



Space Law and Intellectual Property Rights : Issues and Challenges

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ABSTRACT

As humanity ventures further into outer space, the intersection of Space Law and Intellectual Property Rights (IPR) has become increasingly significant. This abstract explores the evolution of legal frameworks governing space activities and the protection of intellectual property within this expanding frontier. The historical development of space law and IPR reflects a response to technological advancements and emerging commercial interests. As private enterprises and international collaborations propel the space industry forward, contemporary issues arise, including the protection of patents, trademarks, and copyrights related to space technologies, satellite data, and space missions. This discussion highlights the complexities of applying traditional legal concepts to novel space-related contexts and examines current challenges such as jurisdictional disputes, enforcement of rights, and the need for updated regulatory frameworks. In conclusion, navigating the legal landscape of space exploration and intellectual property requires a nuanced understanding of both historical precedents and evolving practices. Addressing these challenges is crucial for fostering innovation while ensuring fair and equitable legal protections in the new frontier of space.

Keywords : Outer Space Treaty, Intellectual Property, Liability

I. INTRODUCTION

Since the formation of the space age, remarkable progress has been made in understanding and exploring the vast space environment. The space exploration activities were mainly done by governmental agencies but now the private sector is

equally advancing in the same. The satellite communication industry has been a profitable industry for a long time whereas remote sensing, space manufacturing, direct broadcasting and space vehicles are assured for commercial development. However, the growth of these space industries depends on whether sufficient incentives are

provided for the private sector to invest in space activities.

Traditionally, the protection of IP including patents, copyrights, trademarks and trade secrets were through national laws and international agreements. However, the protection of emerging inventions like semiconductor chip design is not sufficient. When it comes to outer space, IP protection faces even bigger uncertainty due to involvement of nature and legal framework. The international laws of outer space are based on United Nations treaties which mainly addresses governmental activities and does not safeguard the inventions of the private sector. So, this leaves a lot of unresolved issues in private entities involved in space activities.

As the private sector involved in space exploration increases, the need to address IP protection becomes more important. The recognition and enforcement of IP rights in space are essential for providing the private sector with the confidence to invest in research and development of the space industry. National IP protection systems do play an important role but the involvement of nature of outer space activities asks for adaptation of these protection laws. The existing international space agreements, national laws and developing case law will shape the frameworks for IP protection in space.

The concerns over IP protection in space have been present for many years but the recent inventions on the technological front have brought these issues to forefront. International and national efforts to address IP protection in space includes copyright issues in space communication and remote sensing. For example, the protection of copyrighted works of satellite transmission have been an international concern since the 1960s, but the international agreements like Universal Copyright Convention

and the Berne Convention do not address these issues efficiently. The increasing use of satellites for various applications has not only reduced the launch costs but also increased the involvement of private companies into space industry which demands for IP protection. The improvement of IP rights in the space industry is important for maintaining the involvement of the private sector and understanding the full potential of space as a commercial sector. Space law includes a variety of international agreements, treaties, conventions and United Nations General Assembly resolutions and the rules and regulations of international organizations. The United Nations Office for Outer Space Affairs (UNOOSA) plays a key role in promoting international cooperation in peaceful space explorations and use of outer space.

II. OBJECTIVES

This paper seeks to thoroughly examine the existing regulatory framework for space activities, tracing the historical evolution of space law. It analyzes the foundational principles and treaties, emphasizing their strengths and limitations. Additionally, the paper offers recommendations for creating a unified international framework to address the emerging space economy. The recommendations focus on improving international cooperation and adjusting national laws to align more closely with the unique aspects of space activities, ensuring that regulatory frameworks evolve alongside technological advancements and space exploration.

III. RESEARCH PROBLEMS

The Current international treaties have limited effectiveness in regulating space activities, particularly as commercial entities become more

involved. Treaties such as the Outer Space Treaty offer a foundational framework but fall short in addressing the complexities of the modern space economy, including issues like intellectual property rights and private sector activities. To enhance regulation, it is essential to develop robust international frameworks that can adapt to the evolving nature of space activities and foster collaboration among space-faring nations. Furthermore, national laws should be harmonized with these international frameworks to ensure clear guidelines, compliance, and to encourage private investment in space. This integrated approach will contribute to the development of a sustainable and well-regulated space economy.

IV. LITERATURE REVIEW

The regulations of space activities are based on international law, conventions, treaties and diplomatic efforts. UNOOSA defines space law as "the body of law governing space related activities," which includes international agreements, treaties, conventions, and United Nations General Assembly resolutions. These space related activities include a wide domain from objects launched into space and the collection and sharing of space data to use of space related technologies on earth and in orbit and the collection and utilization of resources from outer space bodies like the moon. UNOOSA supports United Nations Member States in establishing legal and regulatory frameworks for national and international space activities. For example, UNOOSA collaborated with NASA for the Artemis program.

Inventions Made on Earth but Meant to Be Used in Outer Space: Satellite systems, propulsion technologies, and space habitats are examples of

Earth-based inventions for use in space. Protecting these inventions requires regular patent systems, but with considerations for their application in the unusual and extraterritorial environment of space. One of the most difficult tasks is identifying whether national rules apply to these inventions after they are launched into space. Traditional intellectual property rules are territorial in nature, which complicates their application to space activities. To ensure that intellectual property rights are respected across jurisdictions, international agreements and IP law harmonization is required. The lack of a global legal framework governing intellectual property in space makes it difficult to protect and enforce rights for Earth-based inventions intended for space.

Inventions Made in Outer Space but Meant for Use on Earth: Space missions involve international collaborations which makes it important to ensure that IP rights are well respected across different countries. To avoid disputes and promote cooperative inventions, it is crucial to establish clear agreements on IP ownership among nations. The developed technologies in space have important significance on earth. For instance, the advanced materials created in microgravity and innovative manufacturing processes.

The traditional IP laws are adapted for unique conditions of inventions made in space. This includes contributions from different nations in various space missions in the space environment. The clear guidelines on IP ownership and usage helps in commercialization of these inventions on earth. By providing strong IP protection for space originated inventions, nations can motivate further innovation and investment in space technology. This is important for space exploration and terrestrial application of these innovations.

Inventions Made in Outer Space for Use in Space: Inventions developed in space specifically for use in space, such as space habitats, life support systems, and exploration tools, present unique challenges due to the absence of a clear legal framework for IP protection in space. There is a need for developing specific legal frameworks that address the authority and enforcement of space-based inventions. The absence of such frameworks can hinder innovation and investment in space technologies. International cooperation is crucial in establishing these frameworks to ensure that inventors and companies have the necessary protections.

V. EVOLUTION OF SPACE LAW

The birth of modern space law can be dated back to the Cold War era, especially the launch of the Soviet Union's Sputnik 1 satellite in 1957, which triggered the "Space Race". The launch of Sputnik 1 has highlighted the inadequacy of existing international air law to govern spacecraft which led to the negotiation of the 1967 Outer Space Treaty. This was the foundational principle of space law. This milestone highlighted the need for legal frameworks to govern activities beyond Earth's atmosphere. In response, the United Nations formed the Committee on the Peaceful Uses of Outer Space (COPUOS) in 1959, which became pivotal in developing international space treaties. [6] The Outer Space Treaty, established in 1967 is the foundation of international space law. It sets the principles of governing the activities of nations in the exploration and use of outer space. This treaty provides that outer space is free for exploration and can be used by all countries and is not subjected to national appropriation. However, the treaty primarily addresses governmental intervention and does not support private entities in IP protection.

But it conflicts with the exclusive rights granted by IP laws. To balance these two aspects, careful considerations and potential amendments are made to the treaty. One way could be to include provisions that recognize the role of private entities in space exploration and provide clear IP protection guidelines. This would ensure interests of both public and private stakeholders are addressed. As the space activities evolve, the treaty must be updated to showcase the modern realities and support the commercialization of space ventures. Amending the treaty to incorporate IP protection can ensure that inventors and companies have the necessary legal frameworks to protect their innovations in space.

A. Legislative Framework Of Space Law At Global Level

The Paris Convention: The Paris Convention, created in 1883 and administered by the World Intellectual Property Organization (WIPO), is one of the oldest and most important international treaties in the Intellectual Property area. It establishes a framework for protecting intellectual property, including patents, trademarks, and industrial designs, across 177 countries. The Convention, which was created largely to address terrestrial intellectual property challenges, has concepts that can be applied to outer space activities. Key elements of the Paris Convention, such as the right of priority, which permits an applicant to use the first filing date in one member country in subsequent files in other member nations are especially important. This right of priority means that innovators can get patent protection in various jurisdictions, which is vital for ideas developed for use in space or those created in space. The national conventional laws must be adapted to space

applications to ensure full protection of space related inventions by the Paris Convention.

The Rescue Agreement: The 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, commonly known as the Rescue Agreement, builds on the principles established in the Outer Space Treaty. It commands the states to assist the astronauts in distress and ensure their safe return to earth. It also specifies the return of any space objects that land within a state's territory to launching state. This agreement ensures the collaborative spirit of international space exploration and brings the humanitarian aspect of space activities and commercialization.

The Space Liability Convention: The 1972 Convention on International Liability for Damage caused by Space objects established the framework for damage caused by space objects. It holds launching states absolutely liable for damages caused by their space objects on the surface of earth and in airspace and liable for all the faults caused in the outer space environment. The convention provides methods for resolution of claims and outlines procedures for diplomatic negotiations and arbitration to ensure that states can seek remedy for damages caused by space activities. This legal framework promotes accountability and responsible behaviour which enables states to take necessary precautions to prevent damages from their space activities.

The Registration Convention: The 1975 Convention on Registration of Objects Launched into Outer Space, known as the Registration Convention, requires states to produce details about the space objects they launch to the United Nations Office for Outer Space Affairs (UNOOSA). [13] This information is recorded in a registry to help

improve transparency and help the identification of space objects. States must provide details such as the name of the launching state, a designator of the space object, date and territory or location of launch, basic orbital parameters, and the general function of the space object. This convention aims to ensure that space activities are conducted responsibly and that states can track and identify objects launched into space.

The Moon Agreement: The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, or the Moon Agreement, is built upon the principles of the Outer Space Treaty to the Moon and other celestial bodies. It states that these celestial bodies are the "common heritage of mankind" and forbids their national appropriation. This agreement controls the space exploration and use of celestial resources, which states that activities should be conducted for the benefit of humanity and under an international regime which is established for governing the exploitation of resources. The Moon Agreement also addresses issues such as environmental protection of celestial bodies, by preventing contamination and need for international cooperation. However, the moon agreement has not been widely approved and only a few handful countries are committing to its terms which in turn is impacting international space law.

Non-Binding Resolutions and Agreements: The United Nations General Assembly has adopted several non-binding resolutions and agreements to complement the legally binding treaties. One significant non-binding resolution is the 1963 Treaty banning Nuclear Weapon Tests in the atmosphere, outer space and under water. [11] This treaty is not specifically a space law treaty but it prohibits the nuclear tests in outer space which contributes to peaceful use of space. Another

important agreement is the 1992 International Telecommunication Union (ITU) Constitution and Convention which addresses the use of radio frequency spectrum and satellite orbits to avoid harmful interference. The ITU framework ensures that the radio spectrum is used effectively and equitably which will facilitate global communications and prevent conflicts over frequency use.

B. Legislative Framework Of Space Law At National Level

The United States established NASA in 1958 and later introduced the Commercial Space Launch Act to foster private sector participation. [3] Similarly, the European Space Agency (ESA) was created in 1975 to promote cooperation among European nations, while other countries like Russia, China, India, and Japan developed their own space programs and legal frameworks.[5] Although India does not yet have a dedicated space law, several policy documents and regulatory frameworks guide the nation's space activities. As mentioned above, India lacks a comprehensive Space Law, but for the time being the regulations regarding outer space are contained in the articles. Article 51 of the Indian Constitution provides for the promotion of international peace and security. According to article 51(c), The State must (c) respect International Law and Treaty obligation and to encourage settlement of the International dispute by way of Arbitration. Hence, article 51 of the Indian Constitution obligates the State to work in coordination with other nations and enhance “international peace and security”. The State must respect all such international laws and treaties, whether regarding space matters or otherwise, which it is a signatory to and promote harmony among all nations.

Article 73 of the Constitution is another such legal framework. According to article 73 (1) of the Indian Constitution, the executive power of the Union extends to the matter relating to which Parliament has the power to make laws, and to exercise of such rights, authority, and jurisdiction as one exercisable by the Government of India under any treaty or agreement. Hence, article 73 empowers the Parliament, any State or any such authority of the State to enact laws to ratify any international treaty, agreement or convention, India is a signatory to.

The last one being Article 253 of the Constitution which states that the Indian Constitution – Legislation for giving effect to International Agreements: Notwithstanding anything in the foregoing provisions of this Chapter, Parliament has the power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement or convention with any other country or countries or any decision made at any international conference, association or other body. Hence, the Constitution empowers the Parliament to formulate any such laws required to implement any agreement, treaty, or convention with other countries or any decision taken by the International Agencies, India is a member of.

Draft Space Activities Bill: The Draft Space Activities Bill passed in 2017, represents a significant step towards making the regulatory framework for space activities in India. This bill aims to promote and regulate the country's space activities, ensuring they align with international treaties and obligations. It establishes a complete framework for the permission and supervision of space activities conducted by both governmental and non-governmental organizations. The bill instructs that all entities engaging in space activities must obtain permission from the government,

ensuring that activities are conducted responsibly and comply with national and international laws. The bill also addresses responsibility for damages caused by space activities, specifying that entities must have appropriate insurance and protection arrangements to cover potential damages. This provision ensures that any damages resulting from space activities can be adequately compensated, promoting responsible behavior among spacefaring entities.

Remote Sensing Data Policy: The Remote Sensing Data Policy passed in 2011 says the purchase and distribution of remote sensing data in India. This policy aims at balancing the widespread distribution of remote sensing data with national security and public safety considerations. It enables access to remote sensing data for various user segments, including government agencies, private sector organizations to ensure that data is distributed responsibly and securely. It also outlines procedures for licensing remote sensing data providers about the security protocols to be followed for sensitive data.

Satcom Policy: The Satellite Communication (Satcom) Policy passed in 2000 is a foundational document which regulates the use of satellite communication services in India. This policy encourages private sector participation in satellite communication, encouraging competition and innovation in the space industry. It also sets out the guidelines for the procurement of satellites, launch services, and the operation of satellite systems, ensuring that these activities are conducted in line with national interests and international obligations. The policy also addresses spectrum allocation and licensing, ensuring that satellite communication services are provided efficiently and equitably. By promoting private sector involvement, the Satcom

Policy aims to enhance the availability and quality of satellite communication services in India, supporting various applications such as broadcasting, telecommunications, and broadband services.

Spacecom Policy: The Spacecom Policy passed in 2020 is a recent initiative which was designed to further liberalize and improve India's satellite communication sector. This policy marks a significant shift towards greater private sector involvement in space exploration by allowing private organizations to establish and operate communication satellite systems. The Policy also builds a regulatory framework for satellite communication services, including spectrum allocation, licensing, and the operation of satellite systems. It also aims at creating a collaborative environment for investment and innovation in the satellite communication sector by enabling private companies to contribute to the growth of the nation's space industry. The policy also addresses issues related to satellite procurement and launch services. The Spacecom policy aims to enhance the availability and quality of communication services in India which will help in the country's broader economic and technological development.

Technology Transfer Policy of ISRO: Technology transfer is a process through which ISRO transfers its technical know-how of the technology created by its centers and elsewhere using the resources of ISRO, to the external entities. In order to further such transfer of technology from its centers to the industry for the production of items required for its space projects as well as outside users by the industry, ISRO undertook a significant initiative in the mid-seventies. The "ISRO Technology Transfer Group" was created to implement the policy. Hence, by allowing transfer of numerous technologies, the Department of Space is furthering

commercialisation of the know-how of different disciplines of space-related technologies. Multi-pronged initiatives resulted in terms of the group's work for awareness building, quality assurance, selection criteria for industries, know-how pricing principles, innovative contract systems and so on. The main objective for conceiving the technology transfer policy was to encourage Indian industry participation in the outer space activities of ISRO. It also aimed to grab the advantages of "spin-offs of such technologies" created. The policy enables the industry to acquire licensing of the technology know-how from ISRO centers. Technology transfer cases, falls under the purview of technologies for ISRO buyback, technologies for development of space systems utilization and space applications and the technologies for the development of spin-off or non space applications.

To create awareness among the industries, ISRO publishes such information regarding

technology transfer on its website and other trade journals to invite applications for the same, from time to time. In order to facilitate the transfer of technology to both public and private sectors for industrial and national development, ISRO created a public sector company called 'New Space India Limited (NSIL)', in March 2019. According to ISRO Chairman K Sivan, "The main objective of this new company will be to act as a mediator or link between ISRO and the industry and facilitate the transfer of ISRO technologies to private companies. Till now, ISRO had to directly engage with private companies and oversee the entire process of technology transfer." Till now, ISRO has transferred over 300 technologies to different potential industries.

VI. INTELLECTUAL PROPERTY RIGHTS AND ITS CHALLENGES IN SPACE

IPR in space involves the protection of creations of the mind, such as inventions, literary and artistic works, designs, and symbols, used in space activities. Patents are used to protect inventions that are new, non-obvious, and useful. Challenges include determining jurisdiction and ensuring protection across different countries. Trademarks protect brand names, logos, and other identifiers used in space-related businesses. As space commerce grows, so does the importance of protecting trademarks globally. Copyright protects original works of authorship, such as software, designs, and written content. The challenge is ensuring copyright enforcement in the context of international space stations and satellites.

However, there are several issues that come into picture when formulating regulations for intellectual property protection in space. The jurisdictional issues when the space activities involve multiple countries which complicate the enforcement of IPR of one country. International cooperation and agreements are essential to addressing these issues. The other issue might be resource utilization. With the potential for mining asteroids and other celestial bodies, questions arise about the ownership and intellectual property rights related to the extraction and use of these resources.

Both space law and IPR are evolving fields, adapting to new technological advancements and the increasing presence of private companies in space. They aim to ensure that space activities are conducted safely, responsibly, and for the benefit of all humankind.

The enforcement of IPR in space is challenging due to lack of clear legal frameworks and enforcement mechanisms that apply beyond national borders. The balance between technology transfer and sharing can be challenging. The protection of proprietary data and technologies along with international collaboration calls for special policies. These policies must ensure that technological advancements benefit all participating nations. Space missions generate vast amounts of data and rely heavily on software. Protecting these intellectual assets while promoting open access for scientific research poses a significant challenge. The final challenges would be the patents on space related inventions. The novelty and nonobviousness of inventions must be assessed in the context of space activities. Ensuring that patent laws are adapted to address the unique aspects of space technology is essential.

Challenges in Space Law:

1. Jurisdiction and Sovereignty: Outer space is considered a global commons, meaning no single nation can claim sovereignty over it. This raises questions about which legal systems apply to activities conducted in space. [14]
2. Regulation of Private Sector Activities: With the growing role of private companies in space exploration and commercialization, there is a need for regulatory frameworks that balance innovation with safety and international obligations.
3. Resource Utilization and Ownership: The legal status of resources extracted from celestial bodies (e.g., asteroids, the Moon) is unclear. Existing treaties like the Outer Space Treaty do not explicitly address property rights over these resources.
4. Space Debris Management: The proliferation of space debris poses significant risks to space operations. International consensus on mitigation and remediation measures is necessary to ensure sustainable space activities.
5. Military Use and Weaponization: Ensuring space remains a domain for peaceful purposes is a challenge, especially with the increasing interest in military applications and potential weaponization of space.
6. Environmental Protection: There is a need to develop legal frameworks to protect the space environment from harmful contamination and to ensure the long-term sustainability of space activities.

VII. JUDICIAL DECISIONS

1. The Google Lunar XPRIZE and Moon Express:

The Google Lunar XPRIZE was announced at the Wired Nextfest on 13 September 2007. It was a \$30 million competition aimed at challenging privately funded teams to land a rover on the Moon, travel 500 meters, and transmit high-definition video and images back to Earth. There were several issues with this case.

As multiple international teams participated, questions arose regarding which national laws would apply to the missions leading to jurisdictional issues. Teams needed launch licenses from their respective national space agencies. For example, Moon Express, a US-based team, had to obtain a mission approval from the Federal Aviation Administration (FAA), which included consultations with the Department of State, the National Aeronautics and Space Administration (NASA), and other agencies which arose the licensing and permits issues. While the Outer Space

Treaty prohibits national appropriation of the Moon, Moon Express planned to extract lunar resources, raising questions about property rights and the legal status of space resources. Teams developed innovative technologies for lunar exploration. Protecting these inventions through patents and ensuring they complied with international technology transfer regulations was crucial.

The outcomes of the case were to build a regulatory precedent. The Moon Express set this regulatory precedent for commercial lunar missions which would balance national and international legal obligations. Furthermore, the inventions developed during the competition contributed to advancing lunar exploration technologies, which were protected under national and international IPR laws.

2. SpaceX and Starlink Satellites

SpaceX's Starlink project aims to deploy a constellation of thousands of small satellites to provide global internet coverage. In late 2022, the FCC approved SpaceX's request to deploy up to 7,500 satellites after the commission in 2018 approved SpaceX plans to deploy up to 4,425 first-generation satellites. The project involves significant legal and IPR considerations.

The major issue was the frequency allocation for these thousands of satellites. Coordinating and obtaining approval for the use of radio frequencies from the International Telecommunication Union (ITU) to avoid interference with other satellites and communication systems. The possibility of increment in space debris raised major environmental concerns. Ensuring compliance with space debris mitigation guidelines set by national and international bodies, given the large number of satellites planned for deployment. Protecting proprietary technologies used in satellite design, launch, and operations. This includes patents for

satellite hardware and software innovations. Obtaining licenses from the Federal Communications Commission (FCC) and other national regulatory bodies for satellite launches and operations. Navigating different national regulations for providing internet services worldwide, including data privacy and security laws.

As for the outcomes, SpaceX successfully obtained the necessary licenses and frequency allocations, demonstrating compliance with regulatory requirements. The company secured patents and trademarks for its technologies, ensuring protection of its intellectual property. Starlink has begun providing internet services in several countries, showcasing the feasibility of large-scale satellite constellations.

3. The Berne Convention and Space Copyrights

The Berne Convention for the Protection of Literary and Artistic Works is an international agreement that ensures copyright protection across member countries. Its application to space-related works presents unique challenges. The jurisdiction issues were determining which country's laws apply to works created in space, such as scientific data, software, and media produced on the International Space Station (ISS). The copyright registration issues were ensuring that works created in space are properly registered and protected under the Berne Convention. The Cross-Border enforcement of copyrights across different jurisdictions is always challenging. Hence, Space agencies and countries cooperated to address jurisdictional issues, establishing guidelines for the protection of space-related works. Furthermore, Cases involving space-related copyrights helped set legal precedents, providing clarity on the application of the Berne Convention to works created in space.

4. The Artemis Accords

The Artemis Accords were first launched and signed by eight nations in October 2020, with representatives of its signatory nations meeting in person for the first time at the International Astronautical Congress in Paris on September 19, 2022. The Artemis Accords are a set of principles for international cooperation in the exploration and use of the Moon, Mars, and other celestial bodies, developed by NASA and signed by multiple countries. The legal issue of resource utilization required establishment of principles for the extraction and use of space resources, in line with international law. Additionally, the sharing of intellectual property and data generated from joint missions and research activities required IPR sharing laws. The safety and transparency of in space exploration activities is necessary to prevent conflicts and ensure peaceful exploration.

Here in this case, the Artemis Accords established a framework for collaboration, emphasizing the importance of adhering to international law and promoting peaceful exploration. The Accords provided guidelines for resource extraction, helping to address legal ambiguities regarding space resources. Signatory countries agreed to cooperate on IPR issues, ensuring that innovations and data are shared in a manner that respects intellectual property rights.

VIII. RECENT DEVELOPMENT AND FUTURE DECISIONS

In recent years, the commercialization of space has introduced new challenges. Private companies like SpaceX and Blue Origin have driven the need for updated regulatory frameworks to accommodate activities such as space tourism and resource extraction. The proliferation of space debris has raised environmental concerns, prompting

international guidelines and national regulations to mitigate risks. Additionally, legal debates over space mining and resource utilization continue as countries like the US and Luxembourg enact laws supporting commercial exploitation. The history of space law reflects an ongoing effort to balance innovation with regulation, ensuring that space activities are conducted safely and responsibly for the benefit of all humankind. International cooperation remains crucial in addressing the evolving challenges of space exploration and utilization.

India's space program began in the 1960s with the establishment of the Indian National Committee for Space Research (INCOSPAR) in 1962, which later evolved into the Indian Space Research Organisation (ISRO) in 1969. The launch of the first Indian satellite, Aryabhata, in 1975 marked India's entry into the space age. ISRO is the primary agency responsible for space activities in India, operating under the Department of Space, which is directly overseen by the Prime Minister. The Space Commission, established in 1972, advises on space policy and oversees the implementation of the space program. The Antrix Corporation, established in 1992, is the commercial arm of ISRO. It handles the marketing of space products, technical consultancy services, and technology transfer to the industry.

The Indian government is increasingly encouraging private sector participation in space activities. This includes the launch of satellites, space exploration, and development of space technologies. The improvement of IP rights in the space industry is important for maintaining the involvement of the private sector and understanding the full potential of space as a commercial sector. ISRO announced the IN-SPACe in 2020 which would be serving as a regulatory body to promote and authorize private

sector activities in the aerospace industry. It is aiming to create a level playing field for private companies and facilitate public-private partnerships. On the satellite front, ISRO established NSIL in 2019 which is focusing on the commercialization of space innovations and services. This also includes satellite launches and space based communication services.

IX. SUGGESTIONS ON SPACE LAW AND IPR

1. **International Harmonization of IPR Laws:** Develop a unified international framework for intellectual property rights in space activities, ensuring consistency across different jurisdictions. This could involve amendments to existing treaties or the creation of new agreements under the auspices of the United Nations or other international bodies.
2. **Jurisdictional Clarity:** Establish clear guidelines on jurisdiction and applicable law for intellectual property disputes arising from space activities. This may involve creating specialized international courts or arbitration mechanisms.
3. **Incentives for Innovation:** Design IPR laws that incentivize innovation while ensuring that advancements are shared for the common benefit of humanity. This could include provisions for compulsory licensing or technology transfer in specific scenarios.
4. **Protection of Space Resources:** Develop regulations to protect the intellectual property rights related to the extraction and utilization of space resources, ensuring that such activities do not lead to conflicts or exploitation.
5. **Public-Private Collaboration:** Encourage

collaboration between public institutions and private enterprises by ensuring that IPR laws fairly balance the interests of both parties. This includes developing fair licensing agreements and sharing of technology developed through public funding.

6. **Technological Neutrality:** Ensure that IPR laws are technologically neutral, allowing them to adapt to new and emerging technologies in the space sector without requiring constant revisions.

7. **Research and Development Incentives:** Provide specific incentives for research and development in space technologies, such as tax benefits, grants, and expedited patent processing for space-related innovations.

8. **Education and Capacity Building:** Invest in education and capacity building to ensure that all stakeholders, especially those from emerging space-faring nations, understand and can navigate the complexities of space law and intellectual property rights.

9. **Sustainable Use of Space:** Develop IPR policies that support the sustainable use of outer space, encouraging innovations that contribute to the long-term sustainability and safety of space activities.

10. **Regular Review and Adaptation:** Implement mechanisms for the regular review and adaptation of space law and IPR frameworks to keep pace with technological advancements and evolving industry practices.

X. CONCLUSION

Space activities are a means of achieving global socio economic development. Intellectual Property(IP) plays an important role in encouraging

space exploration and development by safeguarding the outcome such as satellite obtained data and patentable inventions made in space. International organizations like the United Nations, The World Commission on the Ethics of Scientific Knowledge and Technology and the TRIPS agreement urges the international community to engage in space exploration and mutually benefit each other by providing fair agreements, access to scientific data for researchers, and promoting technology transfer. Strong IP protection for technologies used in space, transmitted from space or resulting from space is important to provide sufficient incentives for private sector investment in space commercialization.

The Global space is rapidly changing, and India is definitely emerging as an outstanding country in the international space market. In order to be among the dominant elite group of countries, India needs comprehensive and robust space legislation positively backed by significant rules and regulations which provide a balanced approach in the areas of certification, licensing, space liability, space insurance, private and foreign investment, infrastructure building, IPR and international cooperation. Moreover, a national space law would help strengthen the defense sector and also help it build a space war strategy in case of any such event in the future. In other words, it would be win-win progress for all participants, both public and private, in the Indian Space Sector.

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