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SPACE LAW: THE NEW WILD WEST

Author: *Amiti Sinha*[1]

Abstract

For most of our evolutionary existence space has always been out of reach of humankind. However, with technological advancements of the 20th century space is no longer the last frontier. With India successfully landing on the Moon to NASA trying to mine an asteroid from outside our solar system, a space race is truly on. The development in space technology despite being desirous for the whole of humankind, is lopsided between countries struggling to launch satellites to countries undertaking space tourism. A set of treaties were formulated amongst the states to govern the space law. However, much water has passed since 1967 when the Outer Space Treaty was formulated. No amendment has been made or suggested despite the quantum increase in space traffic.

The Outer Space Treaty states that no nuclear weapons or other mass destruction weapons can be installed on the celestial bodies. However, with the exclusion of conventional weapons in the provision and advancement of technology, states would militarize outer space. With the launching of space crafts or satellites by countries, there are often missions that are not successful which results in creating space debris which in turn creates an obstacle for satellites that were successfully launched. It poses a threat to already active satellites or space missions, and the ones which shall be embarked on in the future. However, no such issue has been included in the treaty. The current system of space law is threatened by space mining, an emerging venture to take precious materials from celestial bodies. Legal ambiguities resulting from a lack of clarity concerning property rights and resource distribution in space could hinder the growth of this promising venture.

Keywords – outer space, exploration, space law, space militarization, space debris

[1] Assistant Professor, ILS Law College

Introduction

Heavens and heavenly objects have fascinated humans since time immemorial. Art, literature, and science have delved into this subject long before technology could get space into touching distance. While human civilization's advancement has pushed the boundaries of science, this has also led to the need for regulatory mechanisms such as international law.

The expanse of space, with its countless galaxies and celestial bodies, as well as the unlimited possibilities they hold, compels humanity to venture beyond the boundaries of our earthy home. It has generally been recognized that space is for the benefit of all humanity and should be explored without distinction, and no single nation may take Outer Space for its benefit. Space operations, like all other human actions in all other domains, are governed by laws, known as the Space Laws.

The inability to extend conventional laws of sovereignty over space above the land mass compelled the superpowers to act. The signing of the Nuclear Test Ban Treaty in 1963, as well as the Outer Space Committee resolution, barred the testing of nuclear weapons in space. The General Assembly adopted a resolution in 1963 in the 1280th plenary meeting which is known as the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space[2]. The Outer Space Treaty is a fundamental document that provides for the peaceful use of outer space and the prohibition of weapons of mass destruction in orbit.

The Rescue Agreement, born in the wake of the Outer Space Treaty, addresses the basic component of manned space missions - the commitment and cooperation to rescue astronauts in trouble. As the scope of space activities expanded, the necessity to manage accountability for any harm became critical. The 1972 Liability Convention navigates the legal boundaries of liability in the universe. The 1975 Convention on the Registration of Objects Launched into Outer Space emerges as a diligent keeper of humanity's extraterrestrial accomplishments. Lunar explorations led to The Moon Agreement, a one-of-a-kind legal framework to oversee lunar activity, which was adopted in 1979 and came into force in 1984.

These international accords and agreements illustrate space's geostrategic and economic importance. When the national government was the principal accessor of space, these UN-mandated regulations and national laws were well-competent in controlling the huge area. With

[2] Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, 1962.

the entry of private companies, strained ties between governments, and more countries fighting for a piece of the same pie, albeit vast, these policies have been deemed insufficient in addressing state and technological challenges. Maximilian Bertamini, aptly named his article on space law "Of Old Wisdoms and New Challenges[3]." Outer Space is no longer the lovely paradise it once was. It is congested, fiercely disputed, and competitive. Agreements leading to the creation of space law were reached during a nearly Jurassic period when government-controlled space activities and commercial space enterprises were in the early stages of development. The current scenario of regulations is slow to adapt to the evolving nature of the outer space race.

There is no agreement on guidelines for space weaponization and militarization, space debris, and space mining and sustainability. National governance, variations in state interpretations, and lack of enforcement mechanisms may allow space operators to use "flags of convenience," either to avoid costly assessments, designs, or operational mandates or to dodge tighter restrictions in other ways. Since space regions are non-assignable, usable space resources are similarly ambiguous. A technique for determining each country's control over the air above is yet to be agreed upon.

Space law cannot be a static set of rules; rather, it should be a dynamic realm that evolves in tandem with technological progress and our growing understanding of the vastness of space. At its heart, Space Law should handle a wide range of concerns, from defining sovereign jurisdictional limits in space to setting norms for the use of celestial resources. It should strike a balance between encouraging exploration and creativity and avoiding the anarchy that could result from unfettered activity in the ultimate frontier.

War Away From Home: Space Militarization And Weaponization

The Cold War has become history, and the space race born from that era continues to unfold. By the end of the Cold War, the USA and the then-Soviet Union wanted to establish their dominance over space. Due to the rivalry between the two states, President Reagan introduced the Strategic Defence Initiative aka Star Wars[4], to intercept the Soviet Union's ICBMs (Intercontinental Ballistic Missiles) at different phases in space with earth-based direct energy weapons. However, due to the disintegration of the Soviet Union, the Star Wars was halted

[3] Of Old Wisdoms and New Challenges: Comment on Volume 1 of the MILAMOS Project, *available at*: https://voelkerrechtsblog.org/of-old-wisdoms-and-new-challenges/ (last visited on July 11, 2024).
[4] National Institute of Advanced Studies, "India and Weaponization of Space" 7 (2021).

from further development. During the Gulf War, the USA used space assets known as Force Enablers to enhance capabilities for terrestrial operations. China's Anti Satellite (ASAT) weapon test further compounded the space militarization.

With such advancements taking place, treaties, and agreements regulating outer space were introduced. Article IV of the Outer Space Treaty provides that state parties to the treaty should not place in orbit around the Earth any objects carrying nuclear weapons or any other weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner[5]. Due to the wordings – nuclear weapons or other weapons of mass destruction, this has led to numerous interpretations of the article.

Due to this ambiguity and lack of proper definition of weapons that are prohibited from being used or placed in outer space, two concepts regarding weapons have developed-– space weaponization and space militarization which have been used synonymously multiple times. Space militarization is when states use outer space as an aid for their military operations, such as satellites[6]. In space militarization one state uses outer space to collect data or information that aids its military forces. On the other hand, space weaponization is when there is an actual deployment of weapons in outer space[7]. In this case, damage or destruction is being caused to space assets or objects of other states. However, with the advancement and the need to lead the space race, the lines between space militarization and space weaponization have blurred-putting space militarization and space weaponization into a single box that needs regulations.

Erstwhile Soviet Union introduced anti-satellite technology in 1982 followed by the USA. Initially, the space race was between the USA and the Soviet Union, but soon other states, great and medium powers alike, realized the importance of the race and joined it.

Developments in Space Technology were driven by the states' ambition to use higher platforms to control the challengers. Satellites launched in various orbits for civil and commercial purposes, later on developed dual-use capabilities. Space was critical for critical military power- armed forces have relied on space-based or space-supported technologies such as the Global Positioning System (GPS) for navigation, dedicated military satellite-based

[5] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967, art. 4.
[6] Z. Shapira and G. Baram, "The Space Arms Race: Global Trends and State Interests" 3 *Cyber, Intelligence, and Security* 5 (2019).
[7] R.Q. Ahmed, M. Arif, et.al., "Emerging Trends of Space Weaponization: India's Quest for Space Weapons and Implications for Security in South Asia" 18 *The International Journal of Space Politics & Policy* 159 (2020).

communications for secure digital connectivity, and spy satellites for intelligence. GPS could be said to be one of the first instances and the most successful instance of space militarization and dual-use technology. These dual-use weapons are ostensibly civil but covertly provide military capabilities or functions, making differentiating between weapon and non-weapon nearly impossible.

From satellites launched to help the militaries in intelligence and reconnaissance missions, the world is witnessing the rapid development of anti-satellite (ASAT) weapons. The race for these weapons not only increases the risk of global conflict but could jeopardize all future space exploration. ASATs are designed to destroy satellites, mainly those used for military purposes through kinetic energy ASATs (KE-ASATs) which physically collide with the target, and non-kinetic ASATs employing non-physical mechanisms such as blinding satellites with lasers, launching cyberattacks, or jamming frequencies to render the target inoperative[8]. As a result, regulating ASATs and many other space-based weapons systems is tricky and extremely difficult.[9]

More and more nations are joining the space arms bandwagon and that is causing the rapid proliferation of weapons in space. The USA believes in the philosophy that war in space is inevitable, so, they must stay technologically ahead of others. They have carried out numerous experiments relating to close approach and rendezvous in Low Earth Orbit (LEO) and Geosynchronous Orbit (GEO). One of the experiments conducted by the US regarding a satellite servicing mission involved a robotic arm that could successfully capture a space object. They also have the capability and knowledge to deploy ground-based laser weapons that are capable of damaging satellites present in the LEO. Russia, the other initial contender in the space race, suffered a setback after the disintegration of the Soviet Union, but over time it started rebuilding itself. It is believed that Russia has developed an anti-ballistic missile system which was first used in 2021, named S-500[10], and is a dual-use technology with anti-satellite capabilities. Russia just like its fellow contenders, has the capabilities for space weaponization due to its adequate knowledge and capability in electronic counter space methodologies. China's capabilities and knowledge of lasers and other direct energy weapons that could be

[8] The Military Use of Outer Space, Stockholm International Peace Research Institute, *available at:* https://www.sipri.org/sites/default/files/11%20%282001%29.pdf (last visited on July 13, 2024).
[9] Anti-Satellite Weapons and the Emerging Space Arms Race, *available at:* https://hir.harvard.edu/anti-satellite-weapons-and-the-emerging-space-arms-race/ (last visited on July 13, 2024).
[10] National Institute of Advanced Studies, "India and Weaponization of Space" (2021).

used as a countermeasure in outer space is growing. According to a Chinese scientific journal in 2013, China conducted a successful laser blinding test against satellites in the LEO[11]. These three states form the group of space superpowers, while states such as EU, India, and Japan form the medium space powers, and emerging space powers are states such as Brazil, Pakistan, etc.[12]

Space weapons are not only offensive in nature but are also desired because of their conflict-deterrent capabilities. ASATs can function as a conflict deterrent by risking mutual impotence in much similar way as two nuclear armed opponents risked mutually assured destruction(MAD). India, a country that is against the militarization and weaponization of outer space, started developing anti-satellite missiles and in March 2019, it successfully conducted a mission of the same by destroying its satellite. So, states wanting to be on the same footing as other states, have always developed and conducted experiments, even in the outer space, but without being regulated.

The weaponization of space can lead to certain threats which could lead to a conflict in the future. The OST lays that the state parties shall be regulated by principles of international law in outer space such as the principle of non-aggression, which by itself is ambiguous. It can be interpreted either as weaponizing and militarizing outer space with weapons for peaceful use, or as a peaceful means. Another international law - the principle of self-defence can be quoted by one state to attack another state in outer space by stating that there is a threat to its security due to the satellite system. States can very well exploit the principles for their gain. Another threat due to weaponization and militarization is the alteration of the environment- experiments in outer space can leave behind debris or residue.

Apart from ASATs or conventional weapons being placed in orbit, there are various other threats as well. Kinetic energy weapons wherein any state with medium-range ballistic missile capability reaches the LEO; co-orbital satellites stay in orbit and can approach, maneuverer, and damage other satellites; jamming of communication of one state's satellite with its user, etc. are some other threat. So, weapons in the space are truly a dangerous dilemma- Damn if you have them and damn if you don't have them. Space is likely to be lost to mankind due to accidental war or even due to a benign desire to clear up the orbits. The use of ASATs for any

[11] B. Weeden and V. Samson, "Global Counterspace Capabilities: An Open Source Assessment" 19 (2019).
[12] Z. Shapira and G. Baram, "The Space Arms Race: Global Trends and State Interests" 3 *Cyber, Intelligence, and Security* 9 (2019).

reason whatsoever is going to compound the misery by adding more debris to the already littered orbits. Space could very easily achieve critical mass as predicted in the Kessler effect theory either through offensive or defensive actions.

One of the most prominent treaty proposals, called Prevention of the Placement of Weapons in Outer Space with a "No first placement of weapons in outer space", was introduced by China and Russia in 2008, but the US vetoed it. The proposal defined weapons in outer space under Article 1(c), and also defined what use of force or threat of force means providing more guidance than the present scenario as Article II prohibits the state parties from resorting to the threat or use of force against outer space objects. The US vetoed all the drafts presented by China and Russia and claims that such proposals are pointless since there are no weapons deployed in outer space and there is no arms race in outer space. Apart from such initiatives, there have been numerous debates and talks regarding the prevention of weapons being used in outer space and to ban the use of ASATs. UN General Assembly has also been engaged in ensuring a future arms-free Outer Space. On 27 October 2022 during a joint meeting between the first and the fourth committee of the UN, the speakers addressed the concerns of the growing weaponization of heavens and discussed the need to have a multilaterally negotiated and legally binding instrument that would work towards prohibiting the same[13]. However, there will be no recourse to the issue unless all the states come together and decide upon a regulation that shall be binding upon all.

Space Debris: Littering The Heavens

Space was once a romantic dimension, with astronauts exploring its far reaches. With the development of the Superpowers, the race to the Moon became the ultimate mile race. Michael Jackson passed away and so did the Moonwalk. Space has become more competitive, with everyone vying for a toehold, including millionaires.

Growing financial and geopolitical interests are increasingly influencing space exploration, similar to the mythological El Dorado. Unlike early public-sector-funded space activity, private investment has increased dramatically over the last decade. Some recent activities undertaken by new commercial entrants range from providing satellite services, particularly in internet-related communications or launch services, to advancing National "territorial" claims or

[13] General Assembly, *Speakers Renew Calls for Treaty to Prevent Arms Race in Space as First, Fourth Committees Convene Joint Meeting -Concerns Also Raised About Proliferation of Space Debris*, UN GAOR, UN Doc Ga/Dis/3699-Ga/Spd/761 (Oct. 27, 2022).

fostering the development of high-value jobs, particularly in the zone of LEO or Medium Earth Orbit (MEO), as well as outward movement of humans from Earth leading to permanent settlements in space or on other celestial bodies. The space sector is an ever-transforming sector with the advancement of technology. Since space objects like satellites have both civilian and military usage, they are vastly used and placed in outer space and more so in LEO, MEO, or GEO. Satellites are a very profitable venture. New entrants looking to supply LEO or MEO services are putting pressure on the commercial satellite market. Over the last decade, a slew of new corporations, start-ups, and research organizations have raised billions of dollars to fund new uses for space-based activities. This has decreased the cost of launch systems, particularly in LEO, allowing a larger number of people to launch constellations of smaller satellites. Although industries involved in growing digital connectivity on Earth, such as direct-to-consumer broadband access, are witnessing the most growth, new areas of concentration include hyperspectral remote sensing, energy generation, manufacturing, mining, and tourism.[14]

Due to the rapid development, there is a huge risk of space congestion which could prohibit any state from putting any space object in outer space. Since the launch of Sputnik 1 by the Soviet Union, approximately 11,000 satellites have been launched to the LEO, and it is estimated that around 70,000 more will be put into orbit[15]. Since the circumference of the earth is 40,070 km, it is astonishing to imagine where the upcoming 70,000 satellites will be placed. According to a source, in 2023, an Australian satellite and a suspected Chinese satellite had a near-collision[16]. The reason behind the collision could be the overcrowding which is taking place in outer space. China complained to the UN Space Agency regarding two instances wherein the state had to take evasive action to avoid colliding with the satellites of Elon Musk.

States like China are developing technology to launch a n-number of satellites in orbit. According to recent news, China is launching its internet network system via satellites called the Guo Wang, a constellation of 13,000 satellites to provide 6G[17]. Rwanda, one of the poorest

[14] World Economic Forum, "The Global Risks Report 2022" 71 (2022).
[15] "Space Congestion: An Increasingly Contested and Crowded Frontier", Zurich, July 05, 2022, *available* at: https://www.zurich.com/media/magazine/2022/from-moonshot-to-musk-how-the-rules-of-the-game-are-changing-in-space (last visited on July 17, 2024).
[16] A. Greene, "Details Emerge of Near Collision Between Australian and Chinese Satellites", *ABC.Net*, Oct. 18, 2023, *available at*: https://www.abc.net.au/news/2023-10-18/space-incident-australia-china-satellite-conjunction/102988030?utm_campaign=abc_news_web&utm_content=link&utm_medium=content_shared&utm_source=abc_news_web (last visited on July 17, 2024).
[17] "China Breaks New Ground in 6G and Satellite Internet Technologies", Digwatch, Oct. 17, 2023, *available at*: https://dig.watch/updates/china-breaks-new-ground-in-6g-and-satellite-internet-technologies (last visited on July 17, 2024).

states in the world, had in 2021 filed a request with the International Telecommunication Union to put approximately 3,30,000 satellites[18]. States are not the only ones placing satellites, private entities are seeking approvals to put satellites in various orbits. One of the most used services, Amazon, announced Project Kuiper in 2019 and got approval from the state in 2020 to build a satellite constellation consisting of 3,236 satellites in the LEO[19] to deliver broadband services in the United States. Another private entity, SpaceX, which wants to provide low-cost internet to remote locations, aims to put a satellite network, the Starlink, in orbit. The life span of a Starlink satellite is approximately five years and they hope to place almost 42,000 satellites in outer space.[20] As of July 2023, there are approximately 4,500 Starlink satellites in orbit most of which are functional, and due to their size and scale, they are becoming a major source of collision. With such approvals and authorizations, the Satellite Industry Association, in its white paper in 2021[21], provided an estimate of approximately 1,47,671 satellites of which 10,000 satellites are in LEO, 30,000 satellites in medium, and 1,07,671 in high orbit.

Investment in the space sector would not only impact aerospace and defence but also IT Hardware and telecom sectors. It would also impact the mineral and mining sector, which shall be discussed subsequently. According to Morgan Stanley[22], by 2040, the space sector will generate a revenue of $1 trillion, which currently sits at $350 billion.

However, with such expansion comes the cost of collision and the creation of debris. Satellites that are launched into orbit can remain in orbit for hundreds of years. Because of the cheap cost of launch and fewer regulatory restrictions, the proliferation of smaller, low-cost satellites increases the chance of collisions or requires emergency makeovers to prevent such collisions.

The human race has an exceptional ability to generate waste. We are successfully filling up Space with rubbish that we have launched into it, despite having learned nothing from the waste generated. As the author mentioned above, we may have 100,000 satellites in orbit by 2029.

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[18] "Rwanda Files at ITU for Nearly 330,000 Satellites", Spacewatch, Oct. 22, 2021, *available at:* https://spacewatch.global/2021/10/rwanda-files-at-itu-for-nearly-330000-satellites/ (last visited on July 17, 2024).

[19] "Amazon Receives FCC Approval for Project Kuiper Satellite Constellation", Aboutamazon, July 30, 2020, *available at:* https://www.aboutamazon.com/news/company-news/amazon-receives-fcc-approval-for-project-kuiper-satellite-constellation (last visited on July 18, 2024).

[20] Starlink satellites: Everything you need to know about the controversial internet megaconstellation, *available at*: https://www.space.com/spacex-starlink-satellites.html (last visited on July 18, 2024).

[21] The Future of Space and Space Traffic Coordination and Management, Satellite Industry Association, *available at:* https://sia.org/wp-content/uploads/2020/09/REVISED-White-Paper20-STCM-Sept-23rd-V1.0.pdf (last visited on July 18,2024).

[22] *Space: Investing in the Final Frontier*, Morgan Stanley, *available at* https://www.morganstanley.com/ideas/investing-in-space (last visited on July 18,2024).

Some experts are concerned that the amount of metal that will be burned up in the Earth's atmosphere as ageing satellites are deorbited could cause unpredictability in the planet's climate[23]. Nowhere in any of the treaties or agreements the term space debris has been defined. However, it has been defined in the Space Debris Mitigation Guidelines[24] as all man-made objects, including fragments and elements in the Earth's orbit or re-entering the atmosphere, that are non-functional.

Space debris can be created due to various reasons. One of the reasons for the creation of space debris is defunct or decommissioned satellites or space objects. Since the space objects have stopped working, they become pieces of metal floating in outer space, which may end up colliding with live satellites. For example, in February 2009, Iridium 33, a US communication satellite collided with Cosmos 2251, a decommissioned satellite of Russia, at a relative speed of 11.7km/s. This collision took place while both of them were passing over Serbia and upon the collision, there was the formation of a debris cloud and thousands of fragments.[25]

Another reason for the creation of space debris is the anti-satellite weapons. During the testing or usage of the anti-satellite weapons, the said weapons physically collide with the targeted satellites at high-speed causing the satellite to break which would lead to the generation of debris. In the 1970s and 80s, both the US and the Soviet Union developed and tested various ASAT weapons. These tests in itself created 700 large pieces of debris, out of which 300 remained in the orbit. Since then, debris creation has been continuing.

In the LEO, debris travels thirty times faster than a commercial jet aircraft. Due to the excessive amount of debris, which would be travelling at a high speed, the satellites that are placed in the LEO would be in danger of getting damaged or destroyed. Space debris is not only a threat to the satellites, but soon, with the increase in number of space debris, it will form a blanket around the atmosphere of the earth, making it impenetrable from the inside and the outside.

According to the European Space Agency's space debris office in Germany, the number of satellites in space is around 10,590, and around 8800 of them are still functional. More than 640 estimated breakups, explosions, or collisions can take place resulting in fragmentation.

[23] E.T. Pultarova and E. Howell, "Starlink Satellites: Facts, Tracking and Impact on Astronomy", *Space.Com, available at:* https://www.space.com/spacex-starlink-satellites.html (last visited on July 19, 2024).
[24] Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, United Nations Office for Outer Space, *available at:* https://www.unoosa.org/documents/pdf/spacelaw/sd/COPUOS-GuidelinesE.pdf (last visited on July 19,2024).
[25] The impact of Space Debris, The European Space Agency, *available at:* https://www.esa.int/ESA_Multimedia/Images/2021/03/The_impact_of_space_debris (last visited on July 19,2024).

Around 35,340 space debris objects were tracked by the Space Surveillance networks.[26] According to a statistical model, there are around 36,500 space debris whose size is greater than 10cm, 10,00,000 space debris objects between 1cm to 10 cm, and around 130 million space debris objects from the range of 1mm to 1 cm.[27]

The creation of space debris, knowingly or unknowingly, does not benefit mankind, it poses a threat to the satellites and space objects that are present and shall be present in the future. Therefore, one can deduce that there is an underlying obligation on the states via the preamble of the Outer Space Treaty to not create debris. A NASA scientist, Donald Kessler in 1978 propounded the Kessler Syndrome, discussing the scope of space debris and its creation. He provided a situation, where one space object collides with another space object, further causing the objects to fragment into several pieces called space debris. These pieces of space debris into various orbits, would subsequently collide with other space objects, creating a vicious circle of collision and creation of space.

What's astonishing is that no state is actively trying to reduce the debris that is being caused in outer space. Professor Pini Gurfil, in an article, mentioned that this disc formation, would impact the magnetic fields of the Earth which protects us from radiation and light that comes from the Sun, and it may further also affect the weather of the Earth[28]. Similar to plastic on Earth, it becomes difficult to discard the fragments created by the destruction of space objects and satellites. This is in clear violation of Article IX of the OST which puts an obligation on states to conduct exploration in outer space in such a manner that it does not contaminate or cause adverse changes to the environment of the Earth as well as the outer space. Despite it being an obligation, states are taking no initiative as the terms "harmful contamination" or "adverse changes" have not been defined. If the issue of space debris is not solved or guidelines for the same are not provided in the next couple of years, there will be a debris disc around the earth.

Exploring Celestial Riches: Space Mining

Space is an area with unexplored natural resources for which states, whether developing or developed, want to stake their claims for it. Space mining is the exploration, exploitation, and

[26] Space debris by the numbers, The European Space Agency, *available at:* https://www.esa.int/Space_Safety/Space_Debris/Space_debris_by_the_numbers (last visited on July 21, 2024).
[27] *Id.*
[28] S. Askenazi, "Waste in Space: Near Space is Getting More Crowded, and More Polluted", *Calcalistech*, Sept. 26, 2023, *available at:* https://www.calcalistech.com/ctechnews/article/j3izlquus (last visited on July 21, 2024).

utilization of natural resources such as minerals, gases, metals, and water on the Moon, other planets, and near-Earth asteroids (NEAs). Space mining, billed as an activity that will maintain human life in the future by providing energy and raw minerals, is the key to the future of space exploration which requires an appropriate lock to prevent over-exploitation.

Article I of the OST provides that exploration and use of outer space shall be carried out for the benefit and in the interest of all countries. Outer space including the moon and other celestial bodies shall be free for exploration and use by all states and there shall be free access to all areas of celestial bodies.[29] The principle of sovereign equality is maintained by this article in space- space and its resources are res communis. Although Res communis or common heritage is based on jus utendi here it means that everybody owns the celestial bodies, and forbids jus abutendi in the form that nobody owns the celestial bodies so cannot dispose of the same. Developing Countries believe that Article 1 creates a positive obligation on the states to share the knowledge gained by them upon exploration or at least give up a share of the resources. This belief stems from the words benefit and interest of 'all' countries. However, for developed countries, it is simply a statement of goals to be achieved and the states have the right to decide what and how to share the information. As the world progresses, the majority of the states would adopt the second view to protect their endeavours.

Article II of the said treaty states 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.[30] The term "national appropriation" has not been defined in any set of treaties causing states to interpret national appropriation accordingly. Resource extraction does not constitute "national appropriation" and hence is not forbidden for enterprises that are not states. The Artemis Accords, signed by the United States and eight allies, makes use of the view that OST allows for the extraction and resale of commodities from outer space, as "extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty."

The wording of Article II of the OST does not clarify certain aspects that are related to space mining. With technological advancement and the increase in knowledge about outer space

[29] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967, art. I.
[30] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967, art. II

resources, there is no proper definition of resource utilization. The article further does not address the ownership of resources that would be extracted from such bodies.

In the preamble of the Agreement Governing the Activities of States on the Moon and other celestial bodies, the states have acknowledged the fact that the benefits which could be derived from the exploitation of resources, could lead to an international conflict. The provisions of the moon treaty apply only to the moon, and other celestial bodies within the solar system. The agreement has already limited the application of itself to the solar system and not beyond it. Under Article 6[31], there shall be freedom of scientific investigation on the Moon by all states without any discrimination allowing the state parties to have the right to collect and remove from the moon samples of its mineral and shall remain at the disposal of the states which collected them. It enforces a menial obligation on the states to have regard to the desirability of making a portion of the sample available to other interested parties. However, countries could choose how to make such portions of samples to be made available and what portion of them to be made available.

Hence, both the OST and the Moon Agreement create a grey area that is being exploited by countries as shown above in the case of the USA. With companies investing in technology to extract water, precious rocks, and metals in space, the regulatory grey zone under the OST and the Moon agreement has come under focus. These two treaties, long hailed as the cornerstone of Space Laws neither make any mention of property rights nor does it expressly condone or forbid mining. Due to this murky area, Barack Obama in 2015 guaranteed private firms the right to possess, trade, and profit from space mining[32] and passed the Commercial Space Launch Competitiveness Act (CSLCA). According to the OST, a state or other legal body cannot own a planet or space object, although such entities can harvest and sell resources generated from these objects for private profit—this privilege is granted in the CSLCA.[33] According to an article by the Luxembourg Space Agency[34], many such missions will be planned by states and private entities. The involvement of state and private entities in a mission

[31] Agreement Governing the Activities of States on the Moon and other Celestial Bodies, 1979, art. 6
[32] A. Ram, "US and Luxembourg Frame Laws for New Space Race", *Financial Times*, Oct. 19, 2017, *available at*: https://www.ft.com/content/af15f0e4-707a-11e7-93ff-99f383b09ff9 (last visited on July 23, 2024).
[33] U.S. Commercial Space Launch Competitiveness Act, 2015, s. 402.
[34] Resources in Space, Luxembourg Space Agency, *available at*: https://space-agency.public.lu/en/space-resources/ressources-in-space.html (last visited on July 23, 2024).

to outer space to extract and use extraterrestrial resources can lead to lines getting murkier regarding the regulations.

The next big business initiative in the globe is space mining start-ups. According to Goldman Sachs, space start-ups have received $13.3 billion in financing since 2010. In Luxembourg, more than 60 start-ups have already filed to profit from space mining. As above mentioned, by 2040 the space sector shall generate revenue of $1Trillion[35]. Psyche, a giant metal-rich asteroid is a NASA mission now. It is said that the asteroid contains a core of metals and gold which would be worth $10,000 quadrillion. This figure could put the USA at the forefront of the space race as well as the race to be a state with plenty of wealth.

Way Forward

The overwhelming majority of space initiatives have been undertaken for utilitarian motives, such as gathering information, strengthening state might, or profit. When conducting space activities, outer space should be viewed as a universal commons in which all states have an equal stake. The Outer Space Treaty grants rights for exploration, and operations to be conducted in the best interest of humanity and international cooperation, and should give due regard to other state parties.

However, despite such ideals, International Space Laws are a relic of an age gone by. It was designed to contain the Cold War space race, but it never considered the trend of space development. From the creation of OST in 1967 to the present day, rules have remained static while nation-states have taken space exploration to a whole new level. Failure of international space law to catch up in the short term creates possible concerns since parties risk major conflict due to disputes over space resource rights. The global space governance system, in its current form, excludes certain space operations and allows companies to operate under broad and usually inconsistent interpretations of existing agreements. While several attempts have been made to reform the governance structure, progress has halted, owing in large part to geopolitical differences among international actors, and this has harmed the long-term evolution of space. For example, the USA vetoed the Prevention of the Placement of Weapons

[35] Space: Investing in the Final Frontier, Morgan Stanley, *available at:* https://www.morganstanley.com/ideas/investing-in-space (last visited on July 23, 2024).

in Outer Space, a treaty proposed by China and Russia. The proposal provided a definition for weapons in outer space, which the author believes is an apt definition.

Hence, the author believes that a separate treaty should be formed between all the member states of the UN and it should be binding upon all, irrespective of their status of development since the main objective of the UN Charter and the space treaties and agreements is to allow space exploration and use for 'peaceful' purposes. Militarization and weaponization are the antithesis of peaceful exploration and usage. In the future, if countries have a conflict between resources since outer space is weaponized and militarized, there could be another war taking place.

Due to the overcrowding in the LEO and GEO, there are continual and substantive risks of collision, which need to be mitigated to avoid an increase in space debris. There are various definitions of Space traffic management (STM). The traffic management definitions cover the opposite ends of the spectrum, from – technical and regulatory provisions for the promotion of safe access, operation, and return without any physical or radio interference,[36] to oversight, coordinate, regulation, and promotion of space activities (including preservation of the space environment) at several distinct phases of the mission – launch, operations in space, and return from space.[37] Hence, the states and the Outer Space Agency should be investing their mind and time in providing a system of space traffic management. The Space surveillance network is only able to track approximately 4 percent of the LEO space population and 4 percent of the GEO space population. Due to the deficiency in tracking the space population, there is an urgent need to have a space surveillance system. It could be a respective state that would regularly provide the information to a centralized agency to keep a record of the space population in outer space. If the overcrowding issue in outer space is controlled, then there would be some relief regarding space debris. However, with the existent space debris, the states should collectively take the initiative to collect space debris. If a space object becomes defunct or has completed its purpose, states should bring back the space object to prevent it from damaging or destroying other space objects.

Since outer space works on the principle of res communis any activity conducted in outer space should be in the interest and benefit of the states. However, due to the ambiguous and

[36] D.L. Oltrogge, "The "We" Approach to Space Traffic Management" *American Institute of Aeronautics and Astronautics* 1 (2018).
[37] *Id.*

incomplete provisions regarding space resources and mining, the states are interpreting the provisions on their own and exploiting the resources for their benefit. With the advancement of space technology and the involvement of private players in this space race for exploration and exploiting resources, revision of the provisions has been a need of the hour. The treaties and agreements need to be revised – there should be proper definitions, explicitly providing what could be done and not be done with the outer space resources, etc. If space mining is to be allowed, then a set of guidelines have to be prepared which would be binding upon the states and should revolve around the concept of res communis. There should be a revision done regarding the liability of state and non-state players. Private entities should be held responsible for any violation of the laws and guidelines in outer space.

In the end, the space law amendments would be a watershed moment in the ongoing saga of space exploration and international cooperation. It is a global familial commitment to adapt and strengthen the legal systems that regulate human operations beyond Earth. As we reflect on the voyage thus far, it becomes clear that the amendments would be more than just a legal document; it would be a contribution to the shared duty for space as well as an acknowledgment that as we move farther into the unknown heavens, our laws must grow in tandem with our ambitions. The amendments or introduction of new laws would represent our steadfast commitment to establishing a future in space based on collaboration, sustainability, and the never-ending pursuit of knowledge beyond the bounds of our home planet.