

An Evaluation of Intellectual Property Rights Protection in Outer Space Activities

Sajal Sharma

Assistant Professor, UPES Dehradun

Plans for settlement on the moon and Mars, as well as satellite launches and space missions, are examples of the fast growing field of outer space operations. Establishing precise intellectual property rights frameworks has become essential as both public and commercial entities increase their investments in space technologies. Regarding jurisdictional authority, legislative authority, and the enforceability of intellectual property rights for technologies developed in space or utilized in extraterrestrial conditions, there are uncertainties. In the context of space operations, this article conducts a critical study of present international laws, treaties, and policy discussions on intellectual property protection. It investigates trade secrets, copyrights, trademarks, patents, and industrial designs related to space technology, operations carried out in celestial bodies, and spacecraft launched from Earth. Analyzed are the gaps and restrictions provided by current legislation, particularly Article VIII of the Outer Space Treaty, which prohibits the appropriation of space. It is also assessed how well-suited the existing organizations are to manage this field, including the United Nations Committee on Peaceful Uses of Outer Space and international space law conventions. A review of recent US laws pertaining to "space resources" and case law is presented to emphasize the necessity of an international regulatory framework for intellectual property rights in space innovation, exploration, and business. A sui generis framework is necessary because of the worldwide cooperation needed in space stations and habitats and the lack of prior experience implementing territorial intellectual property rights in extraterrestrial environments. The key components of such a customized regime that are discussed in this article are the necessity for disclosure requirements for space innovations, subject matter jurisdiction, international agreements on ownership doctrines, and technological use, particularly the establishment of priority claims over space resources.

Overview

Over the past ten years, there has been a significant shift in the focus of outer space innovation and exploration from primarily government-driven activities to a burgeoning private commercial sector. The increasing amount of money being invested in space-specific technologies, such as microgravity manufacturing, space tourism vehicles, cargo delivery spacecraft, space mining, and lunar or Mars habitats, highlights the need for appropriate intellectual property protection laws. UNOOSA (2021) estimates that the global space economy will reach \$1 trillion or more in the next 20 years, from its current level of about \$420 billion in economic activity. According to Morgan Stanley, revenue from the "global space industry" might more than treble to \$1.1 trillion by 2040 from \$350 billion in 2016. (MS, 2020). International space law is based on the 1967 Outer Space Treaty, however it does not specifically cover the use of traditional intellectual property legal tools such as patents, trademarks, copyrights, industrial designs, or trade secrets in space. It is expressly forbidden under Article VIII for any country to claim sovereignty, use, or possession of any area of space. Additionally, it specifies that space objects continue

to be owned and governed by the states who launched them. This restricts the use of celestial body elements for commercial purposes as well as the territorial expansion of intellectual property rights to include spacecraft and habitats. To encourage private investment expected to be over \$8 billion in the next ten years, however, clarification on IP protection is needed as missions planned by NASA, SpaceX, and Blue Origin, among others, propose greater long-term habitation or industrial activity on the Moon and beyond (Bryce Tech, 2021).¹

Although the original purpose of Article VIII was to prevent colonization or armed conflict in the geopolitical context of the 1960s, given the enormous costs incurred by space mining companies and technology developers, there are growing calls to review non-appropriation principles for resources extracted from planets or asteroids (Lee, 2016). The US Commercial Space Launch Competitiveness Act of 2015, which grants the right to extract "space resources," is an example of how viewpoints are shifting. The proposed Moon Agreement of 1979, which would have allowed states to exploit lunar and celestial resources, is also being reexamined internationally after being ratified by fewer than twenty nations at first. UNCLOS regulations governing deep seabed mining have provided frameworks for benefit-sharing and shared management that can also be applied to space mining (Gorove, 2001). As a result, the question of whether merely not appropriating property without impairing its legal acquisition can balance individual investor motivations with global stakeholding is becoming more and more contentious in academia (von der Dunk 2015; Viikari 2015).

It is imperative to assess both national and international space laws concerning intellectual property protection, particularly in light of growing commercialization, prior to constructing sui generis frameworks. This article looks at current laws, identifies gaps and uncertainties, particularly with regard to protecting intellectual property during space activities, and clarifies issues with jurisdiction and enforcement capabilities in order to try such a critical examination. It evaluates recent laws and institutional discussions about IP rights limitations in prominent spacefaring nations including the United States. The paper also looks at factors including limiting subject matter jurisdiction, requiring disclosure of space innovations, and reaching global agreements on ownership doctrines and utilization rights that are crucial for balanced sui generis regimes.

Patenting Space-Related Inventions

The 1967 Outer Space Treaty, which was ratified by the UN General Assembly, is currently the most important international legislation controlling space travel. As previously mentioned, Article VIII says that "states party to the treaty," whose register the object is carried, have jurisdiction over "space objects." This suggests that entities that launch objects from other countries are subject to their political jurisdiction, and any territorial rights extensions only extend to those entities. On the other hand, more and more commercial organizations are working in space, frequently in collaboration with national space agencies. Furthermore, Article VIII merely restricts "national appropriation"—that is, the use or occupancy of territory—rather than outright prohibiting the exercise of sovereign rights in space. It is not obvious what the exact boundaries are in situations where there is no such appropriation (von der Dunk, 2015). The OST

¹ Ruwantissa Abeyratne, The Application of Intellectual Property Rights to Outer Space Activities, 29 J. SPACE L. 1 (2003)

was actually written with a stronger emphasis on arms control than on regulating private space exploration and commerce, due to Cold War political concerns. Therefore, it is unclear whether IP protections designed for terrestrial usage apply to inventions made in space or as components of space objects.²

For example, there are many unanswered questions about whether an innovation developed aboard the International Space Station (ISS) by participating governments can only be patented in those states or if there are other avenues for multinational protections or rights restrictions amongst participating countries. Article 5 of the 1998 IGA establishing the ISS further stipulates that each partner exercises jurisdiction only over respective flight elements and personnel, with activities being "guided by the Space Station Agreements, which establish a framework for cooperation among the Partners in the design, development, operation, and utilization of the Space Station." According to Article 21, ISS partners may prolong their domestic patent systems AS LONG AS THEY ARE COMPATIBLE WITH THEIR OUTER SPACE TREATY DUTY. There's not much consensus on how to protect multilateral rights in the special circumstances of space stations, aside from the fundamental requirement of non-contradiction.

Under the OST (51 U.S.C. § 50902), US space law expressly states that it retains jurisdiction over space objects launched by US organizations or from US territory. Thus, inventions made by private parties or astronauts on US-registered vessels are probably subject to US patent laws. Less than 35 U.S. C §105 states that if an invention satisfies substantive requirements (useful, novel, and nonobvious subject matter) and is created, used, or sold in space on a space object under US jurisdiction, it may be patented. Process patent rights can be enforced by a US holder if space objects carrying patented products reenter nations that offer reciprocal protections, as confirmed by the USPTO recently (USPTO letter, 2020). More complicated intellectual property issues pertaining to inventions made on extraterrestrial habitats or in multi-party missions that are used or exploited in space right away remain unanswered.

The International Space Station Intergovernmental Agreement (IGA) stipulates in Article XXVI that partners must research intellectual property (IP) concerns; nevertheless, there hasn't been much progress in creating global frameworks that make IP safeguards easier for all participating nations. For collaborative initiatives like the Russian-manned Lunar Gateway station project, NASA has signed mission-specific Memorandums of Agreement (MOAs); nonetheless, until there are legal disputes, they mostly rely on the domestic laws of their respective partners. There is uncertainty over whether an innovation developed in space stations can lawfully obtain patent protections from nations whose citizens participated to its development under the current regulations. While businesses retain the right to license, staff inventors are granted legal co-ownership and royalty rights under terrestrial IP regimes. It is still up for debate whether space inventions made by astronauts from a participating nation can be completely appropriated by foreign companies that created and launched the spacecraft (Lee, 2016).

A 2020 Australian case questioned the awarding of exclusive rights to a Japanese business over patented cryptocurrency technology mined utilizing the ISS's computer capabilities and solar energy, according to recent findings. It emphasizes how important intellectual property concerns about the utilization of space stations and resources for profit are becoming. The Federal Court's decision affirmed the company's

² Gerald J. Mossinghoff, Intellectual Property Rights in Space Ventures, 10 J. SPACE L. 107 (1982).

claims, stating that property creation aboard man-made objects launched from Earth is unaffected by non-appropriation under Article VIII of the OST, which solely applies to "celestial bodies." However, as noted in *Chatzipanagiotis v. Wakai* (2020), piecemeal litigation of this kind is unlikely to produce sufficient precedents or clarity for IP claims pertaining to large space habitats or spacecraft with global partners.³

In addition to patents, trademarks, or logos used in spacecraft, space objects or habitats on Mars and the Moon require protection, but these are still debatable under the existing legal framework. Although the Lanham Act is unclear, trademarks registered nationally may not legitimately extend to extraterrestrial uses under the territoriality principle (Blount, 2012). The difficulty in space is determining legitimate authority for extraterritorial usages of logos, unlike those used unlawfully or without legitimate claims to national origin, which can be restricted under consumer laws on Earth. This is especially true unless the mark is already registered with countries that claim jurisdiction over relevant space objects via registries. Another area lacking clear protections outside of registration nations maintaining control over particular space objects is copyright protections for any creative works written, pictured, or built in space. Recorded movies or artwork/designs that reappear on space stations are legally binding to the extent that launching governments have declared their sovereignty under Article VIII OST.

Sui generis frameworks would, however, be most applicable in situations such as those involving surface structures that are 3D printed utilizing lunar ice and regolith over prolonged lunar or Martian habitation. Given that they have collective holdings in resources that are completely taken from the global commons, their copyrights may require equitable benefit-sharing (Quigg, 2020).

Global IP Regulation for Space Activities

Although it was structured in the geopolitics of the late 1960s, the UN Outer Space Treaty serves as the foundation and prohibits unilateralist state appropriation. A limited consensus was reached in the 1979 Moon Treaty, which sought to define standards for resource utilization that extended beyond Earth orbit to activities related to celestial surface exploration. There are new requests for international agreements and the strengthening of space legislation on the equitable harnessing and sharing of benefits from space adventures due to the changing space industry landscape (Dunk, 2015).

The equitable usage frameworks for resources derived from celestial bodies, such as moon ice, regolith, or asteroid mineral richness, are a topic of intense dispute, especially within the UN Committee on Peaceful Uses of Outer Space (UNCOPUOS). These debates can involve intellectual property rights over extraction technology (Lee, 2020). It is challenging to obtain new multilateral instruments, though, because leading space powers are currently skeptical of the perceived dilution of sovereign jurisdiction over national space industries permitted under Article VI OST. The Hague Space Resources Governance Working Group report (2019) is the only soft guidelines that have emerged from UNCOPUOS thus far, and it calls on nations to create policies that balance the need for commercial incentives for mining firms with concerns about sustainability, non-appropriation, and benefit sharing.

³ Lionel M. Lavenue, Database Rights and Technical Data Rights: the Expansion of Intellectual Property for the Protection of Databases, 38 SANTA CLARA L. REV. 1 (1997).

The US Commercial Space Launch Competitiveness Act (2015), a controversial but groundbreaking piece of national law, was enacted during the Obama administration. Commercial industries are granted rights over minerals extracted in space, but claims of sovereignty are forbidden, and adherence to international law is required. However, clauses allowing US businesses to use space resources have raised concerns that they may subtly permit expropriation by giving them priority over extracted assets and intellectual property rights (Tronchetti, 2017). Arguments that firms should be granted temporary usage rights over mined raw materials and intellectual property protections over exploited technology, in order to recover their expenses, have some value if they spend in developing equipment, methods, and processes for exploring or extracting resources. However, balancing stakeholder interests and common inheritance principles in the OST is also necessary to regulate unilateral IP expansions in global commons. The US and more than a dozen allies recently signed the Artemis Accords, which acknowledges the right to resource exploitation but is agnostic about intellectual

property regimes. Sovereign jurisdiction is maintained by calling for use "as provided by law."

By establishing benefit sharing pledges and avoiding unilateralism through the awarding of licenses by multilateral bodies, the Deep Seabed mining laws case study provides valuable insights into the creation of balanced intellectual property regimes for space mining (Okbazghi, 2019). It is required by nations to guarantee worldwide access to deep ocean technologies as well as ownership rights. While innovators can obtain copyrights for mining processes, the riches of maritime resources is nevertheless a shared cultural heritage. Space mining would greatly benefit from similar commitments regarding access and benefit sharing.

Given that private companies are entering into design partnerships and contracts, IP protection disputes have also lately arisen over plans by the European Space Agency (ESA) to build a lunar town camp close to the moon's South Pole. Relevant governing ideas for lunar communities can be gained from operating models of Antarctica's terrestrial stations (Crisafulli, 2020). Standards against arbitrary discrimination among participants may be important in addition to non-militarization, maintaining freedom of entry, and trade. Intellectual property limitations on research or materials mined in space stations or habitats may constitute discriminatory practices that restrict the sharing of benefits worldwide. Simultaneously, it is reasonable to safeguard intellectual property (IP) against technology or infrastructure created to provide access, particularly when funded by high-risk private investments. In order to resolve these concerns, specific IP conventions that cover protracted orbital, lunar, and interplanetary projects that fall outside of NASA MOAs or current space treaties that are primarily based on sovereign rights over space objects must be used.

US Case Law and Legislation

The US SPACE Act, which was enacted in 2015, gives its citizens the right to "possess, own, transport, use, and sell space resources" but explicitly negates territorial sovereignty claims retaining consistency with international obligations" (SPACE Act 2015, 51 U.S.C. 51303). This was followed by an executive order in 2020 that called for the commercial extraction and utilization of space resources. When combined with other proposed legislation, such as the COMSPOC Act (which is currently in draft form) that establishes property rights over extracted resources traded back on Earth, the progressive tilt is clear. However, these private rights can cause problems when trying to secure multinational intellectual property

protections over mining-related technologies and even accuse governments of appropriating common assets.

The US courts have upheld the company's contention that inventions created in human-made space stations specifically designed to have a temporary presence in space fall under enacting nations' jurisdictional control as per Article VIII OST and domestic laws like Title 51 on retained rights over launched space objects (Harrington v. Cryptocurrency 2020). American entrepreneurs have been prolific in asserting IP rights between 2013 and 2020. Under the US Patent Act, inventions made, used, or sold in outer space onboard space objects under US jurisdiction are patentable subject matter provided they meet substantive criteria (Title 35 U.S.C. § 105).

Conflicts may arise if US companies secure IP exclusivities over promising genetic or bioengineering research conducted aboard the International Space Station (ISS), invoking Title 35 provisions and severely restricting access to global partners who contributed resources for maintaining the platform and habitability affordances in orbit. While the US has largely resisted ill-defined "benefit sharing" burdens, including in its Artemis program, calls for qualifying IPRs for such IP rights are possible but delimiting their scope is untested in contexts beyond licensed short-term ISS research experiments.

Sui Generis Systems for Intellectual Property Rights in Space Research and Trade

Intellectual creativity will undoubtedly be an integral driver of outer space explorations especially upcoming activities such as space tourism, asteroid mining, microgravity R&D and lunar or Mars settlements involving increased private participation along with public agencies. With limitations in international space laws on protecting IP exclusively used or created in space environments highlighted in preceding sections, tailored sui generis models are imperative to balance recovery of risk investments, access for utilization especially by developing countries and preserving collective stakeholding in global commons defined under principles like common heritage and province of humankind. IP rights directly incentivize R&D initiatives so targeted frameworks facilitating appropriations within legitimate bounds would be constructive. This can take the form of multilateral specialized agreements on patents, industrial design protection, trademarks etc. for space actors under authorization of UNCOPUOS. Such a convention must place safeguards against disproportionate privatization, delimit subject matter carefully excluding extraterrestrial resources protected under common asset principles and mandate equitable access and benefit sharing following precedents like UNCLOS marine technology diffusion guarantees.

Being a novel complex domain, establishing new protocols on disclosure requirements, technology access and diffusion arrangements and streamlining Space IP enforcement mechanisms including addressing infringements aboard habitats would be essential too. UNCOPUOS can draw members and observer space agencies to frame draft elements of such a balanced regime allowing licensing of rights to sustain risk investments in space technologies without enabling unilateral extensions of sovereign privileges. It can define qualifications around mineral riches mined from celestial bodies remaining 'global commons' assets while still protecting IP in utilized technologies. Provisions for compulsory licensing in cases of failures to reasonably disseminate innovations hampering access and reciprocity in valuation of IP protected abroad relative to home countries can promote equity as well. Conflict resolution mechanisms through a dedicated judicial body on Space IP cases like the International Tribunal for the Law of the Sea



can potentially be created too. Predictable protections incentivizing private investment balanced with common inheritance of space assets and guaranteed access to sustain a shared destiny in humanity's quest beyond earth's frontiers must form the cornerstones for this essential 21st century multilateral IP compact.