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Governing the Final Frontier: A Legal Perspective and Path Forward in realm of Space

VRINDA[1]

ABSTRACT

The research paper tends to explore the development of space law, dating back from the year of 1957 to contemporary developments. It seeks to explore the ill effects of rapid militarization and commercialization of space by the nations and potential solutions that can help us undo the impact of harms caused. The paper also highlights the importance of stringent regulatory framework to ensure progress without environmental hindrances. Various gray areas in the realm of space laws alongside the sociological and ethical considerations to be kept in mind while drafting and codifying the laws have been stated to shed a light upon various arguments about the use of space for well being of mankind.

Keywords*: Space law, History, Challenges, Recommendations.*

I. INTRODUCTION

The launch of Sputnik 1 into Earth's orbit lead to the foundation of development of a new era of law. Later on the first animal called Laika was launched into the space to check the behaviour of living organism in outer space[2]. All these events lead to emergence of need of regulatory frameworks guiding space activities. The potential benefits as well as threats to mankind were recognized out of common interest which lead to conduction of Resolution 1348 XIII[3], targeting safe use of outer space by nations for the well being and interest of human race. United Nations also formulated a Committee on Peaceful Use of Outer Space in 1959[4] for similar purposes. Later on a major development in the realm of Space Law was formulation of Outer Space Treaty 1967 Resolution XVIII[5] which laid down the fundamentals for peaceful use of space and prohibition upon the use of harmful weapons to disrupt and cause mass destruction.

[1] Author is a student at National Law Institute University, Bhopal, India.
[2] A History of Space, https://www.unoosa.org/oosa/timeline/ (last visited Jan 12, 2025).
[3] RES 1348 (XIII), https://www.unoosa.org/oosa/oosadoc/data/resolutions/1958/general_assembly_13th_session/res_1348_xiii.html (last visited Jan 12, 2025).
[4] COPUOS History, https://www.unoosa.org/oosa/en/ourwork/copuos/history.html (last visited Jan 12, 2025).
[5] The Outer Space Treaty, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html (last visited Jan 13, 2025).

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Post all this, individual countries started developing national legislation[6] governing regulatory frameworks for their specific agencies including authenticated use of domestic space, licensing agreements etc. Say, developing nations like India lay down their primary focus upon the use of space technology for national priorities and public good. In today's world of technology space and its usage has been intriguing aspect globally. Space law must be addressed carefully in a way to keep check on global environmental concerns with international cooperation to ensure benefit of mankind and rise in knowledge about outer space.

Delving into the aspect of militarization of outer space, we can clearly see that use of space based technologies for military purposes is rising at its peak provided the rising global conflicts.This concept emerged during mid 20th Century with the cold war between Soviet Union and United States[7]. The primary issue with militarization of space is identifying the weapon used since in the realm of space a thing as tiny as needle can be sufficient to destroy satellites or spacecrafts. The increased militarization of space in quest of power has put enormous amount of space debris in just a period of 50 years approximately. Space debris is already a threat for the spacecrafts, drones, satellites etc launched into the space and if the militarization continues at same pace, ultimate result will be human disruption. So, the space law must have stringent norms to put limit upon activities that can potentially be a threat to space. The UN has also taken a step keeping this side of argument in mind via creation of multinational treaty called PAROS[8] that is Prevention of Arms Race in Outer Space. So outer space is gradually transforming into a platform to establish supremacy of power and space of mass destruction which requires a stringent multifaceted approach in space law so as to ensure a blend of human well being alongside constant growth and development without imposition of any sort of hindrance on rights of human beings and nations as a whole.

II. MILITARY USES OF SPACE AND NECESSITY OF SPACE ARMS CONTROL

Militarization of Space involves use of military technology in space with the underlying objective of enhancing national security and military operations. Even in our day to day lives we use this technology, the Global Positioning System (GPS), Missile Defence Systems and Surveillance Satellites all operate via space based technologies. Most of the major economies have sent a humungous number of space satellites to govern space based military capabilities.

[6] Space law | International Regulations & Agreements | Britannica, (2024), https://www.britannica.com/topic/space-law (last visited Jan 12, 2025).
[7] Cold War | Summary, Causes, History, Years, Timeline, & Facts | Britannica, https://www.britannica.com/event/Cold-War (last visited Jan 12, 2025).
[8] Understanding the Militarization of Space: Implications for Security - Total Military Insight, https://totalmilitaryinsight.com/militarization-of-space/ (last visited Jan 12, 2025).

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US owns 204 , China 114 and Russia 104 military satellites[9]. The latest addition to this is the launch of a new batch of spy satellites by Space X on January 9, 2025 under the NROL-153[10] mission.

We can understand that in rising global politics it is of dire importance for the nations to militarize space since it is not only necessary for national security via detection and interception of incoming ballistic missiles[11] but also has strategic advantages in the form of communication, intelligence and support. But everything has its own pros and cons, so far as militarization of space is concerned it has given rise to many problems which majorly include accommodation of space debris from collisions, failed experiments, satellite and space craft explosions etc. Moreover, increased trend of space militarization give rise to immense competition in arms race[12] at global level. This will produce tension in global politics owing to conflict as to ownership of more and more assets in the outer space. So, the treaties and conventions must address these issues aptly in order to sustain a healthy approach towards space militarization.

The Outer Space Treaty of 1967[13] emphasized the peaceful use of space only for the purposes of national security thereby washing out other perspective misuses of space militarization. Later, the Rescue Agreement of 1968[14] laid prominence upon the collaborative efforts required to ensure safe rescue of the astronauts sent to space by nations. Also, the Nuclear Test Ban Treaty[15] promoted disarmament and indirectly emphasized the harmful impacts of rapid militarization of space in longer run.

There are no specific laws that address the use of space by various nations besides the limited treaties and conventions. So, there are various gray areas in realm of space law that need to be addressed aptly.

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[9] International Law Editorial, Military Uses of Outer Space: Strategic Advantages and Challenges - World Jurisprudence, (May 11, 2024), https://worldjurisprudence.com/military-uses-of-outer-space/ (last visited Jan 12, 2025).

[10] SpaceX launches 7th batch of next-gen spy satellites for US government (photos) | Space, https://www.space.com/space-exploration/launches-spacecraft/spacex-to-launch-7th-batch-of-next-gen-spy-satellites-for-us-government-tonight (last visited Jan 12, 2025).

[11] International Law Editorial, Military Uses of Outer Space: Strategic Advantages and Challenges - World Jurisprudence, (May 11, 2024), https://worldjurisprudence.com/military-uses-of-outer-space/ (last visited Jan 12, 2025).

[12] Understanding the Militarization of Space: Implications for Security - Total Military Insight, https://totalmilitaryinsight.com/militarization-of-space/ (last visited Jan 12, 2025).

[13] The Outer Space Treaty, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html (last visited Jan 13, 2025).

[14] Rescue Agreement, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introrescueagreement.html (last visited Jan 14, 2025).

[15] The Comprehensive Nuclear-Test-Ban Treaty (CTBT) | CTBTO, https://www.ctbto.org/our-mission/the-treaty (last visited Jan 12, 2025).

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III. GRAY AREAS IN THE GENRE OF SPACE LAW

Due to the rapid evolution of technology, the space law needs more confinement as it face major challenges in various aspects. There is no clear regulation that governs framework for holding nations liable if any harm is done with respect to already established regulations under treaties like Outer Space Treaty[16]. Different countries govern separate interpretation of space laws and there is lack of uniformity at global level. This issue was highlighted by ICJ in aerial incident between India and Pakistan in 1999[17] where court stressed upon importance of clear regulations and space based evidences to prove the liability of the nation. In addition to this, a major problem that current framework is facing is due to the addition of private sector in realm of space. This highlights the need for stringent frameworks and policies.

Various loopholes such as weak interpretation of important terminologies like 'astronauts', 'damage caused' etc in Rescue Agreement and Liability Convention[18] further adds on to the gray areas since there are already few treaties and conventions to define these terms but the ones which do still suffer from ambiguity as to what constitutes damage under space law and other technical aspects which might be relevant to ensure effective and uniform application of space law. Moreover, the liability convention Article 7[19] states liability of the launching state in case damage is caused by the launch made into space by the nation be it damage on the Earth or space. But this article does not aptly answer situations whereby damage is caused in the space no only because of fault in the space launch by that particular state but because of some collision or sudden disruption caused due to interference in space crafts by space debris. In such situations who shall be held liable for the damage and is there a sole responsibility of some nation for space debris? The current system fails to adequately answer these questions.

In addition to this, some private individuals have claimed the ownership of lunar land despite the fact that Outer Space Treaty clearly states that all celestial bodies belong to mankind and no one can claim private ownership over any celestial land[20]. So, there must be stricter provisions to exclude such fraud claims. The rapid militarization of space is also posing serious threat to the governance of space since due to increased quench of power nations are deploying anti-

[16] The Outer Space Treaty, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html (last visited Jan 12, 2025).
[17]Dr Annette Froehlich, The Impact of Satellite Data Used by High International Courts Like the ICJ (International Court of Justice) and ITLOS (International Tribunal for the Law of the Sea) (2012).
[18] Rescue Agreement, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introrescueagreement.html (last visited Jan 14, 2025).
[19]Liability Convention, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html (last visited Jan 13, 2025).
[20] The Outer Space Treaty, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html (last visited Jan 13, 2025).

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ballistic missiles and other space based weapons, which can lead to increase in arms conflict beyond Earth, rise in amount of space debris, space piracy etc[21]. The current framework doesn't specifically state provisions that govern use of conventional weapons[22] in space by the nations which constitutes yet another loophole in the space law.

Exploitation of space based assets is yet another emerging issue. The ownership of space based assets is itself questionable under the current provisions. With advent of technology the mining of asteroids, stones and extracting unique metals from them is being explored. The passing of US Commercial Space Laws Competitiveness Act[23] showcases the uprising of this issue since this act promotes commercial launches into the space and states that governance should be in hands of FAA administrator.

So, from all these issues we can clearly infer that there is a huge scope of improvement in the current legal framework governing space law, it needs a multi-pronged approach in which not only legal but advancing technology is also taken into consideration so as to ensure safety of celestial body for mankind and prevention of larger threats in form of space arm conflicts etc.

IV. ETHICAL AND HUMANITARIAN CONCERNS WITH RESPECT TO SPACE LAW AND MILITARIZATION OF SPACE

Various ethic-o-humanitarian concerns draw attention with respect to the latest developments in space laws. The rising militarization and commercialization of space has lead to increased risk to environment as well as extra-terrestrial life. Due to rapid evolution of technology countries are dumping more and more waste in the form of space debris. Space debris is a threat to space assets as well as the environment at large. The incident of 2007 whereby China conducted anti satellite tests[24] to destroy its own weather satellite dumped a humongous amount of debris into the space. This raised ethical concerns with respect to environmental protection and our duty towards it.

Space colonization is also an emerging concept, which includes the idea of establishing human settlements far beyond Earth's surface. This can ideally be a survival strategy in case of major mishap on the globe but with fast evolution of technology, this idea is gaining popularity. This

[21] Space Piracy in the Spotlight - Payload, https://payloadspace.com/space-piracy-in-the-spotlight/ (last visited Jan 14, 2025).
[22]Legality of Deployment of Conventional Weapons in Earth Orbit: Balancing Space Law and Law of Armed Conflict, https://academic.oup.com/ejil/article/18/5/873/398694 (last visited 12 Jan, 2025).
[23] U.S. Commercial Space Launch Competitiveness Act Incorporation, FEDERAL REGISTER (2024), https://www.federalregister.gov/documents/2024/09/19/2024-20900/us-commercial-space-launch-competitiveness-act-incorporation (last visited Jan 13, 2025).
[24]Dale Stephens & Cassandra Steer, Conflicts in Space: International Humanitarian Law and Its Application to Space Warfare, (2016), https://papers.ssrn.com/abstract=2722315 (last visited Jan 13, 2025).

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raises humanitarian concerns as to management of celestial properties, curtailment of human rights by use of space for commercial rather than common good purposes. Moreover, the IHL application in space is quite ambiguous owing to lack of strict interpretation and application of principles in space law. The Gulf War of 1990-1991[25] highlighted the same, it is considered as the first space war. There is enormous threat to the lives of astronauts being sent via space shuttles by the nations owing to increased space piracy that is use of one space craft to steal and attack other space crafts. Also, the presence of debris creates hazard for smooth running of space assets[26]. All this, raises questions as to the safety of astronauts and also about the liability of nations since there are no clear grounds to hold some particular entity liable for damage caused due to space debris.

Space mining is also being explored by the space agencies as it can prove to be really helpful in extracting resources from celestial stones. But it raises environmental concerns. Many argue that activities like colonization of space, mining etc tend the exploit the space in the name of overall well being of mankind, all this will ultimately lead to instability in the space which will lead to our disruption in a longer run. So, all these pros of exploring more and more space and making its use for power can lead to major cons which raises ethical as well as human rights' concerns, so these aspects must be carefully evaluated and laws must be enforced in a way that ensures protection alongside benefits.

V. SOLUTIONS AND RECOMMENDATIONS

As highlighted earlier that there is a need of multi-faceted approach to enhance the current framework governing space laws. Multiple steps can be taken to implement this, some of them are stated below:

1. International Co-operation

Global Co-operation is essential as it would ensure enhanced knowledge, better access to technology, sharing costs[27] and improved international relations fostering collective efforts. All this will ensure sustainable exploring and use of space since diverse researchers will progress upon the same projects thereby ensuring global progress. International collaboration will

[25] Persian Gulf War | Summary, Dates, Combatants, Casualties, Syndrome, Map, & Facts | Britannica, (2025), https://www.britannica.com/event/Persian-Gulf-War (last visited Jan 13, 2025).
[26] About Space Debris, https://www.esa.int/Space_Safety/Space_Debris/About_space_debris (last visited 12 Jan, 2025)
[27]Discuss The Importance Of International Collaborations In Space Exploration And How India Can Strengthen Its Partnerships To Enhance Its Capabilities, Drawing Lessons From The VIPER Mission. (10M, 150 Words) - PWOnlyIAS, https://pwonlyias.com/mains-answer-writing/international-collaborations-in-space-exploration/ (last visited Jan 14, 2025).

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promote sharing of scientific experiments and findings. India's Mars Orbiter Mission, 2014[28] mission in collaboration with NASA's Maven mission[29] provided significant knowledge about environment of Mars, which ultimately lead to a major victory for India becoming fourth country to reach Mars. India's collaboration with Space X[30] has allowed us to create cost effective satellites with similar success rates. So, diversifying partnership can improve decision making and raise resource allocation which will prove to be a progressive step for global enrichment.

2. Updating law with respect to evolving technologies

It is extremely important to keep evolving with the changing technologies as it helps address latest challenges, thereby promoting safe growth. As highlighted earlier that due to quick advent of technology the aspect of space mining and celestial ownership is emerging quickly, so we need to codify framework in a way that it aptly addresses issues at hand. Also, limits must be set upon space debris emission by nations and strict liabilities must be imposed in case breach of that limit occurs due to any operations by the nations. Recently, the Inter Agency Space Debris Coordination Committee[31] as well as United Nations Office of Outer Space Affairs[32] has launched guidelines and is taking steps to ensure reduction in space debris and to promote sustainable environment for mankind as responsible individuals.

So far as space mining is concerned the Hague International Space Resources Governance Working Shop[33] is working to create guidelines for efficient use of space resources without ruining the essence of environment protection and human well being. Nowadays, the increasing contribution of AI from our day to day chores to the complex ones is notable, the European Union agencies[34] are figuring out the ways in which AI can be a boon for space projects and also exploring the negative aspects in which it can be misused.

There is requirement of clarity in definitions used in realm of space law. For instance, the term

[28]Mars Orbiter Mission, https://www.isro.gov.in/MarsOrbiterMissionSpacecraft.html (last visited Jan 14, 2025).
[29]Solar System Interactive, SOLAR SYSTEM INTERACTIVE, https://eyes.nasa.gov/apps/orrery (last visited Jan 14, 2025).
[30]Here's Why Elon Musk's SpaceX Steps In To Launch India's GSAT-N2 Satellite, https://www.ndtv.com/world-news/heres-why-elon-musks-spacex-steps-in-to-launch-indias-gsat-n2-satellite-7056445 (last visited Jan 14, 2025).
[31] IADC, https://www.iadc-home.org/what_iadc (last visited Jan 14, 2025).
[32] United Nations Office of Outer Space Affairs - Google Search, https://www.google.com/search?client=safari&rls=en&q=United+Nations+Office+of+Outer+Space+Affairs&ie=UTF-8&oe=UTF-8 (last visited Jan 14, 2025).
[33]The Hague International Space Resources Governance Working Group, LEIDEN UNIVERSITY, https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-of-air-space-law/the-hague-space-resources-governance-working-group (last visited Jan 14, 2025).
[34]Emerging Issues in Space Law: Navigating Legal Challenges Ahead - World Jurisprudence, https://worldjurisprudence.com/emerging-issues-in-space-law/ (last visited Jan 14, 2025).

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Space Object has been used in various treaties but there is lack of unanimity in its interpretations. These interpretation vary from the nature of the objects and even nation to nation. Also, the Registration convention[35] states that it is mandatory to get space objects registered but the ambiguity as to the definition of what constitutes space object is questionable and leads to major inconsistencies. These instances highlight the importance of clarity in definitions and need for a framework that is inclusive of better understanding and strict implementation of laws washing off the element of ambiguity.

3. Promoting Public Private partnership

Another step which can prove to be a blessing in disguise for space laws is promotion of public private agencies governing in the realm of cosmos. These collaborations will ensure better access to technology and sharing of knowledge which is a very important aspect for running new projects to explore more of outer space. Also, it will be easier to get the risks of failure insured as the cost will be divided and mitigation strategies can be formulated. Another major advantage of promoting public private partnership will be recruitment of higher number of skilled individuals to the space project. If we opt for an integrated approach then this will automatically result in urge to follow uniform set of rules which will enhance the governing framework of space law.

The United States Space Force (USSF) has partnered with Space X to launch satellites using Falcon 9 and Falcon Heavy Space Rockets.[36] Blue Origin founded by Jeff Bezoz has joined hands with NASA to develop a lunar Blue Moon Lander[37]. Even Indian government has invested funds in private sector agencies to ensure collaborative approach towards India's national space operations[38]. So, all these steps are actions in furtherance of one objective that is evolution of mankind in space.

4. Promote Responsible Behaviour in Space

Responsible behaviour means exercising due care and caution to prevent any mishaps during

[35]Registration Convention, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/registration-convention.html (last visited Jan 14, 2025).

[36] United States Space Force launches seventh X-37B mission, UNITED STATES SPACE FORCE (2023), https://www.spaceforce.mil/News/Article-Display/Article/3628417/united-states-space-force-launches-seventh-x-37b-mission/https%3A%2F%2Fwww.spaceforce.mil%2FNews%2FArticle-Display%2FArticle%2F3628417%2Funited-states-space-force-launches-seventh-x-37b-mission%2F (last visited Jan 14, 2025).

[37]NASA Selects Blue Origin as Second Artemis Lunar Lander Provider - NASA, https://www.nasa.gov/news-release/nasa-selects-blue-origin-as-second-artemis-lunar-lander-provider/ (last visited Jan 14, 2025).

[38]Space industry funding in India falls 55% in 2024, data show - The Economic Times, https://economictimes.indiatimes.com/news/science/space-industry-funding-in-india-falls-55-in-2024-data-show/articleshow/116986727.cms?from=mdr (last visited Jan 14, 2025).

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execution of any operation in space. Measures must be taken to avoid accidents, proper checks must be made for space crafts, satellites, drone etc whatever is being used in the space operation so as to get clear understanding if particular machine used is viable enough to reach and remain in the space environment for desired tenure. Liabilities must be clearly stated in case some nation fails to exercise proper caution before launching any space mission. Liability Convention[39] lays down regulations governing responsible behaviour that must be exercised by the agencies as well as the nations indulging in space operations.

Transparency must be ensured in communication channels to build up trust and cooperation between the entities. Campaigns must be run to educate and make people aware about the hazards to negligent behaviour in space operations. These campaigns can help policy makers, drafters etc to concisely implement required policies to enhance the current framework as responsible individuals. As highlighted earlier, the ethical and humanitarian grounds must also be taken to account while drafting policies governing space laws. So, all these steps can be stepping stones upon the pathway of improvement of space law.

VI. CONCLUSION

Starting from the cold war between Soviet Union and United States the realm of space law has expanded distantly in past years. With time and technology, the space is now at verge of exploitation due to rise in militarization and commercialization of space. The thirst of competition and power is rising globally, thereby giving rise to simultaneous threat to the space as well as humanity as a whole. Primary issues lay in the fact that we do not have sufficient laws, treaties or conventions to govern the problems of current time.

The existing framework fails to aptly address the concerns of growing mining, militarization, property ownership claims etc. Moreover, the lack of uniformity at global scales deepens the issue. Hence, we must join hands to create supportive environment whereby the focus relies upon futures enhancement without threat to mankind and our environment as a whole. Potential solutions to help achieve these objectives can be encouraging public private partnership, promoting responsible behaviour among individuals, addressing legal loopholes with clarity etc. So, space law is a dynamically evolving aspect which must be addressed using a well-rounded approach to ensure constant progression with sustainable future without perspective threats to nature and mankind.

[39] Navigating the Legal Cosmos of Space Disputes: Sources of Space Law and Core Principles, https://globalarbitrationreview.com/guide/the-guide-aviation-and-space-disputes/first-edition/article/navigating-the-legal-cosmos-of-space-disputes-sources-of-space-law-and-core-principles (last visited Jan 14, 2025).