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“COMPARATIVE STUDY OF LEGAL FRAMEWORKS GOVERNING INTELLECTUAL PROPERTY RIGHTS IN SPACE ACTIVITIES: PERSPECTIVES FROM THE USA, CANADA, AND INDIA”

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“Mankind is drawn to the heavens for the same reason we were once drawn into unknown lands and across the open sea. We choose to explore space because doing so improves our lives and lifts our national spirit.”

— George W. Bush

ABSTRACT

This comparative study explores a comprehensive analysis of the legal frameworks regulating intellectual property rights (IPR) in outer space activities under the Outer Space Treaty and various present Domestic and National regimes across three respective jurisdictions: the United States, India and Canada. The USA, has a well versed space law regime that extends patent and proprietary protection of intangible rights and remote sensing data sharing through established agencies like NASA and FAA and keeping national security as its priority. Canada keeps its power to govern over IP protection with the Canadian Government and makes its key priority to emphasize on technology, earth observation and robotics. Canada relies on bilateral agreements and international treaties to govern the IPR in the space sector. The Indian space sector is rapidly growing and giving competition to other players in the space sector. India understands the need for rapidly growing space sector legislative reforms and has stepped forward with the Draft of Space activities bill. Currently India has ISRO and IN-SPACe to govern the IPR in the space sector. ISRO is the main authority and IN-SPACe is the wing of ISRO that manages private sector regulations in India. By Comparing and Analysing their legal approaches towards solving, amending and reforming the issues faced collectively at general, this study emphasizes on the need for a strong International Organ and framework to support the future innovations, space exploration and commercialization.

KEYWORDS: *Intellectual Property Rights, Outer Space Treaty, Jurisdictionality issues of OST, Territoriality of IPR, Patent Protection, Remote- Sensing, Copyright, Technology Transfer, Space Inventions, Earth Observation and Robotics.*

INTRODUCTION

The fresh launch of *NISSAR* Mission (a collaboration between *NASA - ISRO*)(*NISAR - NASA Science*, n.d.), SpaceX's *Amazon Project Kuiper* and *Sending Humans to Mars under Project Artemis*(*Artemis - NASA*, n.d.) , the world has come a long way since the launch of the very first Russian made Satellite *Sputnik1*, from Launching first satellite for transmission of radio signals to modern advance mapping of Earth's climate changes using dual frequency radar and planning future manned missions to Mars in 2030s, continues the series of record breaking space developments in outer space sector between states and private players. The increased commercial activities in outer space give rise to more joint missions and partnerships between states and more effective public-private partnerships, which give access to the privatisation of space, therefore increasing private commercial launches and private competition. With the rapid growth of space sector industries and their privatisation brings forth more and new dimensions to the legal regime, especially the basics, i.e Intellectual Property Rights.

The IPR is the basic yet most important and complex part of the cross-border dealings with and within the states. The whole world is in a race, especially countries like the USA, Canada, India, China, etc, to invent and develop more advanced outer space technologies, which would ultimately strengthen them in the long run. It is not only intended for innovation, but it is also a power move; the more advanced a country is with technology and inventions, the more powerful it is.

In Outer Space Law, Intellectual Property works in a different way in relation to Space than that of on Earth due to the territorial nature of IPR. It has a more complex and diverse nature, The average rules and regulations of Intellectual property apply differently to space-related issues. In this paper, we discuss, analyse and compare the working of IPR law application to space law within the jurisdiction of INDIA, the USA and CANADA.

The discussion on the cruciality of addressing and analysing the stark issues of IPR in space law covering all aspects of Territoriality of IPR in Space Law, Remote Sensing, Space invention, Technology and AI. The Comparative Analysis of the issues will help us in a better understanding of the issues of how different international treaties work and what expansion, growth and buildout is needed for harmonisation and readjustments for a more effective implementation of IPR legislation in Space.

LEGAL FRAMEWORKS CURRENTLY IN EXISTENCE

To get a decent understanding of where the issues lie, we need to analyse the currently existing international legal frameworks. One such important legislation is ***THE OUTER SPACE TREATY OF 1967*** (*The Outer Space Treaty*, n.d.)

The United Nations Office for Outer Space Affairs, commonly known as ***UNOOSA*** (*The Outer Space Treaty*, n.d.), gives the treaty on principles governing the activities of states in exploration and use of outer space, including the moon and other celestial bodies (*The Outer Space Treaty*, n.d.). The Outer Space Treaty predominantly establishes the International Space Law. It entails that the Outer Space is free for exploration for all nation states but however, it does not allow states to place weapons of mass destruction in outer space or any celestial body and also does not allow any state to claim sovereignty of any part of the space or celestial body.

However, the OST (Outer Space Treaty) does not specifically mention or explain the IPR issues or guidelines; we can, in a wide sense, interpret via the nature and the implementation of the treaty that affect the Inventions in and for Space. OST contains the non-appropriation of the Space and placing the Jurisdiction of the state that launches the object and the Human. OST somewhere contradicts and clashes with the General Understanding of the IPR governance. OST on the one hand, allows Jurisdictionality and Responsibility of Objects launched into Space and also the peaceful use and research of Space with the state launching it and over the inventions that occur in space, but on the other hand, it prohibits the territoriality of Space. This Lecuna creates a void in the implementation and Interpretation of IPR Legislation in Outer Space. (*Intellectual Property & Its Relevance In Outer Space – Chambers of Namrata Pahwa*, n.d.)

If we try and dive deeper over the horizon and analyse the Article II and Article IV of the OST, one could only ponder and find that the OST does not specifically focus on the Intellectual Property Protection as it was mainly adopted for benefit of the Public Sphere, so evidently the Private Rights Nature of IPR was not given or was made clear in respect of Space. (puthrans, 2021a)

The above-mentioned void is almost compensated by another International Treaty - “Registration Convention” (puthrans, 2021a), which mentions that A Launching State can be a State which Launches or Procures the Space Object and the Territory from where the Object was Launched or the Facility from where it was launched (*Conv_Regi_Objects_Launched.PDF*,

n.d.).

However, the unclear term- Launch State given in the Treaty gives private parties an opportunity to omit the requisites of International Space Law. The International Space Law comes within the ambit of International law, and with this common understanding, we can say that International law works in correlation with National laws. Similarly, in International Space Law, the Nationally Developed Space Regulations give more capacity to the International law and vice versa.

Such regulation was passed by the United States under the name of *IGA - Intergovernmental Agreement*, and it was signed by Canada, ESA (European Space Agency), Russia, Japan and the USA with many other members (*ESA - International Space Station Legal Framework*, n.d.).

This treaty's main purpose was International Space Station Cooperation in the ISS (International Space Station), and it does not directly set a framework for IPR, but it does set some grounds for Rights and Obligations of Member States using the Space Station for Design and Development, which also includes the Intellectual Property Generated During the Process. This Treaty enables the protection of IPR specifically arising out of the R&D of ISS.

Article 21 of this Multilateral Agreement mainly focuses on Patent Protection. The ISS is formulated into Modules, and each module falls under the jurisdiction of each member state participating in the ISS. Each Module is the territory of the participating state, and it is registered under each member's jurisdiction for the purpose of IPR. (*puthrans, 2021b*)

The case is slightly different with the USA's neighbour, Canada. Canada's commitment to space law policies exists in correlation with the existing International Treaties, like the OST, which help formulate the Domestic treaties. International Space Law in Canada is mainly managed by the Canadian Space Agency. IPR issues in Space Law are yet not clearly defined under the Space-related legislations, but are generally governed by the Domestic IPR Laws of Canada.

Canada has expertise in 2 main fields -Remote Sensing and Space Robotics. Canada also collaborates with other member states and which gives foundation to the Initiatives and frameworks developed by Canada. Generally, for IPR-related issues, the space object is treated

as a quasi-territory, meaning the state registering can apply its own laws claiming the IPR. The state however, must raise a claim for IPR. The key issue here still is the Territoriality of the IPR issues.

On the other hand, India lacks the legislation of any sort that might govern the IPR in Space. India does have IPR laws relating to Patent, Design and Copyright but nowhere are there laws or policies that cover Space Law. India does actively participate in space-related activities and is at fourth front with the space developments, from launching strong advanced rockets and geostationary objects to planned manned missions into space. India, through its new laws, has now allowed Private Entities to enter the Space sector and contribute to IN-Space with ISRO in developing more advanced space objects. But with all the advancements, there is an increasing need for good IPR laws to regulate space exploration, but India still needs to remake its existing laws. The IPR issues have been addressed and mentioned in the Draft Space Activities Bill Proposed in the Lok Sabha, but due to extreme criticism, it unfortunately could not be passed and is currently being formulated with new frameworks.

India is a Signatory to the Outer Space Treaty and has ratified it, and has also signed the Joint Declaration of Interest for Space Climate Observatory. (2020-02-03-PM-Item04-08-IndiaE.Pdf, n.d.)

KEY COMPARATIVE ISSUES FACED BY THE USA, CANADA AND INDIA

The following are the main sectors where major of the issues are contained-

- *Territoriality*
- *Space Inventions*
- *Technology communication*
- *Remote Sensing data and Copyright*
- *Space collabs and joint missions*

TERRITORIALITY

The issue with IPR in Space started with the provisions of the Outer Space Treaty, “**Article I** - *The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of*

their degree of economic or scientific development, and shall be the province of all mankind. Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies. There shall be freedom of scientific investigation in outer space, including the Moon and other celestial bodies, and States shall facilitate and encourage international cooperation in such investigation.” (United Nations Treaties and Principles on Outer Space, 2002a)

It can be easily interpreted from the language Article 1 of the OST that there is a conflict with the blunt restrictions on the use of outer space and the territorial nature required for the implementation of IPR.

It is mentioned in Article 1 of the OST that no state can make claims in outer space and the celestial bodies in space. This is the prime hindrance in the effective implementation of the IPR regulations concerning the increasing need for IPR protection in outer space-related issues.

The restrictive nature of the OST is leading to issues arising out of Patents and copyrights of Inventions that are being done in outer space by many states, either alone or in cooperation.

This Article clearly creates a Void in the effects of how IPR laws would be enforced in the Space space-related inventions.

ARTICLE 8 -

“A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return.” (United Nations Treaties and Principles on Outer Space, 2002b)

This Article addresses the Jurisdiction aspect under OST.

It mentions that the jurisdiction on a space object is with the states under whose name the object is registered or from where it was launched. But it does not clearly define the situation under IPR law as the Ownership rights relating to technology can include either private or public entities.

This again creates a significant gap in the matter regarding the registry of the object, which is registered under the state's name, and the inventions taking place in the object are registered under any private entity.

This might lead to the Absolute, sovereign or operational control over the object by the state, limiting the control and rights of the private entity.

SPACE INVENTIONS

1. PATENTS in Space Law -

Patents are territorial in nature (*Patent Expert Issues: Inventions in Space*, n.d.) and technically apply in the jurisdiction of the state that grants the patent. OST, on the other hand, does not grant permission to the state to own or register Outer Space, but does mention that the state launching and registering the space object has jurisdiction over it. The legal status of Physical Property, such as spaceships and satellites in outer space, has been a recurring topic but however, intangible property like IPR in outer space has no international consensus. (*Patent Expert Issues*, n.d.-a)

The very solution to this anomaly is by filling the gaps between the implementation and regulation of OST in such a clever way that it is in total sync with the territorial nature of patent laws. (*Space-Related Disputes Part 2 – The Current Landscape and Specific Intellectual Property Aspects - Daily Jus*, 2024)

2. Use of Space for Inventions-

When it comes to the invention taking place in space, the key issue arises while determining the laws to be applied. Patenting is comparatively easy on Earth in comparison to inventions requiring patents in space. Due to this disturbance, there arises an inability to catch any illegality or irregularity, contending for the legal protections beyond earth. (*Patent Expert Issues*, n.d.-b)

Inventions in space face great challenges pertaining to IPR Regulations due to the clear restrictions imposed by the OST, and also due to the void created by lack of existing IPR frameworks for space inventions. Jurisdictional and implementation anomalies create dilemmas and uncertainties for space sector private investors, creating a commercialisation challenge worldwide.

There is repeated criticism and scrutiny of the existing legal framework that governs space law activities. (Sonisvision, n.d.)

TECHNOLOGY COMMUNICATION

There are complex issues encountered by the USA, Canada and India regarding the applicability and functionality of space law with IPR. The key issues faced collectively by all 3 jurisdictions range from complex and different regulatory forms and balancing collaborations between countries while also maintaining the continuous reforms of legal frameworks with evolving technologies.

IPR issues in Space arise from jurisdictional anomalies of enforcing tangible rights beyond the forces of the earth.

NASA has an extensive Technology Transfer program that promotes the commercialisation of space tech developed through space missions. This initiative allows NASA to give its patented tech to private companies and entities while still retaining its IP Rights. (*Technology Transfer and Spinoffs*, n.d.). ITAR, which is a global framework for the transfer of space technologies internationally and the FAA- Federal Aviation Administration of USA, oversees any licensing taking place in commercial space from launches to satellite deployments in space. The USA's approach towards licensing is a step towards unification and harmonisation between public and private entities.

On the other hand, Canada's space law is majorly influenced by the International Regulations and treaties with other organisations like NASA, ESA and ISRO, etc. Canada's most well-known collaboration is with NASA in the ISS for developing the ISS - CANADARM. The Canadian Space Agency uses legislation like the Export and Import Permits Act to ensure satellite and robotics technology sharing. Canada maintains a strong IP law, so Licensing requires the government's approval and the partner's readiness in multilateral agreements. (Gohil, 2021)

In India, we have ISRO, which also like NASA, encourages technology transfer sharing by licensing its space innovations to domestic entities; this also encourages indigenous development of tech in India.

IN-SPACe - The Indian National Space Promotion and Authorisation Centre, Is a governmental body of ISRO that functions as a regulatory body and regulates the technology and licensing utilisation among private sector players. (Mehra, 2019)

India, with the understanding of global growth competitiveness in the space sector, also initiated and proposed a draft Space Activities Bill, which extensively covered the provisions relating to IPR in outer space.

Indian approach towards IPR is clearer in aiming towards the reforms and refinement of IPR laws in outer space by promoting domestic private players in sync with the Government and

also facilitating international agreements under International space law.

The below mentioned table below more clearly summarises the USA, Canada and India's approach towards licensing in Space IPR.

COUNTRY	LICENSING AND TECH IN SPACE LAW	FOCUS OF EACH COUNTRY
USA	NASA controls the commercial and research licensing, while the FAA oversees licensing for space operations	Government and Private sector partnerships for economic growth
CANADA	The government controls all the licensing directly under EIPA and also relies on International agreements for IP protection.	Focuses on international collabs
INDIA	ISRO regulates Licensing of the private sector via its regulatory body IN-SPaCe.	Focuses on indigenous empowerment of domestic players and strong IPR space reforms.

REMOTE SENSING DATA AND COPYRIGHT

Remote sensing data refers to the imagery and data collection from geo-stationary objects like satellites, telescopes and also spacecrafts. These remote sensing applications apply and work differently in the USA, Canada and India. The main issue faced by each of the countries is significantly related to the copyright of the data, as the data received can be both processed and raw, and copyright applies to processed data and not raw data. Moreover, there are voids created by international treaties like the Berne Convention in the copyright issues for cross-border trades and international collaborations between countries and private partners.

The Land Remote Sensing Policy of 1992 of the USA is the governing law for the commercial remote sensing activities (Gummadi & Gupta, n.d.-a). This act of 1996 specifically makes a clear distinction between the raw data and the processed data. It also makes it very clear that copyright is only available for the processed and enhanced data and not the raw data, alongside unmodified signals. The USA adheres to the Berne Convention, which enables the processed data to be available worldwide; however, the convention is silent on the issues of cross-border trade and the availability of the data. The raw data from the satellites and spacecraft are available for everyone to use, but processed data can only be accessed through copyright (Gummadi & Gupta, n.d.-b).

Canada's Remote Sensing Systems Act of 2005 also distinguishes between raw and processed data. Similarly, processed data is only available for processed outcomes. Canada's regime is very similar to the USA's copyright regulations for remote sensing data and copyright.

In India, however, ISRO is the main governing body for the control of satellites and the mapping of data. Similarly to the USA, in India also copyright is also reserved for the processed data.

According to the Copyright Act of 1957, if ISRO processes some data and publishes the same data, the copyright will belong to ISRO (Kumar, n.d.).

SPACE COLLABS AND JOINT MISSIONS

Space collabs and joint missions between countries such as the USA, Canada and India will bring complex IPR challenges in Outer space missions. The main key issue arising out of the collaboration is the different national regulations and different approaches towards ownership, licensing and technologies.

In the USA, IPR management with respect to space collabs involves a strict contractual framework that defines the rights and obligations of the agencies with private partners. But national security checks and export controls like ITAR and the extensive need for technology sharing lead to complicated agreements and delayed commercialisation. The USA has a strong protection policy, but international treaties and collaborations need more refinements. Canada, on the other hand, has IP protection rights with the government, so eventually any collaborations or contracts would need careful negotiations ensuring shared benefits while not violating any Canadian law and protecting Canadian innovations.

India in comparison to both the USA and Canada, faces challenges in regulating and managing IPR during international collaborations. India is at a set continuous pace to reform and amend the legislation to enable agencies like ISRO and International entities, especially private partners, to increase their participation.

Therefore, while collaborating in the field of space and creating space missions, it encourages a great amount of flow of expertise of states and more over to contract in harmony in harmonising frameworks for IPR issues in Space.

CASE STUDY

ANTIRX CORPORATION vs. DEVAS MULTIMEDIA (Malhotra, 2022)

This case highlights the complexities in space commercializations and the management of IPR in government contracts. India's Current legal framework shows gaps regarding IP protection

in space, raising concerns about patent enforcement and legal jurisdiction in this emerging domain.

In the US, Space related IPR is covered under specific laws like section-105 of USC which applies terrestrial patent laws to inventions developed on US- Registered Spacecraft.

NASA's extensive portfolio of patents, trademarks and proprietary data serves as a key example of how IP rights are governed for space innovations.

Canada's approach centers on specialized technologies such as earth observation and robotics in space.

Examining these countries together reveals shared challenges in jurisdictional authority and enforcement of IPR beyond Earth's atmosphere. The U.S. maintains the most comprehensive legal system in this area, while Canada prioritizes collaborative legal frameworks, and India is actively working on improving its regulatory landscape. Multinational projects further complicate IP ownership, pointing to the urgent need for internationally harmonized policies to effectively protect and promote space technology developments.

CONCLUSION-

The research study shows that cooperative space activities and joint missions pose the most difficult intellectual property rights issues, especially when several jurisdictions with disparate regulatory frameworks work on a single project. Through modular jurisdiction allocation, the ISS framework under the Intergovernmental Agreement offers a model for resolving some of these problems; however, this strategy is still restricted to particular international partnerships and ignores more general commercial space operations.

Several important suggestions for harmonising international space IPR frameworks are made in light of the analysis. In order to clearly distinguish between operational state control and private intellectual property ownership, Article VIII of the OST must be amended. This could be done, for example, by implementing creative dual licensing agreements that divide sovereign regulatory authority from private innovation rights. This would allow private organisations to keep their intellectual property rights in their inventions while allowing states to keep operational control over space objects.

An important next step is the creation of an international space-specific IPR framework that

strikes a balance between respect for private property and technological advancement, as well as the "common heritage" principles of space law and legitimate state obligations. While upholding the peaceful use principles of space, such a framework should cover technology transfer procedures, patent protection for space inventions, and collaborative mission IPR management.

Since the aviation industry has effectively struck a balance between strong protection of private aviation technology patents and national sovereignty over airspace, drawing instructive parallels from aviation law frameworks offers helpful guidance. A model for the development of space law is provided by the Chicago Convention and later aviation agreements, which show how territorial sovereignty and private intellectual property protection can coexist in international transportation domains.

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