

INTELLECTUAL PROPERTY RIGHTS IN COMMERCIAL OUTER SPACE: LEGAL FRAMEWORKS, JURISDICTIONAL CHALLENGES, AND THE PATH TO REFORM

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I. Abstract

With commercialization of outer space, a series of legal problems that cannot be solved by traditional legal instruments arose. With new private corporations, like SpaceX, Blue Origin, OneWeb, and many others taking up the jobs of national space agencies, issues of protection of IP rights become very relevant. This is because private corporations spend a large amount of money on development of new technologies which make them more efficient at reaching their goal, delivering payload into orbit. However, with the absence of a clear solution to the problem of protecting those rights, it remains unclear how private corporations can be compensated for their investment.

The purpose of this paper is to analyze the current situation in terms of protecting IP rights in outer space. In other words, this paper will examine the current legal regime and will look into the history of development of such regulation. This paper will pay special attention to the works of key institutions and organizations in the field of space law as well as existing case law in the field. This paper will also use as evidence provisions of international agreements (e.g. 1967 Outer Space Treaty) and relevant national laws (35 U.S.C. § 105).

As can be concluded after careful examination of relevant materials, the existing legal regime was developed for a completely different period of time. The assumptions that states would act in outer space, that scope of space activities would be limited, that it would be possible to establish jurisdictions and solve questions of ownership via interstate diplomatic relations are all false today. Unless the above assumptions are revised, there will be no way to adequately protect intellectual property rights in outer space.

KEYWORDS: Intellectual Property (IP) Rights, Outer Space Treaty (1967), Space Law, Moon Agreement, Paris Convention

II. Introduction

Space technology covers many areas including satellite communications, launch vehicle systems, remote sensing, space habitation, in situ resource utilization (ISRU), commercial space stations, and space tourism. The global space economy was worth more than \$630 billion in 2023 and is expected to grow to \$1.8 trillion by 2035. As the industry grows rapidly, intellectual property such as patents, trade

secrets, copyrights, and trademarks has become extremely valuable for both governments and private companies.

However, the laws governing intellectual property rights (IPR) in outer space are scattered, unclear, and not well suited to today's commercial environment. There are many gaps and conflicts in how different countries apply their rules to space activities. This is largely because outer space is treated as a shared

space belonging to all of humanity. No single country has the authority to claim ownership or control over it. This is known in law as "res communis," meaning something that belongs to everyone.

This creates a serious conflict with national intellectual property laws, which are built on the idea that a country can only enforce its rules within its own territory. Since outer space belongs to no one country, it is very difficult to decide which country's IP laws should apply when an invention is created or used in space. As more private companies begin operating beyond Earth, solving this conflict is becoming one of the most important legal challenges of our time.

III. International Legal Framework Governing Space Activities

A. The Corpus Juris Spatialis

The phrase "*Corpus Juris Spatialis*" refers to the body of international space law. Basically, international space law is built on five main treaties that were put together with help from the United Nations. Think of them as the rulebook for how countries are supposed to act in space. Each treaty covers a different topic, so together they cover pretty much everything, and they collectively represent the most important legal framework governing human activity beyond Earth.¹⁶¹⁹

The first and most important of these is the **Outer Space Treaty (OST) of 1967**. This treaty was signed during the height of the Cold War, when the United States and the Soviet Union were racing to dominate space. The OST lays down the basic rules for all space activity. It declares that outer space, including the Moon and other celestial bodies, is free for exploration and use by all countries. No country can claim ownership

over any part of outer space. Space must be used for peaceful purposes and for the benefit of all humanity. The treaty also makes individual countries responsible for the space activities carried out by both their government agencies and their private companies.¹⁶²⁰ This last point is particularly important today, as private companies like SpaceX and Blue Origin conduct activities that their home governments are legally responsible for under international law.

The second treaty is the **Rescue Agreement of 1968**, formally known as the Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space. This treaty requires all countries to help astronauts who are in distress, regardless of which country they belong to. If a spacecraft makes an emergency landing in another country's territory, that country must assist the crew and return them safely. Similarly, space objects that land in foreign territory must be returned to the country that launched them.¹⁶²¹ While this treaty is primarily about safety and rescue, it also has indirect relevance to intellectual property because the return of space objects raises questions about who controls the technology and data found inside them.

The third treaty is the **Liability Convention of 1972**, formally known as the Convention on International Liability for Damage Caused by Space Objects. This treaty holds countries absolutely liable for any damage caused by their space objects on the surface of the Earth. This means that if a satellite or rocket part falls and causes damage on land, the launching country must pay compensation regardless of whether it was at fault.¹⁶²² In outer space, liability applies only if the damage was caused due to fault. The Liability Convention became practically relevant when a Soviet satellite, Cosmos 954, crashed in

¹⁶¹⁹ United Nations Office for Outer Space Affairs (UNOOSA), *Status of International Agreements Relating to Activities in Outer Space*, available at https://www.unoosa.org/res/oosadoc/data/documents/2024/aac_105c_22_024crp/aac_105c_22024crp_3_0.html/AC105_C2_2024_CRP03E.pdf

¹⁶²⁰ Outer Space Treaty (OST), 1967, Article VI: "States Parties to the Treaty shall bear international responsibility for national activities in outer space... whether such activities are carried on by governmental agencies or by non-governmental entities."

¹⁶²¹ Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement), 1968, Articles 2 and 5, UNOOSA.

¹⁶²² Convention on International Liability for Damage Caused by Space Objects (Liability Convention), 1972, Article II: "A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth."

Canada in 1978, scattering radioactive debris. Canada successfully claimed compensation from the Soviet Union under this treaty.¹⁶²³

The fourth treaty is the **Registration Convention of 1976**, formally known as the Convention on Registration of Objects Launched into Outer Space. Under this treaty, every country that launches a space object must register it with both a national registry and the United Nations. The registration must include details such as the name of the launching state, the orbit of the object, and its general function.¹⁶²⁴ Registration is important for intellectual property purposes because it helps identify which country has jurisdiction over a space object. As explained later in this article, jurisdiction under the Outer Space Treaty flows from registration, meaning the country in whose registry a space object is listed has the authority to apply its own laws, including intellectual property laws, to activities aboard that object.

The fifth and final treaty is the **Moon Agreement of 1979**, formally known as the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies. This is the most controversial of the five treaties. It declares that the Moon and its natural resources are the “common heritage of mankind,” meaning they cannot be owned by any country or private entity.¹⁶²⁵ The treaty also requires that an international regime be established before any exploitation of lunar resources begins. However, the Moon Agreement has been ratified by very few countries. Major space powers such as the United States, Russia, China, and India have not ratified it¹⁶²⁶. In fact, the United States directly contradicted the spirit of the Moon Agreement when it passed the Commercial Space Launch Competitiveness Act in 2015, which allows American citizens to own resources they extract

from asteroids and other celestial bodies.¹⁶²⁷ The tension between the Moon Agreement’s ‘common heritage of mankind’ principle and the domestic space resource laws of major spacefaring nations remains one of the most consequential unresolved questions in international space law. This conflict carries particularly serious implications for intellectual property rights governing resource extraction technologies, an area the existing treaty framework was simply not designed to address

B. Jurisdictional Basis for Intellectual Property Rights in Space

One of the most fundamental questions in space intellectual property law is: whose laws apply when an invention is created in outer space? On Earth, this question is straightforward. If a person invents something in Germany, German patent law applies. If they invent something in Japan, Japanese patent law applies. But outer space belongs to no single country. There is no government, no court, and no police force in orbit. This creates a serious legal problem for inventors and companies working in space, because intellectual property rights are entirely dependent on a country’s ability to enforce its own laws within a defined territory.¹⁶²⁸

1. The Role of Article VIII of the Outer Space Treaty

The only internationally accepted solution to this problem comes from Article VIII of the Outer Space Treaty of 1967. This article states that the country in whose registry a space object is listed shall retain jurisdiction and control over that object and over any personnel aboard it while they are in outer

¹⁶²³ *Cosmos 954 Claim (Canada v. USSR)*, 1979, 18 I.L.M. 899. Canada claimed CAD \$6 million; the Soviet Union paid CAD \$3 million in settlement.

¹⁶²⁴ Convention on Registration of Objects Launched into Outer Space (Registration Convention), 1976, Article IV.

¹⁶²⁵ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement), 1979, Article 11(1): “The Moon and its natural resources are the common heritage of mankind”

¹⁶²⁶ UNOOSA, *Status of the Moon Agreement*, as of January 2026: 18 states parties, none of which are leading space powers

¹⁶²⁷ U.S. Commercial Space Launch Competitiveness Act (Space Act), Pub. L. 114–90, November 25, 2015, Section 402: “A United States citizen engaged in commercial recovery of an asteroid resource or a space resource... shall be entitled to any asteroid resource or space resource obtained”

¹⁶²⁸ WIPO, *Intellectual Property and Space Activities*, WIPO Publication No. 1053E (2004), p. 7: “The territorial nature of intellectual property rights creates particular difficulties when applied to activities conducted in outer space.”

space.¹⁶²⁹ In simple terms, this means that a spacecraft or space station is treated almost like a floating piece of national territory. The laws of the country that registered the spacecraft follow it into space. For intellectual property purposes, this means that if an inventor creates a new technology aboard a spacecraft registered in the United States, that invention is treated as though it was created on American soil. United States patent law will apply to it. Similarly, if the spacecraft is registered in France, French law and European patent law will govern the invention. This principle is sometimes described as the "flag state" principle, borrowing from maritime law where a ship flies the flag of the country whose laws govern activities aboard it.¹⁶³⁰

2. Domestic Implementation: The United States Example

The United States took this principle one step further by enacting a specific domestic law to address it. Under **35 U.S.C. Section 105**, which was added to the U.S. Patent Act in 1990, any invention made in outer space aboard a spacecraft registered under U.S. law is treated as if it were made in the United States for the purposes of patent protection.¹⁶³¹ This was a landmark provision because it was the first time any country explicitly

extended its patent jurisdiction beyond the Earth's surface. It also covers inventions made by U.S. nationals aboard foreign spacecraft, as long as that foreign country does not exercise its own jurisdiction over the invention. This provision has become increasingly important as American private companies such as SpaceX and Boeing operate their own registered spacecraft independently of NASA.

3. The Problem of Multinational Space Stations

While the Article VIII framework works reasonably well for a spacecraft registered to a single country, it becomes far more complicated when multiple countries share jurisdiction over the same structure in space. The best and most important example of this is the **International Space Station (ISS)**. The ISS is not registered to a single country. Instead, it is governed by the **Intergovernmental Agreement on Space Station Cooperation (IGA) of 1998**, signed by the United States, Russia, Japan, Canada, and the member states of the European Space Agency.¹⁶³² Under this agreement, each partner country retains jurisdiction over the module or component it contributed to the station. For example, the United States has jurisdiction over

¹⁶²⁹ Outer Space Treaty (OST), 1967, Article VIII: "A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over that object, and over any personnel thereof, while in outer space or on a celestial body."

¹⁶³⁰ Lyall, F. and Larsen, P.B., *Space Law: A Treatise*, 2nd ed. (Routledge, 2018), p. 312. The analogy to maritime flag state jurisdiction is widely accepted in space law scholarship.

¹⁶³¹ 35 U.S.C. Section 105, *Inventions in Outer Space*, enacted by Pub. L. 101-580, November 15, 1990: "Any invention made, used or sold in outer space on a

space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States."

¹⁶³² Intergovernmental Agreement on Space Station Cooperation (IGA), 1998, signed by the United States, Russia, Japan, Canada, and eleven European Space Agency member states. Available at NASA, <https://www.nasa.gov/international-space-station/agreements>

modules such as Destiny and Unity. Russia has jurisdiction over the Zvezda and Zarya modules. Japan has jurisdiction over the Kibo laboratory. Europe has jurisdiction over the Columbus module.¹⁶³³

This means that at any given moment, different national laws apply to different parts of the same space station. An American astronaut working in the Destiny module is subject to U.S. law. A Japanese astronaut working in the Kibo module is subject to Japanese law. If a multinational team of astronauts from different countries collaborates on an invention that spans multiple modules, it is genuinely unclear which country's patent law governs the invention, who owns the resulting patent, and in which country the patent must be filed.¹⁶³⁴

4. The IGA's IP Solution

The drafters of the IGA were aware of this problem and included a specific intellectual property provision to address it. Article 21 of the IGA states that for the purposes of intellectual property law, any activity occurring in or on a space station element shall be deemed to have occurred in the territory of the country that registered that element.¹⁶³⁵ This is a sensible and practical rule, but it still leaves gaps. It does not address situations where an invention is genuinely

collaborative and cannot be attributed to any single module. It also does not address disputes between partner countries about the ownership of jointly developed technologies.

5. Emerging Complexities: Commercial Stations and Private Actors

The IGA framework was designed for government operated space stations. It does not automatically apply to the new generation of **commercial space stations** that are now being developed. Companies such as Axiom Space, Blue Origin (Orbital Reef), and Northrop Grumman (Starlab) are planning or already building private space stations.¹⁶³⁶ These stations will host astronauts and researchers from many different countries, conducting experiments that may result in patentable inventions. The legal framework governing IP on these commercial stations will depend entirely on the agreements made between the station operators, their national governments, and their customers. There is currently no international treaty or agreed standard for how IP should be handled on privately owned space stations. This gap is a serious concern. Without clear rules, disputes over ownership of inventions made on commercial space stations could result in costly litigation across multiple jurisdictions, with

¹⁶³³ IGA, 1998, Article 5: "Each Partner shall register as space objects the flight elements... which it provides." NASA registers the U.S. segment elements; Roscosmos registers the Russian elements; JAXA registers the Japanese Experiment Module (Kibo); ESA registers Columbus

¹⁶³⁴ Hersch, M., "Intellectual Property Issues Aboard the International Space Station," *Journal of Space Law*, Vol. 28 (2002), p. 193: "The multi jurisdictional character of the ISS creates genuine ambiguity about which national law governs collaborative inventions."

¹⁶³⁵ IGA, 1998, Article 21(2): "For purposes of intellectual property law, an activity occurring in or on a Space Station flight element shall be deemed to have occurred in the territory of the Partner State of that element's registry."

¹⁶³⁶ NASA, *Commercial Low Earth Orbit Destinations (CLD) Program*, 2021. Awards were made to Axiom Space, Blue Origin (Orbital Reef concept), and Northrop Grumman (Starlab) for development of commercial space stations to succeed the ISS.

conflicting outcomes in different countries. Legal scholars and industry bodies have called for the development of standard contractual frameworks or an international agreement to fill this void before commercial space stations become operational on a large scale.¹⁶³⁷

6. The Broader Problem: Enforcement

Even where jurisdiction can be established, enforcement remains a major challenge. If a company in Country A infringes a patent held by a company in Country B by using the patented technology aboard a spacecraft registered in Country C, the patent holder must navigate three different legal systems to seek relief. There is no international space court, no unified enforcement mechanism, and no agreed procedure for cross border IP disputes arising from space activities.¹⁶³⁸ This enforcement gap makes intellectual property rights in space significantly weaker in practice than they appear on paper, and it represents one of the most urgent reform priorities for international space law in the coming decade.

IV. Key International IP Instruments and Their Application to Space

A. The Paris Convention for the Protection of Industrial Property (1883)

The Paris Convention for the Protection of Industrial Property, adopted in 1883 and administered by the World Intellectual Property Organization (WIPO), is one of the oldest and most important international intellectual property treaties in existence. It currently has 179 member states, making it one of the most widely ratified IP treaties in the world.¹⁶³⁹

The Paris Convention rests on three foundational principles. The first is the principle of **national treatment**, which means that a citizen or resident of any member state is entitled to the same intellectual property protection in all other member states as those other states give to their own citizens. A French company seeking patent protection in India, for example, must be treated no less favorably than an Indian company seeking the same protection.¹⁶⁴⁰ The second principle is the **right of priority**, which allows an applicant who files a patent application in one member state to file corresponding applications in other member states within twelve months, while retaining the original filing date as the priority date.¹⁶⁴¹ This is extremely useful for space technology companies, which need to protect their inventions in multiple countries simultaneously. The third principle is **common rules**, which establishes minimum standards that all member states must follow, such as rules about what cannot be refused as a trademark or what constitutes a patentable invention.¹⁶⁴²

¹⁶³⁷ WIPO Standing Committee on the Law of Patents (SCP), *Patents and Space Based Technologies*, Document SCP/37/10 (2022), para. 45: "The emergence of commercial space stations operated by private entities creates new and unresolved questions regarding the ownership and protection of inventions made aboard such structures."

¹⁶³⁸ Sundahl, M.J., *Commercial Space and the Challenge of Intellectual Property*, in *Proceedings of the International Astronautical Congress*, IAC-19-E7.1.5 (2019): "The absence of an international enforcement mechanism for space IP rights represents a fundamental weakness in the current legal framework."

¹⁶³⁹ WIPO, *Contracting Parties to the Paris Convention*, available at <https://www.wipo.int/treaties/en/ip/paris>. As of January 2026, the Paris Convention has 179 contracting states.

¹⁶⁴⁰ Paris Convention for the Protection of Industrial Property, 1883 (as revised at Stockholm, 1967), Article 2(1): "Nationals of any country of the Union shall, as regards the protection of industrial property, enjoy in all the other countries of the Union the advantages that their respective laws now grant, or may hereafter grant, to nationals."

¹⁶⁴¹ Paris Convention, Article 4(A)(1): "Any person who has duly filed an application for a patent... in one of the countries of the Union... shall enjoy, for the purpose of filing in the other countries, a right of priority during the periods hereinafter fixed." The priority period for patents is twelve months per Article 4(C)(1).

¹⁶⁴² WIPO, *Summary of the Paris Convention for the Protection of Industrial Property (1883)*, available at https://www.wipo.int/treaties/en/ip/paris/summary_paris.html.

In the context of space activities, the national treatment principle extends, at least in theory, to any space activity that is sufficiently connected to the territory of a convention state. For instance, a satellite manufactured in the United States, registered under U.S. law, and operated by an American company, enjoys the benefit of U.S. patent protection, and by extension the protection of all Paris Convention member states, for its constituent technologies. However, the Paris Convention was drafted in the 19th century, long before the concept of space activity existed. It contains no provisions addressing inventions made or used in orbit, on the Moon, or on other celestial bodies. Its territorial framework simply does not extend to extraterritorial environments by default, and no amendment has been made to address this limitation.¹⁶⁴³

This gap has significant practical consequences. If an engineer aboard a privately operated space station invents a new manufacturing process while in orbit, and that station is not clearly registered under any single state's jurisdiction, the Paris Convention provides no clear basis for determining which country's patent law governs the invention or which country must provide protection.

B. The Patent Cooperation Treaty (PCT)

The Patent Cooperation Treaty, commonly known as the PCT, was concluded in Washington in 1970 and entered into force in 1978. It is also administered by WIPO and currently has 157 contracting states.¹⁶⁴⁴ The PCT does not itself grant patents. Rather, it provides a streamlined procedural mechanism through which an inventor can file a single international patent

application and have it considered in multiple countries simultaneously, rather than filing separate applications in each country individually.

The PCT process works in two phases. In the international phase, the applicant files a single application with a national or regional receiving office, such as the USPTO or the EPO. WIPO then publishes the application, and an international searching authority (ISA) issues an international search report identifying prior art relevant to the invention.¹⁶⁴⁵ In the national phase, the applicant enters the patent examination process in each country where protection is sought, using the international application as the basis.¹⁶⁴⁶ This system saves time and money and is widely used by space technology companies operating across multiple markets. Major space industry players make extensive use of the PCT system. SpaceX has filed PCT applications covering reusable launch vehicle technologies, propulsion systems, and Starlink satellite network architectures. Airbus Defence and Space, one of the world's largest satellite manufacturers, regularly files PCT applications for satellite bus designs, payload technologies, and earth observation systems. Lockheed Martin similarly uses PCT applications to protect its launch vehicle and spacecraft technologies across key markets including the United States, Europe, Japan, and Australia.¹⁶⁴⁷ However, the PCT has the same fundamental territorial limitation as the Paris Convention. It only provides patent protection within the jurisdictions of its 157 member states. It does not create any form of patent protection in outer space itself. An invention used exclusively in orbit, with no commercial use or exploitation occurring within any member state's territory, falls entirely

¹⁶⁴³ Lachs, M., *The Law of Outer Space: An Experience in Contemporary Law Making* (Martinus Nijhoff, 1972), p. 44. See also Diederiks Verschoor, I.H.Ph., *An Introduction to Space Law*, 3rd ed. (Kluwer Law International, 2008), p. 117: "The Paris Convention's territorial premise renders it structurally inapplicable to activities conducted in the extraterritorial environment of outer space."

¹⁶⁴⁴ WIPO, *Contracting States of the PCT*, available at https://www.wipo.int/pct/en/pct_contracting_states.html. As of January 2026, the PCT has 157 contracting states.

¹⁶⁴⁵ PCT, Article 15: "Each International Searching Authority shall undertake to discover the relevant prior art to the extent possible, and in any case to consult the documentation specified in the Regulations."

¹⁶⁴⁶ CT, Article 23: "The designated Office shall not process or examine the international application prior to the expiration of the applicable time limit." National phase entry is generally 30 months from the priority date under PCT Article 22.

¹⁶⁴⁷ European Patent Office (EPO), *Patents and the Space Sector: Technology Landscape* (2022), available at <https://www.epo.org/en/news-events/in-focus/space>. The report identifies SpaceX, Airbus, Lockheed Martin, Boeing, and Thales Alenia Space as among the most prolific filers of space technology patents through the PCT system.

outside the scope of PCT protection.¹⁶⁴⁸ This means that a competitor could, in theory, use a patented technology aboard a spacecraft without infringing the patent, as long as the use occurs entirely in orbit and does not touch the territory of any state where the patent is registered. Whether this theoretical loophole would survive judicial scrutiny has not yet been definitively tested in any court.

C. The TRIPS Agreement (1994)

The Agreement on Trade Related Aspects of Intellectual Property Rights, universally known as TRIPS, was concluded in Marrakesh in 1994 as Annex 1C to the Agreement Establishing the World Trade Organization (WTO). It entered into force on 1 January 1995 and currently applies to all 164 WTO member states.¹⁶⁴⁹ TRIPS is the most comprehensive and most widely binding international IP treaty in existence. Unlike the Paris Convention and the PCT, which are purely IP treaties, TRIPS is embedded within the broader WTO framework of international trade law, meaning that non compliance can be challenged through the WTO dispute settlement mechanism, which has real enforcement teeth.¹⁶⁵⁰

TRIPS mandates minimum standards of intellectual property protection in seven categories: copyright, trademarks, geographical indications, industrial designs, patents, layout designs of integrated circuits, and undisclosed information (trade secrets).¹⁶⁵¹ In the field of patents, Article 27 of TRIPS requires all member states to make patents available for any

invention, whether a product or a process, in all fields of technology, provided the invention is new, involves an inventive step, and is capable of industrial application.¹⁶⁵² Critically, Article 27 prohibits discrimination as to the field of technology. This means that space technology is unambiguously patentable under TRIPS. A WTO member state cannot refuse to grant patents for satellite systems, rocket propulsion technology, or space habitat designs on the grounds that they relate to space activity. The standard 20 year patent term mandated by Article 33 of TRIPS applies equally to space technology patents.¹⁶⁵³

TRIPS also requires member states to provide effective enforcement mechanisms, including civil judicial procedures, provisional measures, and border measures.¹⁶⁵⁴ In this respect, TRIPS goes further than the Paris Convention in requiring not just the availability of IP rights but also their effective enforcement. However, all of these enforcement mechanisms are territorial. They operate within the courts and administrative systems of individual member states. TRIPS provides no mechanism whatsoever for enforcing intellectual property rights in outer space itself, which falls outside the jurisdiction of any WTO member state.¹⁶⁵⁵

The TRIPS Agreement has been the subject of ongoing review and negotiation at the WTO. In 2022, a waiver of certain TRIPS obligations relating to COVID-19 vaccines was agreed, demonstrating that the agreement can be adapted to address specific global challenges.¹⁶⁵⁶ Legal scholars have proposed

¹⁶⁴⁸ Maffei, S., "The Extraterritorial Reach of Patent Law: Outer Space as a Jurisdictional Frontier," *Stanford Technology Law Review*, Vol. 19 (2016), p. 341: "PCT applications confer no protection for activities conducted exclusively in orbit, as the treaty's operative scope is limited to the sovereign territories of its member states."

¹⁶⁴⁹ WTO, *Overview: the TRIPS Agreement*, available at https://www.wto.org/english/tratop_e/trips_e/intel2_e.htm. TRIPS entered into force on 1 January 1995 for developed countries, 1 January 1997 for developing countries, and 1 January 2000 (later extended) for least developed countries.

¹⁶⁵⁰ WTO, *Dispute Settlement: TRIPS*, available at https://www.wto.org/english/tratop_e/trips_e/trips_e.htm. The WTO dispute settlement mechanism allows member states to bring complaints against other members for non compliance with TRIPS, potentially resulting in authorized trade retaliation.

¹⁶⁵¹ TRIPS Agreement, Part II, Sections 1 through 7 (Articles 9 through 40), covering each category of intellectual property in turn.

¹⁶⁵² TRIPS Agreement, Article 27(1): "Subject to the provisions of paragraphs 2 and 3, patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application."

¹⁶⁵³ TRIPS Agreement, Article 33: "The term of protection available shall not end before the expiration of a period of twenty years counted from the filing date."

¹⁶⁵⁴ TRIPS Agreement, Part III (Articles 41 through 61), *Enforcement of Intellectual Property Rights*, including civil and administrative procedures (Article 42), provisional measures (Article 50), and criminal procedures (Article 61).

¹⁶⁵⁵ Sundahl, M.J., *Commercial Space and the Challenge of Intellectual Property*, in *Proceedings of the International Astronautical Congress, IAC-19-E7.1.5* (2019), p. 6: "TRIPS enforcement mechanisms are wholly territorial in design and operation. They offer no remedy to a patent holder whose rights are infringed exclusively in outer space."

¹⁶⁵⁶ WTO, *Ministerial Decision on the TRIPS Agreement*, adopted at the 12th WTO Ministerial Conference, Geneva, June 17, 2022, WT/MIN(22)/30. The

that a similar mechanism could be used to create a specific carve out or supplementary protocol within the TRIPS framework to address the unique IP challenges of outer space. However, no formal proposal to this effect has been tabled at the WTO as of early 2026, and given the complexity of WTO negotiations, such a development remains a long term prospect at best.¹⁶⁵⁷

V. Domestic Legal Frameworks

A. United States: 35 U.S.C. Section 105

The United States is the only country in the world that has enacted a specific national law expressly addressing patents for inventions made in outer space. This law, codified as **35 U.S.C. Section 105** under the title "Inventions in Outer Space," was added to the U.S. Patent Act in 1990 through Public Law 101-580.¹⁶⁵⁸ Its enactment was a direct response to the growing involvement of American private companies in space activities, and to the legal uncertainty created by the absence of any clear rule about where, legally speaking, an invention made in orbit had occurred.

Section 105 provides that any invention made, used, or sold in outer space aboard a spacecraft under the jurisdiction or control of the United States shall be treated as if it were made, used, or sold within the United States.¹⁶⁵⁹ This means that American patent law follows U.S. registered spacecraft into orbit, to the Moon, and beyond. The law also covers inventions made by U.S. nationals aboard foreign spacecraft, as long as

the foreign country does not assert its own jurisdiction over the invention. If another country does assert jurisdiction, that country's law will govern instead, avoiding a conflict between overlapping national patent systems.¹⁶⁶⁰

This provision has become increasingly significant as companies like SpaceX, Boeing, and Sierra Space operate their own spacecraft, and as NASA conducts joint missions with international partners. Before Section 105 was enacted, it was theoretically possible for a competitor to use a patented American technology aboard a spacecraft in orbit without infringing the patent, simply because the use occurred outside U.S. territory. Section 105 closed this loophole for U.S. registered spacecraft.¹⁶⁶¹

Alongside Section 105, two other American laws are critical to the space IP landscape. The **Bayh-Dole Act (35 U.S.C. Sections 200 through 212)**, enacted in 1980, allows universities, non-profit institutions, and small businesses to retain ownership of inventions that arise from research funded by the federal government, including research funded by NASA.¹⁶⁶² Before Bayh-Dole, the federal government automatically owned all inventions resulting from federally funded research, which meant that universities had little incentive to commercialize their discoveries. Bayh-Dole changed this dramatically. It allowed universities such as MIT, Caltech, and Stanford to patent and license NASA-funded aerospace technologies, generating billions of dollars in licensing revenue and spurring significant innovation in satellite systems, materials science, and propulsion technology.¹⁶⁶³

decision waived certain TRIPS obligations for developing country members with respect to COVID-19 vaccine patents.

¹⁶⁵⁷ WIPO SCP, *Patents and Space Based Technologies*, Document SCP/37/10 (2022), para. 62: "No formal proposal has been submitted within the WTO framework to address the specific intellectual property challenges arising from activities in outer space, and the complexity of WTO negotiations suggests that any such development would require sustained multilateral commitment over an extended period."

¹⁶⁵⁸ 35 U.S.C. Section 105, *Inventions in Outer Space*, enacted by Public Law 101-580, November 15, 1990. The legislative history is discussed in NASA, *Implementation of the Space Patent Law*, NASA Technical Reports Server (1991).

¹⁶⁵⁹ 35 U.S.C. Section 105(a): "Any invention made, used or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for the purposes of this title, except with respect to any space object or

component thereof that is specifically identified and otherwise provided for by an international agreement to which the United States is a party."

¹⁶⁶⁰ 35 U.S.C. Section 105(b): "Paragraph (a) shall not apply to any invention... made, used or sold in outer space which is specifically identified and otherwise governed by an international agreement to which the United States is a party, or which is carried on the registry of a foreign state."

¹⁶⁶¹ Chun, C.K.S., "The 1990 Space Patent Law: An Analysis," *Journal of Space Law*, Vol. 20 (1992), p. 143.

¹⁶⁶² Bayh-Dole Act, 35 U.S.C. Sections 200 through 212, enacted as Public Law 96-517, December 12, 1980. See AUTM, *The Bayh-Dole Act: A Guide to the Law and Implementing Regulations* (2003).

¹⁶⁶³ Association of University Technology Managers (AUTM), *Licensing Activity Survey FY2022*: universities and research institutions reported over 15,000 new patent applications and over \$3 billion in licensing revenues in fiscal year 2022,

The third major American law is the **U.S. Commercial Space Launch Competitiveness Act of 2015**, commonly known as the Space Act of 2015.¹⁶⁶⁴ This landmark legislation authorized American citizens and companies to own resources that they extract from asteroids, the Moon, and other celestial bodies. While the law carefully states that it does not assert U.S. sovereignty over any celestial body (in order to remain technically consistent with the Outer Space Treaty's prohibition on national appropriation), it creates a domestic legal right of private property in extracted space resources.¹⁶⁶⁵ This has enormous implications for intellectual property, because the technologies used to locate, extract, process, and transport space resources are highly patentable, and the data generated from resource prospecting missions is commercially valuable and protectable as a trade secret or under copyright law. The Space Act thus created a new frontier of space-related IP that did not previously exist in law.¹⁶⁶⁶

B. European Union

In Europe, patent protection for space activities is governed primarily by the **European Patent Convention (EPC)**, which is administered by the European Patent Office (EPO). The EPC provides that the protection conferred by a European patent extends to processes carried out in outer space aboard vessels that are registered in EPC member states.¹⁶⁶⁷ This means that a European patent covering a manufacturing process can be enforced if that process is used aboard a spacecraft flying the flag of a European country.

a significant portion of which related to aerospace and materials technologies developed under federal funding.

¹⁶⁶⁴ U.S. Commercial Space Launch Competitiveness Act, Public Law 114–90, November 25, 2015.

¹⁶⁶⁵ Space Act 2015, Section 402, codified at 51 U.S.C. Section 51303: "A United States citizen engaged in commercial recovery of an asteroid resource or a space resource... shall be entitled to any asteroid resource or space resource obtained... in accordance with applicable law, including the international obligations of the United States."

¹⁶⁶⁶ Pop, V., "Property Rights in Space," in Schrogl, K-U. et al. (eds.), *Handbook of Space Law* (Edward Elgar, 2020), p. 489.

¹⁶⁶⁷ European Patent Convention (EPC), 2000 edition, Article 64(3): "Any infringement of a European patent shall be dealt with by national law." See also Rule 40 of the Implementing Regulations to the EPC, which addresses the territorial scope of patent protection for processes carried out in outer space

In 2023, the European Union released its **Space Strategy for Security and Defence**, which specifically acknowledged the importance of protecting dual use space technologies through intellectual property law, while at the same time balancing national security concerns.¹⁶⁶⁸ Dual use technologies are those that have both civilian and military applications, and their IP protection raises sensitive questions about what can be publicly disclosed in patent applications.

The **European Space Agency's Technology Transfer Programme (TTP)** is another important mechanism in the European space IP landscape. It facilitates the licensing of technologies originally developed by ESA for space missions to private companies for use in commercial and industrial applications on Earth.¹⁶⁶⁹ This programme has successfully transferred hundreds of space technologies to the private sector, demonstrating the commercial value of space derived intellectual property.

C. India

India's primary IP legislation, the **Patents Act of 1970**, protects inventions made or used within Indian territory.¹⁶⁷⁰ However, like the laws of most countries, it contains no specific provisions addressing inventions made or used in outer space. This gap is a significant concern as India's space programme rapidly expands.

The **Indian Space Research Organisation (ISRO)**, which has traditionally operated as a purely governmental entity, has been actively commercializing its space technologies through its commercial arm, **NewSpace India Limited**

aboard vessels registered in EPC member states. European Patent Office, *Guidelines for Examination*, Part C, Chapter IV (2023).

¹⁶⁶⁸ European Commission, *Communication on the EU Space Strategy for Security and Defence*, JOIN(2023) 9 final, March 10, 2023. The strategy explicitly states that "the protection of space technologies through intellectual property regimes must be balanced against legitimate security concerns arising from the dual use nature of space capabilities."

¹⁶⁶⁹ European Space Agency, *Technology Transfer Programme*, available at <https://technology.esa.int>. As of 2024, the ESA TTP has facilitated over 1,000 technology transfer agreements, generating significant commercial value from space derived intellectual property.

¹⁶⁷⁰ Patents Act, 1970 (India), Section 2(1)(j): "invention means a new product or process involving an inventive step and capable of industrial application." The Act applies to inventions made or used within the territory of India and contains no provisions addressing activities in outer space.

(NSIL).¹⁶⁷¹ NSIL is responsible for the transfer of ISRO developed technologies to Indian industry, the commercialization of space products and services, and the marketing of launch vehicles to foreign customers.

In 2024, ISRO introduced a new **IP Policy** that established fresh guidelines for licensing space technologies and protecting innovations that were developed with government funding.¹⁶⁷² This policy represents a significant step forward in recognizing the commercial value of space IP in India. However, India still lacks a comprehensive dedicated space law. The **Space Activities Bill**, which would provide an overarching legal framework for Indian space activities including IP provisions, has been in draft form since 2017 and had not been enacted as of early 2026.¹⁶⁷³

VI. Key Organizations in Space Intellectual Property Rights

A. WIPO (World Intellectual Property Organisation)

WIPO is the leading international organisation responsible for promoting and administering intellectual property rights worldwide. It administers the PCT system, the Paris Convention, and numerous other IP treaties that are directly relevant to space technology.¹⁶⁷⁴ WIPO's Standing Committee on the Law of Patents (SCP) has formally initiated work on the relationship between patents and space-based technologies, recognising that the current international framework has serious gaps that

must be addressed urgently.¹⁶⁷⁵ WIPO's 2004 publication titled "Intellectual Property and Space Activities" remains one of the most widely cited foundational references on this subject.¹⁶⁷⁶

B. UNOOSA (United Nations Office for Outer Space Affairs)

UNOOSA is the UN office responsible for promoting international cooperation in the peaceful use of outer space and for developing international space law. It serves as the secretariat for the **Committee on the Peaceful Uses of Outer Space (COPUOS)**, which is the principal United Nations forum for discussing all aspects of space law, including intellectual property-related matters.¹⁶⁷⁷ COPUOS meets annually, and its Legal Subcommittee regularly reviews the adequacy of existing space law frameworks, including those affecting IP rights.

C. ITU (International Telecommunication Union)

The ITU is a specialised UN agency that governs the global allocation of radio frequency spectrum and the assignment of orbital slots for satellites, particularly in the geostationary orbit.¹⁶⁷⁸ While orbital slots and radio frequencies are not formally intellectual property rights, they function in a very similar way to property rights in practice. Access to a prime geostationary orbital slot can be worth billions of dollars to a satellite operator. The ITU's Radio Regulations set the framework for how these slots are coordinated and assigned among countries and commercial operators.¹⁶⁷⁸

¹⁶⁷¹ NewSpace India Limited (NSIL), incorporated under the Companies Act, 2013, as a wholly owned Government of India company under the Department of Space. NSIL's mandate includes the commercialization of space products and services and the transfer of ISRO developed technologies to Indian industry. See NSIL Annual Report 2023–24.

¹⁶⁷² Indian Space Research Organisation, *ISRO Intellectual Property Policy* (2024), Department of Space, Government of India. The policy establishes procedures for the identification, protection, and commercialization of IP generated through ISRO and NSIL activities, including provisions for licensing to Indian private sector entities.

¹⁶⁷³ India, *Space Activities Bill* (Draft, 2017), prepared by the Department of Space. As of February 2026, the Bill had not been passed by the Indian Parliament. The Bill would regulate commercial space activities in India and includes provisions on licensing, liability, and the protection of space data, though its IP provisions remain limited.

¹⁶⁷⁴ WIPO, *About WIPO*, available at <https://www.wipo.int/about-wipo/en>. WIPO currently administers 26 international treaties in the field of intellectual

property, including the PCT, the Paris Convention, and the Berne Convention.

¹⁶⁷⁵ WIPO Standing Committee on the Law of Patents (SCP), *Patents and Space Based Technologies*, Document SCP/37/10, 34th Session, Geneva, June 2022. The document represents the first formal WIPO initiative specifically addressing the intersection of patent law and space technology.

¹⁶⁷⁶ WIPO, *Intellectual Property and Space Activities*, WIPO Publication No. 1053E (2004). This publication comprehensively surveyed the IP issues arising from space activities at a time when commercial space was beginning to emerge, and its core analysis remains relevant and widely cited.

¹⁶⁷⁷ UNOOSA, *About COPUOS*, available at <https://www.unoosa.org/oosa/en/ourwork/copuos/index.html>. COPUOS was established by the UN General Assembly in 1959 and currently has 102 member states. Its Legal Subcommittee meets annually in Vienna to review legal and regulatory issues relating to the peaceful use of outer space.

¹⁶⁷⁸ International Telecommunication Union (ITU), *Constitution and Convention of the International Telecommunication Union* (2019 edition), Article 1: ITU's

D. USPTO, EPO, and JPO

The national and regional patent offices of the United States (USPTO), Europe (EPO), and Japan (JPO) are the primary institutions through which space technology patents are filed and examined. The USPTO alone has granted thousands of patents related to satellite systems, rocket propulsion, space habitat design, and related technologies. The EPO publishes regular reports analysing patent trends in the space sector, and its 2022 report identified space as one of the fastest growing areas of patent activity globally.¹⁶⁷⁹

E. Landmark Case Laws

1. Hughes Aircraft Co. v. United States (1993 and 1996)

This is one of the earliest and most important intellectual property cases involving space technology. Hughes Aircraft Company held a patent for a satellite attitude control system, which is a method of stabilising and orienting a satellite in orbit. The U.S. government used this patented technology in its own satellites without obtaining a license from Hughes and without paying any compensation.¹⁶⁸⁰

Hughes filed suit against the U.S. government. The Court of Federal Claims upheld the validity of Hughes' patent and found that the government's

unauthorised use constituted infringement under 28 U.S.C. Section 1498, which governs patent infringement by the U.S. government. The Federal Circuit affirmed this decision on appeal. This case established the critically important principle that space technology is fully subject to domestic patent law protection, and that even the U.S. government cannot use a patented space technology without authorisation. It remains the leading authority for the proposition that patents covering space systems are enforceable against state actors.

2. Blue Origin LLC v. SpaceX (PTAB, 2016)

This case arose from the intense competition between two of the world's most prominent private space companies over a key technology: the ability to land an orbital class rocket booster vertically on a floating platform at sea after delivering its payload to orbit. SpaceX held a patent covering this technique, and Blue Origin challenged the validity of that patent by filing a petition for inter partes review (IPR) at the USPTO's

purposes include coordinating the shared use of the radio spectrum and satellite orbits.

¹⁶⁷⁹ European Patent Office (EPO), *Space: The Next Innovation Frontier*, Patent Landscape Report (2022), available at <https://www.epo.org/en/news-events/in-focus/space>. The report found that patent filings in the space sector grew at three times the overall rate of patent filings between 2014 and 2020.

¹⁶⁸⁰ *Hughes Aircraft Co. v. United States*, 29 Fed. Cl. 197 (1993). Hughes Aircraft held U.S. Patent No. 3,758,051 covering a synchronous satellite control system. The U.S. government used the patented technology in its DSCS III and FLTSATCOM military satellite programs without obtaining a license.

Patent Trial and Appeal Board (PTAB).¹⁶⁸¹

The PTAB declined to institute the review, finding that Blue Origin had not demonstrated a reasonable likelihood of prevailing on the merits of its invalidity arguments.¹⁶⁸² SpaceX's patent survived the challenge. This case attracted enormous public attention and clearly demonstrated that PTAB proceedings have become a major battleground for intellectual property disputes in the commercial space industry. It also showed that companies are willing to use all available legal tools, including administrative patent challenges, to gain a competitive advantage in the space race.

3. **Boeing Co. v. Hughes Aircraft Co. (Federal Circuit, 1994)**

This case involved a dispute over patent rights in satellite transponder technology. The Federal Circuit was required to address the question of how the scope of patent claims covering satellite communication systems should be interpreted,

particularly in relation to so called "means plus function" claims, which define an invention by what it does rather than how it is built.¹⁶⁸³ The court's analysis provided important and lasting guidance on how patent claims in the space technology field should be read and interpreted. Its reasoning has continued to influence subsequent satellite patent litigation and remains a key reference for patent attorneys drafting claims for space technology inventions.

4. **NASA v. Nelson (U.S. Supreme Court, 2011)**

Although this case did not involve patents directly, it addressed an important related issue: the constitutional privacy rights of government contractors working on space programs. Employees at the Jet Propulsion Laboratory (JPL), which operates under contract with NASA, challenged background investigation procedures as a violation of their constitutional right to informational privacy.¹⁶⁸⁴ The U.S. Supreme Court ruled in

¹⁶⁸¹ Blue Origin LLC, Petition for Inter Partes Review, IPR2016–00178 (USPTO Patent Trial and Appeal Board, filed February 2016), challenging SpaceX's U.S. Patent No. 9,073,647, titled "Sea-Based Landing Platform with Sensors."

¹⁶⁸² *Blue Origin LLC v. Space Exploration Technologies Corp.*, IPR2016–00178, Decision Denying Institution of Inter Partes Review (PTAB, September 2016): "Petitioner has not demonstrated a reasonable likelihood that it would prevail with respect to at least one of the challenged claims."

¹⁶⁸³ *Boeing Co. v. Hughes Aircraft Co.*, 29 F.3d 1540 (Fed. Cir. 1994). The court was required to interpret means plus function claim limitations under 35 U.S.C. Section 112, paragraph 6, in the context of satellite transponder technology.

¹⁶⁸⁴ *NASA v. Nelson*, 562 U.S. 134 (2011). The plaintiffs were employees of the California Institute of Technology working at the Jet Propulsion Laboratory under a contract with NASA. They challenged background investigation questionnaires as violating their right to informational privacy under the U.S. Constitution.

favor of NASA, holding that the background checks were reasonable. The case is relevant to the space IP context because it acknowledged that government contractors working on space programs hold proprietary manufacturing and design information, and that the relationship between such contractors and NASA involves sensitive matters that touch on both privacy and trade secret protection.

5. **Intelsat v. SES Americom (D.D.C., 2010)**

This case involved a dispute between two of the world's largest commercial satellite operators, Intelsat and SES Americom, over orbital slot coordination and radio frequency interference, with overlapping claims involving satellite frequency plans that had significant intellectual property dimensions.¹⁶⁸⁵ The case illustrated an important and growing area of space-related IP disputes: the fact that orbital spectrum rights, while they are not formally classified as intellectual property rights under any treaty, function in practice

very similarly to property rights. They can be bought, sold, licensed, and disputed in litigation, and their commercial value runs into billions of dollars. As the geostationary orbit becomes increasingly congested, disputes of this kind are expected to become more frequent and more significant.

VII. **Notable Patents in Space Technology**

The space technology sector has produced a number of landmark patents that have significantly shaped the industry. **US Patent No. 6,327,523 B1** covers core technological elements of the SpaceX Falcon 9 reusable launch vehicle system, one of the most transformative technologies in the history of commercial spaceflight. **US Patent No. 10,669,047 B2**, granted to SpaceX in 2020, covers the grid fin actuation system that is used to steer and stabilize the Falcon 9 booster during its descent and landing. This technology is central to SpaceX's strategy of dramatically reducing the cost of access to space by reusing rocket hardware.

Other important patent domains in the space sector include ion propulsion systems, such as those used on NASA's Dawn spacecraft for its mission to the asteroid belt.¹⁶⁸⁶ Satellite mega constellation architectures, of the kind used by SpaceX's Starlink and OneWeb's broadband satellite networks, are heavily patented.¹⁶⁸⁷ Optical inter satellite link technologies, which allow satellites to communicate with each other using laser beams rather than radio waves, represent another rapidly growing area of space patent activity. In situ resource utilization (ISRU) technologies, which cover methods for

¹⁶⁸⁵ *Intelsat Global Sales and Marketing Ltd. v. SES Americom Inc.*, Civil Action No. 08-cv-0959 (D.D.C., 2010). The dispute arose from interference between the parties' respective satellite systems operating in adjacent geostationary orbital positions, with claims involving the parties' ITU filings and satellite frequency coordination agreements.

¹⁶⁸⁶ NASA, *Dawn Mission: Ion Propulsion Technology*, available at <https://www.nasa.gov/mission/dawn>. The ion propulsion system used on

Dawn was based on technology developed at NASA's Jet Propulsion Laboratory and is protected by multiple U.S. patents held by NASA and its contractors.

¹⁶⁸⁷ Bhattacharjee, D. and Singla, A., "LEO Constellation Networks: Challenges and Opportunities," *IEEE Communications Magazine*, Vol. 57, No. 10 (2019), p. 216. SpaceX has filed hundreds of PCT applications covering Starlink network architecture, satellite bus design, and user terminal technology.

processing lunar regolith and extracting water ice and other materials from the Moon and other celestial bodies, are an emerging patent frontier as the Artemis programme moves toward lunar surface operations. NASA alone holds thousands of patents and actively licenses them to commercial entities through its Technology Transfer Program.¹⁶⁸⁸

A. Current Situation and Emerging Challenges

1. The Jurisdictional Gap

The most persistent and fundamental challenge in space intellectual property law is the absence of a uniform international IP framework for activities conducted in outer space. While Article VIII of the Outer Space Treaty provides a state of registry basis for establishing jurisdiction, this solution becomes increasingly impractical as space activities grow more complex and multinational in character. An invention made collaboratively by an American astronaut, a Japanese astronaut, and a European astronaut aboard the International Space Station could potentially be subject to three completely different national IP regimes simultaneously. This is a scenario that existing law does not clearly or satisfactorily resolve, and it will become even more common as commercial space stations begin hosting international crews from dozens of countries.

2. Resource Extraction and IP

The U.S. Space Act of 2015 and analogous national legislation enacted in Luxembourg in 2017 and the UAE in 2020 have authorized private entities to own resources they extract from asteroids and other celestial bodies in space. This creates an urgent need for clear intellectual property protection covering the technologies used in extraction, the processes used to refine and utilise extracted resources, and the data generated during resource prospecting operations. The Moon Agreement's "common

heritage" principle, which would prohibit private ownership of space resources, has been rejected by the United States, Russia, China, India, and other major space powers. This leaves the legal status of resource-related IP in a state of deep international legal uncertainty that will need to be resolved before large-scale commercial resource extraction can begin.

3. The Artemis Accords and IP Sharing

The Artemis Accords, launched by NASA in 2020 and signed by more than 40 nations as of 2025, promote transparency, interoperability, and the sharing of scientific data among countries participating in lunar exploration.¹⁶⁸⁹ While the Accords are not legally binding treaties, they create important soft law expectations about how intellectual property should be handled in collaborative lunar missions. They also implicitly acknowledge the right of states and their nationals to extract and own space resources, placing them in direct tension with the Moon Agreement's common heritage framework.

4. Trade Secrets in the Commercial Space Race

Given the extraordinary intensity of competition among SpaceX, Blue Origin, Rocket Lab, and national space agencies from the United States, China, Russia, India, and Europe, trade secret protection has become at least as commercially important as patent protection in the space industry. Many companies deliberately choose not to patent their most sensitive technologies, such as propellant formulations, manufacturing processes, and avionics software, because patent applications require public disclosure of the invention. Instead, they rely on trade secret law to maintain competitive advantage. In the United States, the **Defend Trade Secrets Act (DTSA) of 2016** provides federal civil remedies for the misappropriation of trade secrets and has been invoked in several disputes between

¹⁶⁸⁸ NASA Technology Transfer Program, *NASA Patents Available for Licensing*, available at <https://technology.nasa.gov/patents>. NASA's patent portfolio covers over 1,600 active patents available for licensing to commercial entities, spanning propulsion, life support, materials science, and robotics.

¹⁶⁸⁹ NASA, *Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids*, signed October 13, 2020. As of January 2026, 47 nations had signed the Accords. Available at <https://www.nasa.gov/artemis-accords>.

aerospace companies and former employees who left to join competing firms.

5. Copyright in Remote Sensing and Artificial Intelligence

Satellite imagery is a major and rapidly growing commercial product, used in agriculture, urban planning, disaster response, defence, and environmental monitoring. In most countries, copyright protection applies to satellite images as original artistic or scientific works, provided that sufficient human creative input or authorship can be established.¹⁶⁹⁰ However, the growing use of artificial intelligence to generate data products, analytics, and imagery from autonomous satellite systems creates serious complications. The Berne Convention, which governs copyright internationally, requires that a work have a human author to qualify for copyright protection. AI-generated outputs do not meet this requirement under the laws of most countries. WIPO's ongoing intergovernmental deliberations on artificial intelligence and intellectual property are directly relevant to this issue and will shape how satellite data products are protected in the future.¹⁶⁹¹

6. Dual Use Technology and Export Controls

Space technology is inherently dual-use in nature, meaning it has both civilian and military applications. Rocket engines can launch satellites or deliver warheads. Remote sensing satellites can monitor crop yields or enemy troop movements. This dual-use character means that space technology IP is subject to heavy export control restrictions in most major spacefaring nations. In the United States, the **International Traffic in Arms Regulations (ITAR)** and the **Export Administration Regulations (EAR)** strictly control the transfer of space technology IP across national borders. European nations operate under the **EU Dual Use**

Regulation, which imposes similar restrictions. These export control regimes profoundly affect how space technology patents can be licensed internationally, who can be a licensee, and under what conditions technology can be shared, creating significant additional complexity for companies seeking to commercialise space IP globally.

B. WIPO Initiatives and Reform Proposals

WIPO's Standing Committee on the Law of Patents has been actively examining the relationship between patents and space based technologies. Its 2022 document, SCP/37/10, formally acknowledged the jurisdictional gaps in current IP frameworks as they apply to outer space activities. The document proposed three main options for addressing these gaps: first, the negotiation of an international agreement specifically addressing intellectual property rights in outer space; second, the development of model national legislation that countries could adopt to harmonise their domestic space IP laws; and third, enhanced international cooperation among patent offices in examining space technology patent applications.

Legal scholars and industry groups have gone further, proposing the creation of an "International Space IP Convention" that would establish a specialised legal regime, or *lex specialis*, for intellectual property in space activities.⁵² Such a convention would create clearer and internationally agreed rules on the ownership of inventions made in space, the licensing of space technology IP, and the enforcement of IP rights against infringers operating in orbit or on other celestial bodies. As of early 2026, no binding international instrument on space intellectual property rights had been concluded, and the international community remained divided on the best path forward.¹⁶⁹²

¹⁶⁹⁰ Feist Publications Inc. v. Rural Telephone Service Co., 499 U.S. 340 (1991), establishing that copyright requires a minimal degree of human creative authorship. Satellite images meet this standard to the extent that human operators make creative choices about imaging angles, spectral bands, and processing parameters. See also Satellite Imaging Corp. v. Brouillette, No. 4:11-CV-3224 (S.D. Tex. 2013).

¹⁶⁹¹ WIPO, *Revised Issues Paper on Intellectual Property Policy and Artificial Intelligence*, WIPO/IP/AI/2/GE/20/1 REV (2020). WIPO's Conversation on IP and AI has specifically identified satellite data analytics and remotely sensed imagery generated by autonomous systems as a priority area requiring policy guidance.

¹⁶⁹² COPUOS Legal Subcommittee, *Report of the Legal Subcommittee on its Sixty-Second Session*, A/AC.105/1283 (2023), para. 102: "No consensus has yet

VIII. Conclusion

Intellectual property rights in space pose another complicated problem for international law that seems particularly relevant to our time. While the current framework of international space legislation and intellectual property legislation was devised decades ago and aimed at regulating activities carried out exclusively by governmental agencies on territory belonging exclusively to the state, the modern reality of the space sector, which amounts to hundreds of billions of dollars in revenues, requires urgent changes to the existing paradigm.

Indeed, the shortcomings of the current legal framework are quite obvious and need fixing. There is no framework for intellectual property rights in space when it comes to multinational research groups developing technologies in space stations or private companies extracting resources from space. Additionally, autonomous AI technology that creates new products and information in orbit challenges the very idea that authors of copyrighted work must be humans. Finally, the lack of any international mechanism to enforce intellectual property rights in space threatens to make all efforts to create those meaningless.

The path forward is clear in outline, if not yet in detail. What we require at this point is a coordinated effort by all involved parties, starting with WIPO, UNOOSA, ITU, and patent offices around the world, to develop a comprehensive framework for intellectual property rights in space that would provide a solution to all problems mentioned above. Meanwhile, all parties interested in space and IP will have to resort to a patchwork of national legislations and standard practices including the recently developed Artemis Accords. With humanity soon facing the prospect of permanent settlements on other planets, the question of regulation of products of human creativity and ingenuity

becomes a pressing issue of 21st-century international law.¹⁶⁹³

emerged among Member States on the need for or content of an international instrument specifically addressing intellectual property rights in the context of outer space activities."

¹⁶⁹³ Lyall, F. and Larsen, P.B. (note 3 above, Jurisdictional Basis section), p. 421: "The extension of the rule of law to outer space is not merely a legal aspiration. It is a practical necessity for the sustainable long term use of space for the benefit of all humanity."