PROTECTING INTELLECTUAL PROPERTY IN OUTER SPACE: CHALLENGES AND SOLUTIONS

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I. INTRODUCTION

The commercialization of outer space in the 2020s is one of the largest seismic shifts in human history, as we venture away from Earth and travel throughout the solar system. Yet, outer space today is still a legal vacuum governed mostly by several 20th century treaties which do not focus on the needs of the 21st century. The upcoming exploration and commercialization of outer space will lead to the building of hotels, shopping centers, laboratories, universities, homes, and necessary related goods and services as we "recreate" human life off-planet. With these developments, we will need a legal infrastructure for space, not to "over-regulate" or

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"colonize" it, but to create a safe environment for its new population and a solid basis for both national and private investment.

One legal segment which has been neglected in space is intellectual property (IP) which protects patents (inventions), trademarks (commercial symbols and indications of origin) and copyrights (creative expressions such as art, music, literature, and software). Although this subject has been debated for decades in the United Nations and the World Intellectual Property Organization (WIPO), nothing major has been done to create a legal framework for IP in space. Multiple countries are currently traveling in outer space,[1] and Earth-orbit hotels, as well as Moon and Mars cities are being planned.[2] The IP legal structure needs to be implemented *now* to avoid chaos off-world. This brief review will set forth the current legal situation, as well as principles and parameters for a working model of IP law in outer space. These principles which use trademarks as an example can be used for patents, copyrights, and other intellectual property as well, keeping in mind the differences between "creating" rights off-world and "enforcing" these rights (which can be quite different).

II. THE CURRENT STATE OF AFFAIRS

At the height of the Cold War in the 1950s and 1960s, the originators of space travel, the Soviet Union and the United States were engaged in a two-way "Space Race." Now China, the European Space Agency (ESA), India, Israel, Japan and many others have hearty space programs.[3] New space programs are being developed in countries such as Malaysia, Egypt, Indonesia, Pakistan, South Korea, North Korea, Iran and Saudi Arabia.[4] Moreover, the era of private sector space flights has begun. Virgin Galactic launched the

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[1] Avery Koop, *Visualized: Which Countries are Dominating Space?*, VISUAL CAPITALIST (July 8, 2022), https://www.visualcapitalist.com/visualized-which-countries-are-dominating-space/.

[2] Caroline Delbert, *See the Astonishing Plans for the Very First City on Mars*, POPULAR MECHANICS (Mar. 24, 2021), https://www.popularmechanics.com/science/a35915975/mars-city-nuwa-plans/.

[3] *Countries with Space Programs 2023*, WORLDPOPULATIONREVIEW.COM (Jan. 1, 2023), https://worldpopulationreview.com/country-rankings/countries-with-space-programs.

[4] *Id.*

first commercial flight to the edge of space.[5] Private companies from countries ranging from the United States to India to the United Arab Emirates and even China are now looking to outer space as the next area of commercial development eyeing new industries like asteroid mining.[6] These developments go hand-in-hand with other major disrupter technologies including artificial intelligence and the metaverse.

The number of satellites in space has exploded in recent years. Between 2000 and 2021, the number of active satellites in orbit has increased more than five-fold from 769 to approximately 5,000.[7] Additionally, from 2020 to 2021 alone, the total number of satellites in orbit increased by almost 30 percent.[8] Perhaps most relevant in the near term, with the completion of China's Tiangong Space Station, the International Space Station now has a companion for the first time since Mir was decommissioned in 2001.[9] Where in past films we have been shown glimpses of trademarks in space, including, PAN AMERICAN (PAN AM) and HOWARD JOHNSON'S in "2001: A Space Odyssey" (1968) or HILTON or MARS TODAY (a play on USA TODAY) in "Total Recall" (1990), the very near future promises a flood of off-world trademarks as well as space-based inventions and software patents. For example, Merck has is partnering with Varda Space Industries to create pharmaceuticals in space.[10] Moreover, Rolls-Royce plans to build a nuclear reactor on the Moon,

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[5] Michael Sheetz, *Virgin Galactic Completes First Commercial Flight in Major Step for Space Tourism Company*, CNBC (June 29, 2023), https://www.cnbc.com/2023/06/29/virgin-galactic-first-commercial-spaceflight-live-stream-updates.html.

[6] Robert Lea, *What's Next for India's Chandrayaan-3 Moon Rover Mission?*, SPACE.COM (July 14, 2023), https://www.space.com/india-chandrayaan-3-Moon-mission-next-steps.

[7] Erick Burgueno Salas, *Number of Active Satellites from 1957 to 2021*, STATISTA (Feb. 10, 2022), https://www.statista.com/statistics/897719/number-of-active-satellites-by year/#:~:text=In%202021%2C%20there%20was%20an,3%2C291%20active%20satellites%20in%202020.

[8] Nibedita Mohanta, *How Many Satellites are Orbiting the Earth in 2021?*, GEOSPATIALWORLD.NET (May 28, 2021), https://www.geospatialworld.net/blogs/how-many-satellites-are-orbiting-the-earth-in-2021/.

[9] Ramin Skibba, *China Is Now a Major Space Power*, WIRED (Nov. 4, 2022), https://www.wired.com/story/china-is-now-a-major-space-power-tiangong-space-station/.

[10] Jackie Wattles, *Forget Space Tourism. This Company Wants to Make Drug Manufacturing the Next Big Extraterrestrial Business*, CNN (June 12, 2023), https://www.cnn.com/2023/06/12/business/spacex-launch-varda-drug-pharma-space-industry-scn/index.html.

presumably with patent processes and trade secrets which will need protecting.[11]

III. EXISTING INTERNATIONAL APPROACHES TO OUTER SPACE GENERALLY

In outer space, physical property has been regulated under various international conventions, intergovernmental organizations, bilateral and multilateral agreements, international principles and customary law.[12] Furthermore, several types of soft law such as United Nations (UN) General Assembly Resolutions, international commission initiatives and studies by non-governmental bodies provide States with basic guidelines to aid them in their approach to regulating physical property in space.[13] However, despite the numerous bodies of law seeking to regulate physical property in space, there is no international consensus or understanding regarding the regulation of intangible property, such as intellectual property, in outer space.[14] Given the rapid increase in patent and copyright claims to inventions or software created on the International Space Station, it is highly likely that in the near future more attention will be given to intellectual property rights in outer space.[15]

The latest analysis of IP law in space has emphasized a possible contradiction between the concept of proprietary rights in outer space activities and the fundamentals of existing international agreements, such as the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (OST), which promote the exploration and use of outer space for "the benefit and in the interests

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[11] Josh Dinner, *Rolls-Royce Gets Funding to Develop Miniature Nuclear Reactor for Moon Base*, SPACE.COM (Mar. 19, 2023), https://www.space.com/rolls-royce-funding-microreactor-Moon-base.

[12] *See* Comm. on the Peaceful Uses of Outer Space, Rep. of the Comm. on Its Sixty-Second Session, Annex II, ¶ 5, UN Doc A/74/20 (2019).

[13] *Id*.

[14] *See* The International Space Station Intergovernmental Agreement, Jan. 29, 1998, T.I.A.S. 12927, [hereinafter Intergovernmental Agreement].

[15] Bruce Sterling, *Intellectual Property on the International Space Station*, WIRED (Sept. 26, 2009), https://www.wired.com/2009/09/intellectual-property-on-the-international-space-station/.

of all countries" as the "province of all [hu]mankind."[16] Even accepting these principles, this does not mean that outer space will be a lawless free-for-all, since a sound legal system *will* be for the benefit of all humankind. Moreover, times have changed dramatically since the 1960s, with increased governmental activities and private initiatives indicating that issues of ownership in domains such as intellectual property are becoming more important than ever before.[17] Whatever happens, it is highly unlikely that human intellectual property activity in outer space will be an anarchic system where piracy runs rampant and IP owners and governments are powerless to stop the chaos.

Recent history shows that some international attention has been dedicated to intellectual property issues in outer space and that such reactions have been a response to increases in private investments for potential recreational activities.[18] As an example, the UN issued a formal declaration in 1997 delineating the need for outer space contractual agreements to recognize intellectual property rights.[19] A later UN workshop in 2004 proposed the inclusion of intellectual property issues as a topic for exploration by a dedicated legal subcommittee, but this failed to gain the votes necessary to proceed.[20] A continuing body at the UN, the Office for Outer Space Affairs (UNOOSA), acts as the Secretariat for the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS), which may also be a platform to consider IP rights in outer space.[21]

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[16] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 UST. 2410, 610 UNT.S. 205 [hereinafter Outer Space Treaty].

[17] *Intellectual Property and Space Activities*, WORLD INTELL. PROP. ORG. (WIPO) (Apr. 30, 2004), https://www.wipo.int/export/sites/www/patent-law/en/developments/pdf/ip_space.pdf.

[18] *See* The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids, NASA, Sect. 2(1)(b), https://www.nasa.gov/wp-content/uploads/2022/11/Artemis-Accords-signed-13Oct2020.pdf.

[19] *Meeting of Consultants on Inventions Made or Used in Outer Space,* WORLD INT'L PROPERTY ORG. (Mar. 7, 1997), https://www.wipo.int/export/sites/www/patent-law/en/developments/pdf/inventions_space.pdf.

[20] *Intellectual Property and Space Activities*, WORLD INT'L PROPERTY ORG. (Apr. 1, 2004), https://www.wipo.int/export/sites/www/patent-law/en/developments/pdf/ip_space.pdf.

[21] *United Nations Office for Outer Space Affairs*, UNOOSA.ORG (July 1, 2023), https://www.unoosa.org/ (last visited Dec. 20, 2023).

Likely in response to continued interest in private and commercial activities in outer space, the legal subcommittee of the UNCOPOUS discussed the potential creation of a third suborbital territory to complement the existing demarcation between Earth's sky and outer space.[22] This potential new territory could assist with governing activities, and intellectual property-related assets, connected with suborbital space tourism and "zero gravity" flights.[23]

Nevertheless, the concept of a third suborbital territory is in its infancy, and there remains no internationally recognized demarcation line between Earth and outer space. A decent unofficial proxy for the airspace/outer space divide is the "Kármán Line," specifically a demarcation set at 100 kilometers (62 miles) above the Earth's mean sea level.[24] However, the global community remains divided on whether there should be a demarcating line between airspace and outer space at all, and if so, where it should be located. For example, the US has consistently refused to recognize any such borders, and in 1990 extended its legislation to govern certain outer space invention activities as activities that take place within the US with the Patents in Space Act.[25]

A. UN: 1967 Outer Space Treaty

The OST, which entered into force in 1967 , is the first such agreement to address the exploration and research activities of independent States in outer space.[26] Its objective is to ensure that such activities be pursued "for the benefit and in the interests of all countries" and to establish outer space as "the province of all [hu]mankind."[27] This collective and aspirational spirit is shared by later treaties concerning outer space, and, as such, parameters or

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[22] Space Safety L. & Regul. Comm. of the Int'l Ass'n. for the Advancement of Space Safety, *The Definition and Delimitation of Outer Space: Legal and Policy Considerations*, U.N. Doc. A/AC.105/C.2/2018/CRP.9 (2018).

[23] Legal Subcomm. of the Comm. On the Peaceful Uses of Outer Space, Definition and Delimitation of Outer Space, Additional Contributions Received from States Members of the Committee, U.N. Doc. A/AC.105/C.2/2022/CRP.24 (2022).

[24] Daisy Dobrijevic, *The Kármán Line: Where Does Space Begin?*, SPACE.COM (Nov. 14, 2022), https://www.space.com/karman-line-where-does-space-begin.

[25] Patents in Space Act of 1990 § 2, 35 USC. § 105.

[26] See Outer Space Treaty, *supra* note 16.

[27] *Id.* at art. I.

guidelines for property ownership and territorial governance have been absent from such agreements.

Although the OST specifies that outer space is not subject to national appropriation by a claim of sovereignty, by use, occupation, or by any other means,[28] it nevertheless includes certain provisions that could assist in managing future trademark ownership claims, including:

- Activities of nongovernmental entities in outer space shall require authorization and continuing supervision by an appropriate State party to the treaty.[29]
- While present in outer space, objects shall remain under the jurisdiction of their registry State, and any personnel of such objects shall also be under that same jurisdiction.[30] The registry State is typically the location of the object's launch or the State that procures the launching, otherwise known as the "Launching State."[31]
- All participating nations retain the right to access stations, installations, equipment, and space vehicles based on reciprocity, a clause that signals an intention of the UN to encourage free exchange and movement.[32]
- Mechanisms for addressing future conflicts arising from activities carried on by international governmental organizations in their exploration and use of outer space, specifically an allowance that States parties to the Treaty should resolve such questions by either engaging the international organization directly or electing to engage one or more State members of that international organization.[33]

It could be a simple transition to apply several of these principles to IP. For example, the fact that objects in space remain under

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[28] *Id.* at art. II.

[29] *Id.* at art. VI.

[30] *Id.* at art. VIII.

[31] Convention on International Liability for Damage Caused by Space Objects, Sept. 1, 1972, 24 UST. 2389, 961 UNT.S. 187 [hereinafter Liability Convention].

[32] *See* Outer Space Treaty, *supra* note 16, at art. XII.

[33] *Id.* at art. VI.

the jurisdiction of their registry State could be used to justify extending intellectual property rights to an object if it is registered under a State. Such space objects could be registered under the local laws of the States they are registered in. Importantly, when we analyze the statements for the "benefit" of all countries or the "province" of all humankind, that does not mean that space should be a "no-person's land," particularly if "all countries" and "[hu]mankind" agree that space urgently needs a workable legal system.

B. UN: 1968 Rescue Agreement

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space was ratified by States parties in 1968 with the purpose of ensuring that persons or property of one State will be returned to that State if located by another participating State party.[34] It includes provisions mandating the return of property that may (1) be rescued from outer space; (2) fall from outer space and land in the territory of another State; or (3) fall from outer space and be found on the high seas.[35] These provisions essentially retain the original jurisdiction over space objects that may be recovered by another State following an accident or mishap. If an original State of jurisdiction can provide reasonable identifying information, the rescue State must return that property.

C. UN: 1972 Liability Convention

The Convention on International Liability for Damage Caused by Space Objects contains distinct dispute resolution provisions concerning physical property that could provide groundwork for an intellectual property rights enforcement system to govern outer space activities.[36] Specifically, this agreement ties liability to applicable Launching States and specifies that States can claim Launching State rights based upon (i) the identity of the State that launches or procures the launching of a space object, and (ii) the

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[34] The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Dec. 3, 1968, 19 UST. 7570, 672 UNT.S. 119.

[35] *Id.* at art. V.

[36] Liability Convention, *supra* note 31.

territory or facility from where a space object was launched.[37] The Treaty allows for multiple States to be classified as a "Launching State" for a single object based upon shared connections to a particular launch, and permits for claims of joint and several liability as well as claims for contribution that resemble tradition common law tort damage mechanisms.[38] States are also free to mitigate or plan for potential damages through contractual arrangements of their own.[39]

This agreement contains detailed dispute resolution mechanisms that could conceivably be extended to future outer space IP claims. The following provides a detailed structure that could assist in addressing intellectual property disputes:

> An option to present claims through diplomatic channels.[40]
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> Rights to damages due to gross negligence.[41]
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> A one-year statute of limitations.[42]
>
> Establishment of a "claims committee" to review disputes, an arbitration panel composed of three arbitrators who are selected by the States party to the dispute (i.e., one selected by each State and a third selected by the two States mutually).[43]
>
> A reserved freedom for States to form their own bilateral agreements to resolve future disputes.[44]
>
> Reserved rights for States to seek remedies in their own courts, and specification that such local remedies are not required as a prerequisite for the use of other dispute resolution channels.[45]
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> A prohibition on obtaining "double damages" by seeking remedies for the same damages simultaneously through both

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[37] *See id.* at art. I.
[38] *Id.* at art. IV.
[39] *Id.* at art. V.
[40] *Id.* at art. IX.
[41] *Id.* at art. VI.
[42] *Id.* at art. X.
[43] *Id.* at art. XIV-XVI.
[44] *Id.* at art. XXII.
[45] *Id.* at art. XI.

> national courts of a nation and the dispute resolution choices provided under the agreement.[46]

Arbitration enthusiasts are likely to find common ground with these mechanisms, as they resemble structures followed by internationally recognized bodies such as the London Court of International Arbitration (LCIA),[47] the Singapore International Arbitration Centre (SIAC),[48] and the New York International Arbitration Center (NYIAC).[49] However, the Liability Convention's freeform interpretations of jurisdiction and liability may be difficult, but not impossible, to apply in intellectual property disputes. This is because multiple States can qualify as a Launching State under this structure, and the interpretation of damages is not limited to activities in outer space and includes damages that may be encountered on Earth (e.g., damages that may result from a spacecraft's interim flight or any damages sustained on the Earth's surface).[50] This matters because the standard of liability and the potential number of responsible parties varies significantly depending on the location of the damage. Article II of the Liability Convention establishes an absolute liability regime for damage occurring on Earth, where the launching State is held absolutely liable without the need to prove fault.[51] On the other hand, damage occurring in outer space is governed under Article III of the Liability Convention, which establishes a system of fault-based liability where the claimant must prove that the launching State (or entity) was at fault in causing the damage.[52] Therefore, due to the fault-based liability regime, proving IP violations in space could be more difficult than proving damages occurring on Earth. For example, if a satellite improperly uses patented technology in outer space, the claimant must demonstrate fault instead of getting the benefit of an absolute liability

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[46] *Id*. at art. XII.

[47] London Court of International Arbitration, *LCIA Arbitration Rules* (2020), available at https://www.lcia.org/Dispute_Resolution_Services/lcia-arbitration-rules-2020.aspx.

[48] A Singapore International Arbitration Centre, *About Us*, https://siac.org.sg/about-us.

[49] New York International Arbitration Center, *NYIAC* (July 1, 2023), https://nyiac.org/.

[50] *See* Liability Convention, *supra* note 31, at art. I, IV, V.

[51] *See id.* at art. II.

[52] *Id*. at art. III.

regime, which could involve complex jurisdictional and evidentiary challenges.

D. UN: 1976 Registration Convention

The Convention on Registration of Objects Launched into Outer Space provides some clarification on jurisdiction by establishing a formal recordation system for physical objects launched into space.[53] Specifically, it requires that eligible Launching States (i) maintain their own registry systems to document objects launched into space; and (ii) inform the UN Secretary-General of their establishment of such a registry system.[54] Space objects are defined as the objects themselves, their component parts, and any launch vehicles (along with their component parts).[55]

Details of registration requirements include the name(s) of the State(s) acting as the Launching State(s), a designator such as a registration number, the date of launch, orbital parameters, nodal period, inclination, apogee, pedigree, and a general description of the space object's function.[56] The obligations also apply to intergovernmental organizations as long as a majority of States involved in the organization are parties to the Treaty.[57] All parties to the Treaty are required to inform the UN once they become aware that a particular object has become inactive or has left orbit, and there is also a requirement to inform the Secretary-General of a designator or registration associated with any objects that may be "marked" at the time of their launch.[58]

One can easily imagine complementing this treaty with IP registration requirements, thereby generating a civil law-style deposit registration system for intellectual property such as trademarks, patents, copyrights, etc. However, conflicts about State claims may still arise due to the broad parameters permitted for qualifying as a Launching State. In addition, States could conceivably incorporate IP registration requirements in their national deposit systems

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[53] Convention on Registration of Objects Launched into Outer Space, Sept. 15, 1976, 18 UST 2410, 1023 UNT.S. 15.

[54] *Id.* at art. II.

[55] *Id.* at art. I.

[56] *Id.* at art. IV.

[57] *Id.* at art. VII.

[58] *Id.* at art. IV.

for State objects. Because a Launching State retains jurisdiction of its objects in outer space under the OST, it could be argued that the registration and use of any IP associated with said objects should be governed by the national laws of the Launching State. In fact, the United States has affirmatively stated this interpretation in its own national statute dedicated to outer space activities.[59]

E. UN: 1979 Moon Agreement

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies focuses on activities on the Moon and other planets or space surfaces as its title suggests.[60] It reiterates the nonproprietary themes of the OST, namely that exploration and use "shall be the province of all [hu]mankind" and "carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development"[61] and specifies that the Moon is not subject to national appropriation by any claim of sovereignty (by use, occupation, or other means).[62] Although well-intentioned, only eighteen (18) countries have ratified this treaty and one has withdrawn.[63]

These recurring themes seem more a freedom from political claims of sovereignty (i.e., claiming Mars for Country X), than protection of personal property, whether physical or intellectual. This agreement mirrors the jurisdictional aspects of the OST by specifying that parties retain jurisdiction and control over personnel, space vehicles, equipment, facilities, stations, and installations on the Moon specifically, and the presence of such property on the Moon will not affect any State's ownership rights.[64] The Moon

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[59] 35 USC. § 105 (2018) ("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.").

[60] The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 UNT.S. 3 [hereinafter Moon Agreement].

[61] *Id.* at art. IV.

[62] *Id.* at art. XI.

[63] Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcommittee on its Sixty-Second Session, *Status of International Agreements Relating to Activities in Outer Space as at 1 January 2023*, U.N. Doc. A/AC.105/C.2/2023/CRP.3 (2023); United Nations, Depositary Notification C.N.4.2023. TREATIES-XXIV.2 (Jan. 5, 2023) available at: https://treaties.un.org/doc/Publication/CN/2023/CN.4.2023-Eng.pdf.

[64] Moon Agreement, *supra* note 60, at art. XII.

Agreement also contains a clause encouraging the free exchange and movement of property, specifies a right of States to access property on the Moon, and prohibits States from conducting activities that would interfere with activities of other States.[65]

This Treaty could provide the framework for regulation and control over the flow of goods or services on the Moon should such trade ever arise. For example, jurisdiction would be confirmed upon export (departure from one State's Moon facility) and import (delivery to a different State's Moon facility). Any transitory activities could be approached in a manner resembling the existing international framework for regulating high seas that are summarized below; however, it should be noted that this framework is not harmonized.

F. International Space Station Treaty

The International Space Station Intergovernmental Agreement (IGA) has been signed by the 15 governments that are currently participating in activities conducted within the International Space Station (ISS).[66] It permits participating nations to extend their jurisdiction to the ISS, thereby creating different national zones that correspond to the separate pressurized modules of the ISS.[67] The IGA is the first to specify intellectual property protection as a primary objective; and traditional protections for patents, trade secrets, and even marking procedures are specified.[68] Jurisdiction is determined by the location of the activity pertaining to the intellectual property, specifically the pod or specific areas that may be under the control of a nation's particular ISS activities at a given time.[69]

The progressive approach of the IGA is somewhat mitigated by UN treaty obligations, namely adherence to the concept of using space to further the collective benefit of humankind. Of course, this reflects the ideal objective for any outer space initiatives, and the ISS Treaty therefore obligates parties to exchange technical data and goods "when necessary" to ensure that the ISS is operated

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[65] *Id.* at art. VIII.

[66] *See* Intergovernmental Agreement, *supra* note 14.

[67] *Id.* at art. V

[68] *Id.* at arts. XVI, XXI

[69] *Id.* at art. XXI

effectively.[70] Nevertheless, the ISS provides a solid basis for States to claim control over any IP creation and use that may result from their activities.

Notably absent from the IGA is any structure regarding dispute resolution. Intellectual property claims are deferred to "the parties' respective national regimes for intellectual property" and any contractual arrangements between parties.[71] The European Space Agency (ESA) has already mandated a contractual prerequisite for the use of its facilities, namely that parties using its facilities will agree to a waiver of liability and agree not to pursue their own arbitration claims or lawsuits concerning activities connected to the ISS.[72] As a result, any cooperating parties must agree with the ESA on the applicable law for disputes and arbitration procedures before conducting their ISS activities.

The issue of jurisdiction is likely to become a hot topic in response to the growth in research and commercial activities within the ISS. For instance, European nations that are situated thousands of miles from Japan on Earth are instantly within a spacewalk of each other. Disharmonies in any intellectual property approaches will come into instant conflict, and the ISS Treaty as drafted is currently not suited to address such scenarios.

At best, Article 5(2) states that the exercise of jurisdiction and control over registered flight "elements" (i.e., pods) is subject to any relevant provisions of the agreement itself, the memoranda of understanding (MOU's), and implementing arrangements such as relevant established procedural mechanisms.[73] This implies that some vague established procedural mechanisms are the designated tool to resolve intellectual property disputes, which is not an adequate solution for any serious conflict.

Furthermore, Article 23(1) does add a general clause recommending consultation and dialogue between partners to the treaty for any problems related to space station activities, which could be interpreted as some form of arbitration clause.[74] However, a

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[70] *Id.* at art. XIX

[71] *Id.* at art. XXI

[72] European Space Agency (ESA), *International Space Station Legal Framework*, ESA (July 1, 2023), https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/International_Space_Station/International_Space_Station_legal_framework.

[73] Intergovernmental Agreement, *supra* note 14, at art. 5.

[74] *Id.* at art. 23.

general arbitration clause recommending consultation between partners is not suited to the complex and multifaceted issues which frequently arise in intellectual property disputes, and furthermore, the arbitration clause isn't even related to intellectual property, but to disputes in general.

Perhaps at some point, the ISS's Multilateral Coordination Board, the body comprising representatives from each participating party in the ISS,[75] will be able to hash out specific procedures for protecting data and goods within the ISS. However, this seems highly unlikely since the ISS will be decommissioned by the end of 2030 at the latest.[76]

IV. EXAMPLES OF NATIONAL LEGISLATION

A. Australia

The Space Activities Act was passed by the Australian legislature in 1998. Its current version includes (i) key terms of Australia's treaty obligations under the various UN treaties detailed above,[77] and (ii) terms of Australia's bilateral agreement with the Russian Federation concerning cooperation in the exploration and use of outer space for peaceful purposes.[78] The Space Activities Act covers space activities carried on or launched from Australia, and also binds Australian nationals who may conduct outer space activities from a different Launching State.[79]

While Australian space law does not iterate a formal stance on the legal status of intellectual property in outer space, it does permit future regulations to codify certain outer space intellectual property provisions detailed in Australia's 2001 bilateral agreement with the Russian Federation.[80]

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[75] Carlyle Webb, *Multilateral Coordination Board Joint Statement*, NASA (Mar. 5, 2019), https://www.nasa.gov/feature/multilateral-coordination-board-joint-statement.

[76] Michael Bock, *FAQ: The International Space Station 2022 Transition Plan*, NASA (Feb. 11, 2022), https://www.nasa.gov/feature/faq-the-international-space-station-2022-transition-plan.

[77] Space Activities Act, 1998 (Act No. 123, 1998) (Cth) pt III div 2 (Austl.) [hereinafter Austl. Space Act].

[78] *Id.* at sch 6.

[79] *Id.* at pt III div 1.

[80] Dan Morgan, *Recent Developments in Australian Space Law*, 13 Austl. Int'l L. J. 271, 271 (2001).

Article 7 of that bilateral agreement accounts for all intellectual property recognized by the WIPO Convention, including trademarks.[81] It encourages contractual arrangements by permitting the intellectual property agencies of these nations to reach their own separate agreements concerning conditions and principles that will be applied to intellectual property used or resulting from their joint outer space activities.[82]

B. United States

The United States codified its own legislation regarding IP in outer space in the form of 35 USC. § 105 in 1990.[83] Section 105(a) of the statute states that "[a]ny 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" subject to international agreements and foreign Launching State claims.[84] The international agreement component may support or prohibit US jurisdiction, and section 105(b) of the statute allows for the US to retain jurisdiction on a foreign space object if provided for in an agreement with a foreign State.[85]

The statute effectively extends all appropriate US federal laws to applicable activities in outer space, and it is conceivable that US federal trademark, copyright, and patent law could be extended under this statute to govern certain commercial activities in space.

C. United Kingdom

The United Kingdom has an interesting statute entitled the "Outer Space Act" (1986) which, among other subjects, authorized the Outer Space (Jurisdiction) Order (1987) (Stat. Instruments 1987-1493) in which the UK criminal law was clearly extended to UK space objects.[86] Although this statute does not reference IP *per se*, it could apply to IP violations which are criminal, for example,

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[81] Austl. Space Act at sch 6, art VII.

[82] *Id*.

[83] *See* 35 USC. § 105.

[84] *Id*.

[85] *See* 35 USC. § 105(b).

[86] Outer Space (Jurisdiction) Order 1987, SI 1987/1493, art. 3 (UK).

counterfeiting. Several other countries have somewhat similar statutes, showing a movement in this direction.

V. LAW OF THE SEA

The laws regulating the high seas are frequently referred to as a potential model for the regulation of outer space, because like space, part of Earth's oceans exist outside the sovereignty of any individual nation. The primary convention governing the Earth's oceans is the UN Convention on the Law of the Sea (UNCLOS), an agreement that divides the seas into various territories based on their proximity to a nation's coasts.[87] Under UNCLOS, the waters near a nation's coasts are separated into: 1) territorial waters, the waters within 12 miles of a State's coast which the State has complete jurisdiction over;[88] 2) contiguous zones which can only be used to enforce various tax, immigration, and customs laws;[89] and 3) the still contested concept of exclusive economic zones which a State can only use for extracting and selling natural resources.[90]

The organized regime of UNCLOS provides an appealing method for regulating shared zones of outer space using the "flag law"[91] approach. However, practical issues remain concerning how to measure and govern outer space "quasi-territories" (a legal form of territory under international law where some form of low-level sovereignty exists). It should be noted that UNCLOS includes an abundance of independent State declarations and reservations, and that the United States has not ratified it. Conflicts in State views regarding fundamentals of international sea governance have been recently illustrated by fishing rights disputes, State disputes concerning rites of passage, and broad claims to land rights that can include reefs and atolls.[92]

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[87] The U.N. Convention on the Law of the Sea, Dec. 10, 1982, 1833 UNT.S. 397.

[88] *See id.* at art. 3.

[89] *Id.* at art. 33.

[90] *Id.* at art. 57.

[91] *See* the Lotus Case, *S.S. "Lotus" (Fr. v. Turk.)*, Judgment, 1927 P.C.I.J. (ser. A) No. 10 (Sept. 7).

[92] Sam Bateman, *UNCLOS and Its Limitations as the Foundation for a Regional Maritime Security Regime*, 19 KOREAN J. DEF. ANALYSIS 27 (2007).

VI. HOW DO WE EXTEND IP PROTECTION TO OUTER SPACE IN THE FUTURE?

There is already a wide body of laws regulating physical property in outer space in the form of UN agreements and declarations, domestic legislation, and various international agreements. These laws can provide a foundation for regulating intellectual property and other forms of intangible property in outer space, and it would not be exceedingly difficult to add in several intellectual property provisions to the national laws, international customs, international treaties, and dedicated international organizations that already exist today. While there are many ways to approach IP rights in outer space, the three strategies listed below seem to be the most practical solutions to address the problem.

Approach #1: Expansion of Current National and International Law to Off-World Issues

An approach that can come into being immediately is for Earth-bound judges and arbitration panels to take jurisdiction *now*, whether in a contract choice-of-law and venue clause or merely on common law principles. For example, if there is a trademark franchise agreement for a fast-food restaurant in an orbiting hotel, and this agreement is breached by the franchisee, action can be taken back on Earth with no need for an orbiting court to decide. However, this situation becomes more complicated when there is no written contract. There might arise a scenario where some unnamed third party uses a competitor's trademark in an orbiting hotel without consent. Nevertheless, even this difficult problem is not unsolvable. The United States has made it clear that it intends to apply its "interstate commerce" principles to invention activities governed by 35 USC § 105, and thus it may be a clear next step for national IP rights to extend to US-claimed space property (a principle that could apply to any country or trading bloc such as the European Union). For these avenues to work, interested IP owners must begin the process of including IP clauses in contracts immediately and start testing these theories in courts to build a body of extraterritorial jurisdiction case law, much as was done concerning the internet

in the 1990s concerning the use of IP on "active" or "passive" websites.[93]

The statute could also establish a basis for extending intellectual property protection to outer space as it creates precedent for the extension of all IP law into outer space since patent law has already been extended to space. Review of other statutes strengthens this argument.

51 USC. § 51302 also encourages commercial exploration and recovery of space resources by United States citizens, which could also provide a legal basis for extending IP law into outer space.[94] Subsection a. of 51 USC. § 51302 states that the president shall:

> **1.** Facilitate commercial exploration for and commercial recovery of space resources by United States citizens;
>
> **2.** Discourage government barriers to the development in the United States of economically viable, safe, and stable industries for commercial exploration for and commercial recovery of space resources in manners consistent with the international obligations of the United States; and
>
> **3.** Promote the right of United States citizens to engage in commercial exploration for and commercial recovery of space resources free from harmful interference, in accordance with the international obligations of the United States and subject to authorization and continuing supervision by the Federal Government.[95]

While intellectual property is not explicitly mentioned, there is a near universal agreement that intellectual property rights will be required for the commercial development of space and quite likely the future of space development and exploration itself.[96] Without clear intellectual property rights in space, it is quite

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[93] Kasey J Curtis, *Active vs. Passive Websites: How Businesses Can Navigate This Potentially Costly Distinction*, REEDSMITH.COM (Apr. 6, 2011), https://www.reedsmith.com/en/perspectives/2011/04/active-vs-passive-websites-how-businesses-can-navi. *See* the "Sliding Scale" approach articulated in Zippo Manufacturing Co. v. Zippo Dot Com, Inc., 952 F. Supp. 1119, 1124 (W.D. Pa. 1997).

[94] US Commercial Space Launch Competitiveness Act, 51 USC. § 51302.

[95] 51 USC. § 51302(a).

[96] Rosario Avveduto, *Past, Present, and Future of Intellectual Property in Space: Old Answers to New Questions*, 29 WASH. INT'L L. J. 203, 238-39 (2019).

probable that investors will not want to risk funding space operations which may not be legal under the laws of their respective jurisdictions.[97] Therefore, an argument could be made that to facilitate the commercial exploration of space, and to discourage government barriers to the development of space exploration, intellectual property rights should be established under this statute.

Similarly, Executive Order 13914, titled Encouraging International Support for the Recovery and Use of Space Resources, also creates a precedent for the extension of IP protection to outer space.[98] The order states that

> "Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space, consistent with applicable law. Outer space is a legally and physically unique domain of human activity, and the United States does not view it as a global commons. Accordingly, it shall be the policy of the United States to encourage international support for the public and private recovery and use of resources in outer space, consistent with applicable law.[99]

While the Executive Order does not mention intellectual property specifically, since IP will almost certainly be required for the commercial development of space, this Executive Order could arguably be used to extend IP law into outer space.

Likewise, Space Policy Directive-1 (SPD-1), titled Reinvigorating America's Human Space Exploration Program, also reiterates the idea that Americans should have the right to engage in the commercial exploration of space.[100] Since IP will play such a crucial role in the commercial exploration of space, SPD-1 could justifiably be extended to cover intellectual property rights in outer space.

In addition, section 6 of Space Policy Directive-2 (SPD-2), titled Streamlining Regulations on Commercial Use of Space, requires the Executive Secretary of the National Space Council review export licensing regulations affecting commercial space flight activity and develop recommendations to revise such regulations.[101]

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[97] Sandeepa Bhat B., *Inventions in Outer Space: Need for Reconsideration of the Patent Regime*, 36 J. Space L. 1, 5 (2010).

[98] Exec. Order No. 13,914, 85 Fed. Reg. 20381 (Apr. 10, 2020).

[99] *Id*.

[100] Space Policy Directive-1 of December 11, 2017, 82 Fed. Reg. 59,501 (Dec. 14, 2017).

[101] Space Policy Directive-2 of May 24, 2018, 83 Fed. Reg. 24,901 (May 30, 2018).

Since intellectual property, especially patents, could be classified as export material affecting commercial space flight activity, SPD-2 could be used to get the National Space Council to draft and recommend regulations covering IP rights in space.

Moreover, subsection b. of 15 USC. § 1126 states that

> Any person whose country of origin is a party to any convention or treaty relating to trademarks, trade or commercial names, or the repression of unfair competition, to which the United States is also a party, or extends reciprocal rights to nationals of the United States by law, shall be entitled to the benefits of this section under the conditions expressed herein to the extent necessary to give effect to any provision of such convention, treaty or reciprocal law, in addition to the rights to which any owner of a mark is otherwise entitled by this chapter.[102]

While this statute likely meant the word person to refer to actual human beings, the statute does not define the word person, and therefore it could be argued that the term person could also refer to a legal entity, such as a corporation or the type of intergovernmental organization described in the Madrid Protocol.[103] If the term person does in fact refer to a legal entity and not an actual human, then any businesses or intergovernmental organizations created in space would be entitled to trademark protection under this statute.

Finally, subsection b. of 51 USC. § 50911 states that "No holder of a license under this chapter may launch a payload containing any material to be used for purposes of obtrusive space advertising."[104] The term obtrusive space advertising is not clearly defined in this statute, however there is a possibility that the term obtrusive space advertising could be extended to include trademark infringement/trademark violations, since advertising that violates a company's registered trademarks would probably be considered obtrusive space advertising by that company. Therefore, this statute could be used to regulate trademark violations in space by classifying them as obtrusive advertising.

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[102] Trademark Act of 1946, 15 USC. § 1126.

[103] *See* Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks, June 27, 1989, 28 I.L.M. 1664, [hereinafter Madrid Protocol].

[104] 51 USC. § 50911.

Action Item: Include such clauses in all current agreements being negotiated, regardless of whether there are any immediate plans to use, develop, or create IP in space. IP recognition and enforcement can be controlled by contract to some extent until the off-world enforcement infrastructure is created. For example, a franchisee can recognize a franchisor's rights in a trademark in Earth's orbit regardless of whether they are "registered," and agree to an Earth-bound conflict resolution framework.

Approach #2: Madrid Protocol Trademark Treaty Extension

Using trademark law as an example, one of the simplest ways to extend trademark protection to outer space would be through the utilization of the Madrid Protocol system created under WIPO, which has 114 members covering 130 countries at the time of this writing.[105] The basic premise of the Madrid Protocol is that trademark owners in States that are members of the Protocol can extend their trademark rights to other foreign States by depositing their domestic trademark registrations at WIPO, and on the other hand trademark owners in foreign States can extend their trademark rights back through the same process.[106] It would not be exceedingly complex or difficult to extend this system to the registration of trademarks in outer space.

In a document titled Records of the Diplomatic Conference for the Conclusion of a Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks,[107] there were several critical comments made during the summary minutes of the Madrid Protocol which indicated the delegates' intent for trademark protection to apply via intergovernmental organizations, even if such organizations are created in space. For example, Mr. Schwab, the delegation of the European communities, celebrated the fact that Article 14 of the Madrid Protocol would enable any intergovernmental organization to become a contracting party to the protocol so long as it established some sort of trademark office,

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[105] Madrid Protocol, *supra* note 103.

[106] *Id*.

[107] Records of the Diplomatic Conference for the Conclusion of a Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks, (1989), https://www.wipo.int/export/sites/www/treaties/en/docs/prep-docs/1989_june_Madrid_345-en.pdf.

without clarifying that such an office would have to be located on Earth.[108]

Additionally, on the same pages, Dr. von Mühlendahl, from the delegation of Germany, agreed, and stated that not only should the Benelux Trademark Office (BTO) and the European communities be able to become contracting members of the Madrid Protocol, but any regional organization or group should be eligible to become members of the Madrid Protocol.[109] He reasoned that there were several regions in the world where groups of nations wanted to abolish their national laws and replace them with a regional organization with regional laws, and that if such countries agreed to create an intergovernmental organization having legal capacity, then that organization should be able to become a member of the Madrid Protocol.

This is significant because it means that any intergovernmental organization, even if it has no attachment to a nation's national laws but is instead an entirely original entity composed of a regional legal system, might be eligible become a member of the Madrid Protocol. This reasoning would imply that a novel intergovernmental organization created for space, whether in orbit or on Earth, with a novel regional legal system divorced from any national law, might nevertheless be eligible to become a contracting party of the Madrid Protocol and thereby extend trademark protection into outer space.

Notably, Mr. Bogsch, the director general of WIPO at the time, agreed with this interpretation, furthering the idea that WIPO might allow an intergovernmental organization created in space for the purpose of regulating trademarks in space to become a contracting party of the Madrid Protocol.[110]

Additionally, 15 USC. § 1141l explicitly affirms the principle that intergovernmental organizations might become contracting members of the Madrid Protocol, stating that "An extension of protection may be assigned, together with the goodwill associated with the mark, only to a person who is a national of, is domiciled in, or has a bona fide and effective industrial or commercial establishment either in a country that is a Contracting Party or in a country

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[108] *Id.* at 264-68.

[109] *Id.*

[110] *Id.* at 267-68.

that is a member of an intergovernmental organization that is a Contracting Party."[111]

A new protocol could be added to the treaty (which would need to amend the accession process in Article 14 of the Protocol to allow these areas to become jurisdictions) to expand protection to Earth's orbit, the Moon, and Mars, which each member could either accept or reject. Another vehicle to extend the Protocol is to have Earth members state that their protection extends off-world (e.g., India declaring that its Madrid Protocol rights extend to an orbiting Indian hotel). A clear distinction should be made between whether registration can be *extended* to these areas, and whether the registration can be *enforced* there.

It is probable that enforcement will lag extension, but that should not be a reason for refusing to establish a system whereby rights are claimed, and notice is given to third parties of these claims. For example, if the ABC trademark is extended to the Moon by the Madrid system, but the lunar enforcement infrastructure is not yet created, a competitor of the owner of the ABC trademark may think twice before using ABC on the Moon. These rights may also be helpful in corporate due diligence schedules and financial balance sheets, and in establishing a larger trademark portfolio for possible security interests or licensing.

Action Item: Start now at the grassroots level to lobby governments, WIPO, and professional associations worldwide to add outer space to this treaty. Amending any treaty takes time, and even with best efforts, this amendment may not come into being before 2030.

Approach #3: New or Amended Treaties to Protect Intellectual Property in Space

Of course, an obvious path to take is to create a new treaty specifically for intellectual property, like the intellectual property sections of the IGA. This treaty could fully develop the exact scope of protection for all forms of intellectual property and provide enforcement mechanisms, such as court or arbitration panel review, whenever violations occur. Alternatively, some of the current treaties listed above could be amended to include protection and enforcement mechanisms for IP in outer space. Several of the treaties

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[111] Madrid Protocol Implementation Act, 15 USC. § 1141l.

noted above already protect physical property and do not have to be freshly negotiated, only the amendments need to be.

For example, the Registration Convention could be amended by including a one-sentence clause stating that IP rights and protection are extended to any IP created in outer space onboard a registered space object, with said rights and protections being the policies and laws of the Launching State. Alternatively, the OST could be amended (i.e., OST 2.0) by including a brief clause stating that IP rights do not infringe the "common benefit of all [hu]mankind" principle enshrined in Article II, opening up the door for States to begin creating statutes and treaties to regulate IP in space. Several approaches to what type of sovereignty would apply to lunar "landing zones" or space stations generally have been discussed, along with an Antarctica-style "condominium" joint ownership approach even mentioned.

In fact, an issue paper titled *Intellectual Property and Space Activities*,[112] WIPO pointed out the difficulty that a lack of normative intellectual property law imposes on businesses, investors, and governments, and stated its goal to harmonize the application of intellectual property law to outer space. WIPO acknowledges that the current state of intellectual property law is inadequate to deal with the upcoming privately-driven commercialization of space. However, any such treaty approach will take years if not decades to achieve, lagging *far behind* commercial reality in space.

VII. CONCLUSION

When the international community first confronted IP on the internet, such as websites, domain names, and even social media at the beginning of the 21st Century, it was said the problem was too vast and overwhelming, and that solutions would be impossible. However, this problem was steadily solved, by establishing ICANN for domain names, DMCA copyright takedown procedures, protocols for social media, and related procedures. Now, an ever-larger challenge exists; extending IP protection to the vastness of space. However, we can start now to prepare for this very near future, regardless of whether the IP in question relates to Earth orbit, the Cislunar space between Earth and the Moon, the Moon itself, Mars,

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[112] *See Intellectual Property and Space Activities*, *supra* note 17 at 6-7.

or even to asteroids in the outer reaches of the solar system. The choice is ours: stay ahead of technology or be overwhelmed by it.