towards increased defence spending, while ESA has published its 2040 Strategy, outlining a key aim of establishing European autonomy and resilience.[6] While this could initially demonstrate how geopolitical factors are urging more State non-dependence in space, it can also be a factor which encourages new relations. In light of the White House policy regarding cuts to NASA's science budget, the Korea Aerospace Administration (KASA) has sought to establish deeper ties with ESA, and both agencies are set to sign a Framework Agreement, and '...develop concrete joint programs between Korea and Europe.'[7]

Additionally, the European Commission Draft Space Act,[8] published in June, aims to create a 'single market' for space among EU member states, fostering European growth through harmonised laws.[9] The Act has been long-anticipated, and therefore may predate any expediency provided by drastic changes to international relations caused by the new Trump administration, but still does provide a binding legal framework for European States to create common ground and unity, in a new world order of space powers, reflecting a growing European determination for self-reliance and sovereignty. In July, this was exemplified by the joint declaration from German launch startup, Isar Aerospace, and Norway, to increase sovereign space access and security,[10] while the former carried out its debut space launch from Andøya spaceport (Norway) earlier this year.

Furthermore, the Act, although binding to EU Member States, also strives to set a global benchmark on standards of sustainability and cyber resilience, in that it will also apply to third country actors that wish to operate within the internal market,[11] and may be particularly relevant to partnerships between EU and UK entities, with the latter set to become a hub of European space launch activity, opening up to seven spaceports in Scotland, Wales and England (as discussed in the June edition of our Monthly Report).[12]

In addition, in July, it was also revealed that the UK, along with Ukraine and Norway, could be eligible to join the EU IRIS2 project (infrastructure for resilience, interconnectivity, and security through satellites), which strives to guarantee access to broadband connection from space.[13]

However, while shifting international relations may be forging new relations, geopolitical factors also continue to drive others apart. Space technology and sovereignty are increasingly becoming a strategic priority for more States, identified not least in the Ukraine conflict, where access to satellite services has played a significant role, with Elon Musk claiming that the Ukrainian front lines would collapse without it.[14] Perhaps observing this critical role, in July Japan released its 'Space Domain Defence Awareness Guidelines',[15] which '...clarify the necessity not only to protect satellites...but also to ensure the use of space by the government and the private sector, which forms the foundation of people's lives.' The Guidelines acknowledge the significant role that space has played in Ukraine, as well as China's advanced C4ISR (Command, Control, Communications, Intelligence, Surveillance, and Reconnaissance) satellites, and provide guidance on strengthening defence capabilities in the space domain. This would be achieved through enhancing battle space awareness, satellite communications and mission assurance, according to the Guidelines.[16]

While these steps may seem logical to secure sovereign access to space and protect against adversaries, China has responded, accusing Japan of threatening security and stability.[17] Furthermore, the Chinese Foreign Ministry reacted by saying that Japan, as well as the US and other Western States, are using 'defence' as a pretext to deploy space weapons, once more opening up a debate surrounding the definitions and limitations of dual-use space vehicles, and the deployment of defensive infrastructure in space.[18]

Considering the US plans to develop the $175 billion Golden Dome missile defence infrastructure, there could certainly be legitimate concerns regarding spiralling militarisation in outer space, specifically Earth orbit, which plays an increasingly critical role for civilian and sustainability initiatives.

Lunar Exploration and Resources: Race or Cooperative Exploration?

Lunar exploration could then be a much-needed outlet to develop cooperation for peaceful and equitable space exploration and utilisation. The US-led Artemis Accords,[19] a non-binding framework for the use and exploration of space, now has 56 State signatories,[20] while the Chinese-led International Lunar Research Station (ILRS) project has gained the support of 17 nations and over 50 international research institutions.[21] China is also committed to its '555' strategy on the ILRS project, an initiative to attract 50 States, 500 organisations and 5000 researchers to the ILRS programme.[22]

While it could be argued that both the Artemis Accords and the ILRS project represent opposing politically like-minded 'space blocs', on 24 July, Senegal, already an established member of ILRS, also joined the Artemis Accords, proving that diplomatic bridges can indeed be made across both frameworks.[23] In addition, both projects have proven to gather more support than the ill-fated attempt to create international legislation on lunar activities; the 1979 Moon Agreement,[24] which currently has just 17 ratifications.[25] Representative of this new magnetism towards non-binding approaches on lunar exploration, Saudi Arabia withdrew from the Moon Agreement in January 2023, after signing the Artemis Accords just six months prior.[26]

However, it is also clear to observe a significant divide between these two 'blocs', not least through the reasonable assumption, based on current geopolitical and economic rivalries, that neither China nor Russia would be willing to join the Accords, while the US Wolf Amendment, legislated within the 2011 Department of Defense and Full-Year Continuing Appropriations Act, limits NASA from using government funds to cooperate with China.[27] More recently, the acting head of NASA, Sean Duffy, has announced that NASA will place a nuclear reactor on the Moon by 2030, sparking a flurry of legal debate and rhetoric regarding a 'lunar race'. Duffy made a direct reference to the competition with China, stating that 'we're in a race to the moon, in a **race with China to the moon**. And to have a base on the moon, we need energy.'[28]

While Duffy's predecessor, Bill Nelson, also shared these thoughts regarding a race with China,[29] the acting administrator's remarks sparked concern when he referred to particular areas of interest on the Moon, areas rich in water ice and sunlight, and stated the US aims to '...get there first and claim that for America.'[30] There indeed may be a first-mover advantage in exploring and utilising the Moon, being able to play a leading role in setting norms and standards of behaviour. However, claiming national sovereignty over the Moon is prohibited in the Outer Space Treaty,[31] which is ratified by the US, Russia, China and all leading space nations,[32] with Article II stating that:

> "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."

An argument could be made to implement the use of 'safety zones', in order to prevent harmful contamination resulting from any activities which might impede the safety of other actors on the Moon at that time. The application of these zones is written into the Artemis Accords under Section 11, which states that '...a safety zone should be the area in which nominal operations of a relevant activity or an anomalous event could reasonably cause harmful interference.' This is also supported by the binding principle of 'due regard' within

Article IX of the Outer Space Treaty, which requests that States '...conduct all their activities in outer space, including the moon and other celestial bodies, with due regard to the corresponding interests of all other States...'[33] This could certainly be relevant to the conduct which should be maintained around an active nuclear reactor on the Moon.

However, the use of 'safety zones' has been a divisive issue. Michelle Hanlon, executive director for the Center for Air and Space Law at the University of Mississippi, says that some principles within the OST have created a situation beneficial to those actors who arrive first on the Moon, such as Article 9, arguing that 'whoever gets there first has this implicit greater right to exclude than anybody else', raising the question about how exactly 'due regard' should be used.[34] The debate also leads on from the previous US House discussion on space resources in December 2023, when Hanlon also suggested that, through the use of safety zones, simply landing or crashing a vehicle on the Moon could establish an exclusion zone around it, which could also include the minerals within it.[35] Clarity regarding use and access to resources is also becoming increasingly pressing, given recent events such as the distribution of commercial resource licenses, and the announcement from US company, Interlude, that they aim to launch a lunar helium-3 prospecting as soon as the end of this year.[36]

It is the determination shown by Duffy in the past weeks that presents the increasing and very public attitude of the US to maintain leadership, determine the rules, and secure territorial sovereignty on the Moon. Despite the continuing growth of new alliances through scientific exploration and non-binding approaches, the leading space superpowers appear far apart. The race to put a nuclear reactor on the Moon might showcase the priorities being made in national strategies, but it also highlights a growing conflict, with Chinese observers having already accused the US of aiming to appropriate the Moon through the use of 'safety zones'.[37] Yet at the same time, China is also aiming for strikingly similar goals on the Moon, including establishing its own nuclear reactor in partnership with Russia.[38]

Competition is then certainly increasing, but cooperation will need to be established, at least in order to maintain standards of safety and communication. While the US and China appear to be, for now, engaged in a 'race', it could be the role of other nations, such as the case of Senegal, to prove that 'new space' can be a sphere of cooperation.

Joseph Holden | Senior Strategist
12 August 2025

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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

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