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# INTERSECTION OF U.S. PATENTS AND SPACE LAW – HOW INFRINGEMENT EXISTS AMONG THE STARS

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# INTERSECTION OF U.S. PATENTS AND SPACE LAW – HOW INFRINGEMENT EXISTS AMONG THE STARS

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*With the recent proliferation of the commercialization of space, private entities are beginning to race towards the sky. Increased use of privatized money in space has greatly increased the probability of intellectual property used outside the bounds of the United States on the terrestrial Earth. Current literature has analyzed certain aspects of international space treaties but very few have proposed solutions to combatting space travel. Current literature has not proposed any solutions to the current evolution and explosion of space travel. This paper reviews the past historical analysis from previous authors, looks forward to the proliferation of privatized space travel, and tests a variety of issues coming to the future. This paper proposes a novel framework to determine what constitutes the territory of the United States for the purposes of patent infringement.*

*This paper is broken up into four parts: Part I details the history of patent inventorship within the United States. Additionally, this part outlines the history of space exploration, certain space treaties the United States abides by, and defines characteristics associated with developing the space programs within the United States. Part II explores the United States' jurisprudence with federal causes of action and patent infringement. Additionally, this part briefly explores international treaties the United States abides by and details the criticism of utilizing those treaties as a framework for outer space law in the context of patent infringement in outer space. Part III details solutions to bringing forth domestic causes of action for outer space patent infringement which were discussed in part II.*

International Intellectual Property, Spring 2022
Professor Colleen V. Chien

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[1] J.D. Candidate at Santa Clara University School of Law, Class of 2022. I would like to thank Professor Colleen V. Chien for enthusiastically encouraging this project and for her mentorship throughout law school; my law school colleagues who have helped and supported me throughout this project including: Michael Wang, Lilas Abuelhawa, and Grant Wanderschield; and the Santa Clara High Tech Law Journal Editorial Board and Staff for their invaluable suggestions.

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## I. A BRIEF HISTORY OF OUTER SPACE EXPLORATION AND INTERNATIONAL OUTER SPACE TREATIES

Cold War competition pitted the United States and Soviet Union against each other. Outer space was the next dramatic arena for competition as each side sought to prove the superiority of each nation's technology, military, and economy.[2] On October 4, 1957, humankind was no longer bound to Earth's terrestrial crust as the Soviet Union successfully launched the world's first artificial satellite, Sputnik I.[3] This launch "ushered in new political, military, technological, and scientific developments."[4] To ease Cold War tension, President John F. Kennedy sought to cooperate with the Soviet Union on outer space projects such as a joint lunar landing.[5]

The following year the United States and the Soviet Union began discussions regarding the peaceful use of outer space. [6] Both nations presented the issues for debate to the United Nations.[7] Later, the United Nations instituted the Office for Outer Space Affairs ("UNOOSA") to serve as the space expert unit of the executive arm of the United Nations.[8] UNOOSA serves the General Assembly by implementing its decisions and by fostering intergovernmental cooperation and awareness.[9]

In 1959, the United Nation's General Assembly established another specialized body, the Committee on the Peaceful Uses of Outer Space ("COPUOS").[10] COPUOS is tasked with identifying legal problems related to space and devising the programs to be

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[2] *The Space Race*, HISTORY (Feb. 21, 2020), https://www.history.com/topics/cold-war/space-race.
[3] *Sputnik and the Dawn of the Space Age*, NASA HISTORY DIVISION (last visited May 16, 2022), https://history.nasa.gov/sputnik.html.
[4] *Id.*
[5] Major Brian D. Green, *Space Situational Awareness Data Sharing: Safety Tool or Security Threat?*, 75 A.F. L. REV. 39, 86 (2016).
[6] Edward Ezell & Linda Ezell, *The Partnership: A History of the Apollo-Soyuz Test Project*, NASA Special Publication–4209, 38–41 (1978), http://www.hq.nasa.gov/office/pao/History/SP-4209/ch2-2.html.
[7] *Id.*
[8] *A Timeline of the Exploration and Peaceful Use of Outer Space*, U.N. OFF. FOR OUTER SPACE AFF. (last visited May 16, 2022), https://www.unoosa.org/oosa/en/timeline/index.html.
[9] *Patent Expert Issues: Inventions in Space*, WIPO (last visited May 16, 2022), https://www.wipo.int/patents/en/topics/outer_space.html (Hereinafter "Patent Expert Issues").
[10] *Id.*

undertaken by the United Nations.[11] In 1966, an agreement was reached regarding the Outer Space Treaty and the following year the treaty went into force.[12] The 1967 Outer Space Treaty is often regarded to as the space constitution as it is the foundational space treaty promulgated by the United Nations.[13] Treaties promulgated after the Outer Space Treaty attempted to clarify some of the ambiguous language in the treaty.[14] Specifically, the 1968 Rescue Agreement; the 1972 Liability Convention; the 1975 Registration Convention; and the 1979 Moon Treaty all expanded on the Outer Space Treaty and clarified some of the ambiguous language in the treaty.[15]

Space activities are rapidly shifting from state-owned activities to private and commercial activities.[16] "For quite some time, space was out of our reach. Today, space technology has become increasingly advanced and developments in this field have resulted in the formation of laws governing outer space and intellectual property rights."[17] Commercial use of outer space uses equipment sent into Earth orbit or outer space.[18] The Space Economy is accelerating

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[11] *Committee on the Peaceful Uses of Outer Space*, U.N. OFF. FOR OUTER SPACE AFF. (last visited May 16, 2022), https://www.unoosa.org/oosa/en/ourwork/copuos/index.html#:~:text=The%20Committee%20on%20the%20Peaceful,for%20peace%2C%20security%20and%20development.

[12] U.N. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, art. 2, Jan. 26, 1967, 610 U.N.T.S. 8843 (Hereinafter "Outer Space Treaty").

[13] Yasmin Ali, *Who owns outer space?*, BBC (Sept. 25, 2015), https://www.bbc.com/news/science-environment-34324443; Stacy Morford, *The Outer Space Treaty has been remarkably successful – but is it fit for the modern age?*, THE CONVERSATION (Jan, 27, 2017), https://theconversation.com/the-outer-space-treaty-has-been-remarkably-successful-but-is-it-fit-for-the-modern-age-71381#:~:text=The%20first%20and%20probably%20most,%E2%80%9Cconstitution%E2%80%9D%20of%20outer%20space.

[14] *Space Law Treaties and Principles*, U.N. OFF. FOR OUTER SPACE AFF., http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html.

[15] *Id.*

[16] Patent Expert Issues, *supra* note 9.

[17] *IP and Space Activities*, EUROPEAN COMMISSION (Apr. 29, 2021), https://intellectual-property-helpdesk.ec.europa.eu/news-events/news/ip-and-space-activities-2021-04-29_en.

[18] For a deeper discussion regarding the commercial use of outer space, see Matt Weinzierl & Mehak Sarang, *The Commercial Space Age Is Here*,

cross-sector innovation.[19] In 2019, $366 billion in estimated revenue was earned in the Space Economy where 95% of the estimated earnings was from goods or services produced in space for use on earth.[20] The Space Economy consists of natural resource exploitation and outer space tourism.[21]

The "Billionaire Space Race" in the last two decades highlights the increased reality of the Space Economy.[22] For example, Jeff Bezos' Blue Origin is attempting to establish an industrial base in space;[23] Richard Branson's Virgin Galactic/Virgin Orbit attempting to bring commercial space tourism, low-cost small orbital launch vehicles, and intercontinental Sub-orbital spaceflight;[24] and Elon Musk's SpaceX attempting to colonize Mars.[25] The privatization of outer space through sending rockets in the ionosphere, orbital launching rockets, and suborbital tourist spaceflights creates an increased need to determine the bounds of patent protections in outer space.[26]

## II. UNITED STATES AND INTERNATIONAL LEGAL SCHEMES

Patents are viewed as an incentive to innovation, investment, and disclosure.[27] Commentators have explained the desirability of

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Harvard Business Review (Feb. 12, 2021), https://hbr.org/2021/02/the-commercial-space-age-is-here.

[19] *Space Economy Initiative*, U.N. OFF. FOR OUTER SPACE AFF. (Jan. 2021), https://www.unoosa.org/documents/pdf/Space%20Economy/Space_Economy_Initiative_2020_Outcome_Report_Jan_2021.pdf.

[20] Matt Weinzierl & Mehak Sarang, *The Commercial Space Age Is Here*, HARVARD BUSINESS REVIEW (Feb. 12, 2021), https://hbr.org/2021/02/the-commercial-space-age-is-here.

[21] *Id.*

[22] Jackie Wattles, *Which billionaire is winning the space race? It depends*, CNN (July 20, 2021), https://www.cnn.com/2021/07/14/tech/jeff-bezos-richard-branson-elon-musk-space-race-scn/index.html.

[23] *Id.*

[24] *Id.*

[25] *Id.*

[26] Patent Expert Issues, *supra* note 9.

[27] *The Inequalities of Innovation, __ Emory L. J. 2022;* Chris J. Katopis, *The Curious Crypto Question: Do Patents Advance Fintech Innovation? The Paradox Arising from Five Key Recent Trends*, 38 SANTA CLARA HIGH TECH. L.J. 1, 3–4 (2022); *see* Emily N. Rissberger, *The Future of Biotechnology: Accelerating Gene-Editing Advancements Through Non-Exclusive Licenses and Open-Source Access of Crispr-Cas9*, 38 SANTA

spurring outer space commercial investment through patent rights.[28] Patent protection is based on territorialism. Territorialism is the concept which liability is exercised by the government over individuals within its territory.[29] The following section analyzes the United States' patent legal system with regard to patents, relevant international outer space treaties the United States has joined, and relevant international treaties analogous to outer space.

### A. *United States*

#### 1. United States Jurisprudence

Federal courts in the United States must possess subject matter jurisdiction and personal jurisdiction to hear a case.[30] Subject matter jurisdiction refers to the power the federal courts possess to hear the type of claim presented.[31] In patent law, federal courts have jurisdiction via 28 U.S.C. § 1338 through the federal question doctrine.

Personal jurisdiction refers to the court's power over the parties which binds the parties to the lawsuit.[32] Personal jurisdiction is generally categorized as specific personal jurisdiction, jurisdiction over the specific acts the defendant performed, or general jurisdiction, jurisdiction over any type of act the defendant performed.[33] The constitutional test for specific personal jurisdiction asks whether the defendant has "certain minimum contacts" with the forum state "such that the maintenance of the suit does not offend 'traditional notions of fair play and substantial justice.'"[34] In order to have "substantial contacts," the defendant must "purposefully availed" herself of the forum or it must be foreseeable that the defendant could be sued in

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CLARA HIGH TECH. L.J. 95 (2022) (for a discussion of how licensing in patents spurs innovation).

[28] Dan L. Burk, *Application of United States Patent Law to Commercial Activity in Outer Space*, 6 SANTA CLARA COMPUTER & HIGH TECH. L.J. 295, 309 (1991).

[29] Cameron Hutchison & Moin A. Yahya, *Infringement & the International Reach of U.S. Patent Law*, 17 FED. CIRCUIT B.J. 241 (2008).

[30] *See generally* Joshua S. Stillman, *Hypothetical Statutory Jurisdiction and the Limits of Federal Judicial Power*, 68 ALA. L. REV. 493 (2016).

[31] *Id.*

[32] *Id.*

[33] *Id.*

[34] *Int'l Shoe Co. v. State of Wash., Off. of Unemployment Comp. & Placement*, 326 U.S. 310, 316 (1945).

the forum.[35] Additionally, personal jurisdiction requires the cause of action to "arise from" the defendant's contacts with the forum state.[36] After minimum contacts is established, courts examine factors relating to "fair play and substantial justice" of exercising jurisdiction in the case. For general personal jurisdiction, a court is considered to have general jurisdiction as long as the defendant is "essentially at home" within the forum state.[37]

Additionally, personal jurisdiction can be met under the Federal rules of Civil Procedure 4(k)(2) for claims arising under federal law. Rule 4(k)(2) has three elements: (a) the claim must arise under federal law; (b) the defendant is not subject to jurisdiction in any state's courts of general jurisdiction; and (c) the exercise of jurisdiction is consistent with the United States Constitution. A court will examine whether the defendant has sufficient minimum contacts with the whole of the United States.[38] If a court possess both subject matter jurisdiction and personal jurisdiction, the court has the ability to hear the case.[39]

### 2. United States Patent Law

The United States Constitution empowered Congress to promote the progress of science and useful arts by granting patents, or limited monopolies, to inventors.[40] Patents may be granted to any novel, useful, and non-obvious process, machine, manufacture, or composition of matter.[41] The patent holder is granted a twenty-year exclusive monopoly over the invention in return for disclosure of the patents' workings.[42]

Territorialism is a pervasive theme within patent law. In other words, patent infringement liability on arises if the offending act occurs within the territory of the United States. However, patented inventions now have expanded across national borders which

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[35] *Burger King Corp. v. Rudzewicz*, 471 U.S. 462, 474–75 105 S. Ct. 2174, 85 L. Ed. 2d 528 (1985).
[36] Louis J. Capozzi III, *Relationship Problems: Pendent Personal Jurisdiction After Bristol-Myers Squibb*, 11 DREXEL L. REV. 215, 218 (2018).
[37] *Id.*
[38] *Id.*
[39] *Id.*
[40] U.S. Const. art. I, § 8, cl. 8.
[41] 35 U.S.C. §§ 102, 103, 112.
[42] 35 U.S.C. § 154.

commentators indicate creates "difficulties for patent holders and prospective inventors seeking protection against infringement."[43]

Possession of a valid United States patent allows the patent holder to exclude others from making, using, or selling the patented invention.[44] Section 271 creates a judicial cause of action of patent infringement for the unauthorized making, using, or selling of a patented invention.[45] Territorialism is highlighted through infringement as "[i]t is the general rule under United States patent law that no infringement occurs when a patented product is made and sold in another country."[46] However, the Federal Courts and Congress have expanded the United States patent reach beyond its solely territorialism application.

In 1993, the United States Court of Federal Claims dealt with the specific issue of patent infringement relating to technology operating in space in *Hughes Aircraft Co. v. United States*.[47] The *Hughes* Court addressed the issue of whether the creation of a spacecraft, which was built and primarily operated from the United Kingdom, delivered to the United States for purposes of launching into outer space, constituted infringing technology.[48]

The *Hughes* Court looked to three territorial impact factors outlined in *Decca Ltd. v. United States*, 544 F.2d 1070, 1083 (1976). The *Decca* Court dealt with the issue of where the "using" and "making" of a patented invention took place.[49] The *Decca* Court held the United States government infringed a global positioning system patent based its conclusion of three territorial factors: (1) control, (2) beneficial use, and (3) ownership.[50] The *Hughes* Court held the spacecraft did not infringe on a United States patent because there was no "master station" present in the United States.[51] The Hughes Court focused on the control factor explaining the control factor

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[43] Matthew T. Hanna, *The Exclusive Economic Zone: A "No-Man's Land" for United States Patent Law*, 5 CASE W. RESERVE J.L. TECH. & INTERNET 51, 67–68 (2014).
[44] 35 U.S.C. § 271.
[45] 35 U.S.C. § 271.
[46] *Microsoft Corp. v. AT & T Corp.*, 550 U.S. 437, 437 (2007).
[47] *Hughes Aircraft Co. v. United States*, 29 Fed. Cl. 197, 197 (1993).
[48] *Id.*
[49] *Decca Ltd. v. United States*, 544 F.2d 1070, 1082 (1976).
[50] *Id.*
[51] *Hughes Aircraft*, *supra* note 47, at 242.

would have been satisfied had NASA "originated the commands within the United States" and transmitted them from their facility.[52]

*NTP v. Research in Motion* Court further explored territorialism and the *Decca* factors in 2005.[53] *NTP* is the first case to exclusively use the territorial impact factors in deciding whether an infringement took place under section 271(a).[54] Commentors view *NTP* as a "pivotal case in defining a new era of patent infringement analysis."[55] The *NTP* Court stated, "section 271(a) is only actionable against patent infringement that occurs within the United States."[56] The Court showed that the location of the infringement in *NTP* took place in the United States using the territorial impact factors from Decca.[57]

Territoriality was further examined in *Microsoft Corp. v. AT & T Corp.*, 550 U.S. 437 (2007). The Microsoft Court examined the applicability of 35 U.S.C. Section 271(f) "to computer software first sent from the United States to a foreign manufacturer on a master disk, or by electronic transmission, then copied by the foreign recipient for installation on computers made and sold abroad."[58] In 1984, the Patent Act promulgated 35 U.S.C. § 271(f) which provides infringement does occur when one "supplies . . . from the United States," for "combination" abroad, a patented invention's "components." The *Microsoft* Court held: "Because Microsoft does not export from the United States the copies actually installed, it does not 'suppl[y] . . . from the United States' 'components' of the relevant computers, and therefore is not liable under § 271(f) as currently written."[59]

While patent infringement has expanded slightly beyond the territory of the United States, it still exists within the bounds of territorialism. This territorial requirement can make it harder for patent holders within the United States to ensure that their technology is protected outside the United States.

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[52] *Id.* at 197.
[53] *NTP, Inc. v. Rsch. In Motion, Ltd.*, 418 F.3d 1282 (Fed. Cir. 2005).
[54] *Hughes Aircraft Co. v. United States*, 29 Fed. Cl. 197, 197 (1993)
[55] Elizabeth M. N. Morris, *Territorial Impact Factors: An Argument for Determining Patent Infringement Based Upon Impact on the U.S. Market*, 22 SANTA CLARA COMPUTER & HIGH TECH. L.J. 351, 364 (2006)
[56] *NTP*, *supra* note 53, at 1313.
[57] *Id.* at 1370.
[58] *Microsoft Corp.*, *supra* note 46.
[59] *Id.* at 442.

#### 3. United States' Outer Space Patent Law

The United States does not have a specific law which creates a cause of action for patent infringement in outer space. The United States promulgated 35 U.S.C. Section 105 in the late 1990s which denotes a jurisdictional basis for the application of patent infringement in outer space. Subsection (a) denotes "[a]ny invention made, used or sold in outer space . . . under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States."

Essentially, subsection (a) allows for inventions which are made, used, or sold in outer space to have the jurisdictional component required within patent law. Subsection (a) creates a legal fiction in where anything under the jurisdiction or control of the United States is essentially territory of the United States, for the purposes of patent infringement. This allows a private individual to bring forth a cause of action of patent infringement and utilize the conventional territorial principles already within patent law.

#### 4. Issues Associated with the Application of United States Patent Law to Outer Space

Two major issues exist for the application of United States patent law relating to infringement in outer space. First, section 105 does not make clear if a patent holder could enforce her patent rights against someone infringing the patented invention in outer space beyond the jurisdiction or control of the United States.

Second, issues associated with personal jurisdiction can arise. As explained in Part I, A, I, the United States federal courts must have personal jurisdiction in order to have power over the case. For example, a domestic patent-owner-plaintiff would not be able to seek relief over a foreign defendant's infringing activities if the foreign defendant has no minimum contacts with the United States and if the foreign defendant is not essentially at home in the United States. A solution to both these issues are discussed in Part III. The solution utilizes key concepts derived from international treaties.

### B. *International Governmental Outer Space Treaties*

#### 1. The 1967 Outer Space Treaty

The Outer Space Treaty, often considered the Space Constitution, provides the basic framework on international space

law, including the following principles: freedom of exploration and exploitation of outer space, non-appropriation, peaceful use, and national jurisdiction and responsibility over space objects.

The Outer Space Treaty's main principle is non-appropriation.[60] Essentially, outer space is not subject to national claim by any nation state. The treaty highlights outer space exploration is for the benefits of all states, countries, and humankind.[61] However, states still retain jurisdiction and control over the objects which they launch into outer space.[62]

While the Outer Space treaty has been remarkably successful in multiple aspects,[63] the Outer Space Treaty is not without its criticisms. First, the Outer Space Treaty only applies to nation states. It does not apply to private citizens or corporations of the nation states who have signed on to the treaty. This means private entities are not entitled to any of the protections the Outer Space Treaty affords nor the protections its progeny affords.

Second, the Outer Space Treaty is vague in many aspects. It does not include specific remedial mechanisms for nation states to follow. Third, the Outer Space Treaty views and treats outer space as a global common, an international and global resource, while the United States does not.[64] The United States treats international waters and Antarctica as a global common but the United States' continued desire to utilize outer space as a new frontier to commodify and militarize highlights the United States' reluctance to view outer space as a global common.

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[60] Outer Space Treaty, *supra* note 12.
[61] *Id.*
[62] *Id.*
[63] Morford, *supra* note 13.
[64] Michael J. Listner & Joshua T. Smith, *A Litigator's Guide to the Galaxy: A Look at the Pragmatic Questions for Adjudicating Future Outer Space Disputes*, 23 VAND. J. ENT. & TECH. L. 53, 70 (2020) (citing U.N. System Task Team, *U.N. System Task Team on the Post-2015 U.N. Development Agenda: Global Governance and Governance of the Global Commons in the Global Partnership for Development Beyond 2015*, UNITED NATIONS 3, 5 (Jan. 2013), https://www.un.org/en/development/desa/policy/untaskteam_undf/thinkpieces/24_thinkpiece_global_governance.pdf [https://perma.cc/3AJL-RANJ] (defining global commons as "those resource domains that do not fall within the jurisdiction of any one particular country, and to which all nations have access" and identifying the four major global commons as "the High Seas, the Atmosphere, the Antarctica and the Outer Space")).

### 2. The 1972 Liability Convention

The Liability Convention elaborated on Article VII of the Outer Space Treaty.[65] The "Liability Convention provides that a launching State shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft, and liable for damage due to its faults in space."[66]

The convention sets for a definition of damage: the "loss of or damage to property of States or of persons, natural and juridical."[67] However, this sweeping definition of property does not clarify if the treaty includes intellectual property. While other United Nations documents indicate intellectual property is often times considered a subset of property rights, commentators highlight the Liability Convention explains recovery for property which is unsuitable for use.[68] Additionally, the legal community's consensus is the Liability Convention does not apply to intellectual property rights.[69]

One of the many main criticisms with the Liability Convention is intellectual property exists outside the scope of the treaty. The Liability Convention does not ponder a cause of action for intellectual property. However, even if the Liability Convention did consider intellectual property within the scope of the property it describes, the Liability Convention does not provide an adequate, sustainable, and long-term route to recover damages.

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[65] *Convention on International Liability for Damage Caused by Space Objects*, U.N. OFF. FOR OUTER SPACE AFF. (last visited May 16, 2022), https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/liability-convention.html (Hereinafter "Liability Convention").

[66] *Id.*

[67] *Id.*

[68] Rosario Avveduto, *Past, Present, and Future of Intellectual Property in Space: Old Answers to New Questions*, 29 WASH. INT'L L.J. 203, 216 (2019); Joseph A. Burke, *Convention on International Liability for Damage Caused by Space Objects: Definition and Determination of Damages After the Cosmos 954 Incident*, 8 FORDHAM INT'L L.J. 255, 276 (1984) (citing W. F. Foster, *The Convention on International Liability for Damage Caused by Space Objects*, 10 CAN Y.B. INT'L L 137, 137 (1972)).

[69] Rosario Avveduto, *Past, Present, and Future of Intellectual Property in Space: Old Answers to New Questions*, 29 WASH. INT'L L.J. at 216; Marie Weisfeiler, *Patent Law in Space*, B.C. INTELL. PROP. & TECH. F. 1, 2 (2019); Marie Weisfeiler, *Patent Law in Space*, IPFT (Mar. 1, 2019), http://bciptf.org/2019/03/patent-law-in-space; Juan Felipe Jimenez, *Patents in Outer Space: an Approach to the Legal Framework of Future Inventions*, 98 J. PAT. & TRADEMARK OFF. SOC'Y 447, 456 (2016).

While the Liability Convention provides procedures to settle damage claims, the Liability Convention only provides that claims for compensation can only be presented through diplomatic channels.[70] This creates multiple issues: (1) it can be difficult to obtain the appropriate damages reward from a party if they may only recover through diplomatic channels; (2) utilizing diplomatic channels vitiates the power courts have on any type of damages claims; and (3) it disincentivizes individuals from pursuing technology, specifically made for space flight.

First, obtaining a redress through diplomatic channels can often be difficult or impossible. As commentators have explained, there is a longstanding failure of obtaining redress through diplomacy alone.[71]

Second, the Liability Convention does not indicate there are any bars to pursue claims in local courts by a nation state or jurisdictional person. This indicates that parallel litigation can occur in a nation state. Some commentors have indicated the harm for the ability for individual actors to pursue claims in nation state's courts as hindering the development of a unform "common law of space."[72] This conclusion is largely focused on how the United States legal system functions. Many international courts and arbitration panels do not necessarily strictly follow precedential decision making.[73] Additionally, the Liability Convention does not explicitly speak on the use of precedent.

Third, the non-binding nature to these processes means many individuals would not be able to necessarily protect their inventions. The protection of inventions is critical for the proliferation of the technological advancements. Like explained in *supra*, part I, infringement is a necessary tool for inventors to recover the funds from another individual utilizing their technology.

### 3. The 1975 Registration Convention

The Convention on Registration of Objects Launched into Outer Space is a foundational mechanism that provides Nation States

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[70] Liability Convention, *supra* note 65.

[71] Joyce Rodriguez, Esq., *Resolving Legal Claims Between the United States and Cuba: Applying International Law Where Diplomacy Alone Falls Short*, 14 S.C.J. INT'L L. & BUS. 143, 157 (2018).

[72] Avveduto, *supra* note 68, at 217.

[73] Gilbert Guillaume, *The Use of Precedent by International Judges and Arbitrators*, 2 J. INT'L DISPUTE SETTLEMENT 5, 6–12 (2011).

with the means to identify space objects. This convention also focused on addressing issues related to Nation States' responsibilities concerning their own space objects.[74] The Registration Convention focuses on what is classed the "launching state."[75] The launching state is (1) a state launching or procuring the launch of a space objects, or (2) a state from whose territory or facilities a space object is launched.[76] The Registration Convention's second definition of a launching state focus on territorialism.[77]

One of the main criticisms with the Registration Convention is that it does not address the specific territorial thresholds and determinations.[78] The Convention vaguely addresses how to determine territorial determinations from which commentators have discussed as four different mechanisms.[79] The launching State can be (1) a State which launches a space object; (2) a State which procures the launching of a space object; (3) a State from whose territory a space object is launched; or (4) a State from whose facility a space object is launched.[80]

Another criticism with the Registration Convention is it does not standardize the definition for the edge of space. Many countries and companies use different definitions.[81] For example, the United States military and NASA utilize fifty miles (eighty kilometers) above

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[74] *Convention on Registration of Objects Launched into Outer Space*, U.N. OFF. FOR OUTER SPACE AFF. (Last visited May 16, 2022), https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introregistration-convention.html.

[75] *Id.*

[76] *Id.*

[77] *Id.*

[78] *Id.*

[79] Andrew Stevens & Todd M. Hopfinger, *Obtaining and Enforcing Patents for Outer Space*, STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C. (July 2020), https://www.sternekessler.com/news-insights/publications/obtaining-and-enforcing-patents-outer-space#:~:text=Under%20Section%20105%2C%20an%20entity,invention%20has%20not%20been%20patented.

[80] *Id.*

[81] Lia De La Cruz, *The billionaire space race and the Karman line*, EARTHSKY (July 14, 2021), https://earthsky.org/human-world/the-billionaire-space-race-and-the-karman-line/#:~:text=The%20U.S.%20military%2C%20the%20Federal,62%20miles%20(100%20km).
https://spacenews.com/op-ed-where-does-space-begin-the-decades-long-legal-mission-to-find-the-border-between-air-and-space/.

ground.[82] The Fédération Aéronautique Internationale, an international record-keeping body for aeronautics, utilizes the Kármán line as the space boundary, sixty-two miles (one hundred kilometers) above the ground.[83] The Kármán line is an imaginary line which denotes the boundary between Earth's atmosphere and outer space.[84]

### C. *International Treaties*

#### 1. The Antarctic Treaty

The Antarctic Treaty regulates international relations with respect to Antarctica. This treaty, much like The Outer Space Treaty, was established during the Cold War.[85] The Outer Space Treaty took principles from the Antarctic Treaty.[86] As a result, two treaties overlap in many aspects. [87] They both have extreme environments, located amongst remote places.

The main purpose of the Antarctic Treaty, is to ensure "in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord."[88] The Antarctic Treaty sets aside the entire continent for scientific purposes and established a ban on military activity.[89]

The main criticism of the Antarctic Treaty with regard to outer space is the United States fundamentally views the Antarctic region differently than outer space. The United States considered the

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[82] *Id.*; Timothy G. Nelson, *Where does space begin? The decades-long legal mission to find the border between air and space*, SPACENEWS (Mar. 26, 2019), https://spacenews.com/op-ed-where-does-space-begin-the-decades-long-legal-mission-to-find-the-border-between-air-and-space/.
[83] De La Cruz, *supra* note 81; Nelson, *supra* note 82.
[84] *Id.*
[85] Bailey DeSimone, *How the Antarctic Treaty of 1959 Influenced the Outer Space Treaty of 1967*
LIBRARY OF CONGRESS (Jan. 28, 2022), https://blogs.loc.gov/law/2022/01/how-the-antarctic-treaty-of-1959-influenced-the-outer-space-treaty-of-1967/.
[86] *Id.*
[87] *Id.*
[88] *Antarctic Treaty*, NUCLEAR THREAT INITIATIVE (last visited May 16, 2022), https://www.nti.org/education-center/treaties-and-regimes/antarctic-treaty/.
[89] *Id.*

high seas and Antarctica as a global common. [90] In other words, the United States treats international waters as a resource available to all countries; however, the United States does not consider outer space a global common.[91]

Additionally, nation states have territorial claims in Antarctica. There are currently no territorial claim in outer space. The Outer Space Treaty specifically indicates that no one nation state should make a territorial claim to any portion of outer space. While Antarctica has no patent trolls among the cold frigid wastelands, patent infringement is not an issue which normally arises. However, nation states within Antarctica has a claim to the territory, so their own national laws would govern.

2. Maritime Law

Outer space often is analogized to international waters. International waters and outer space draw many similarities. No country stakes a claim to international water like the Outer Space Treaty dictates. Like maritime law, most laws governing space are through a collection of treaties. Many outer space laws drew parallels from maritime law because of their jurisdiction and physical similarities.[92]

i. Maritime Law – Flags of Convenience

International law requires every merchant ship to register in a country.[93] The country of registration is the ship's "flag state."[94] The ship is under the jurisdiction and control of the flag state's laws and regulations.[95] Therefore, businesses can take advantage of this registration principle to fall under the jurisdiction of a country with

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[90] Michael J. Listner & Joshua T. Smith, *A Litigator's Guide to the Galaxy: A Look at the Pragmatic Questions for Adjudicating Future Outer Space Disputes*, 23 VAND. J. ENT. & TECH. L. 53, 74 (2020).

[91] Open letter to Honourable Francois-Phillippe Champagne, Minister of Foreign Affairs, Canada, on US Executive Order on Recovery and Use of Space Resources (Apr. 20, 2020), https://perma.cc/ DLU2-ARLQ.

[92] William C. Pannell, *Pirate Battles in Outer Space: Preventing Patent Infringement on the 8th Sea*, 46 U. MEM. L. REV. 733, 740 (2016).

[93] *What is a Flag of Convenience?*, NAYORLAW (Feb. 21, 2019), https://naylorlaw.com/blog/flag-of-convenience/#:~:text=Sailing%20a%20ship%20under%20a,lives%20helps%20them%20save%20money.

[94] *Id.*

[95] *Id.*

favorable laws for their business. Many businesses could use the flags of convenience "principle to evade patent infringement by registering ships in international waters to countries the business has only a tenuous connection to."[96] Commentators have indicated businesses are likely to take advantage of the flags of convenience when commercial outer space exploitation becomes more viable.[97]

ii. Maritime Law – The Exclusive Economic Zone

While the Outer Space treaty indicates space objects should not be claimed by nation states, asteroids, moons, plants, and other space objects could be claimed by independent actors much like islands within international waters. While an independent actor may claim sovereignty and/or jurisdictional control over the outer space object, it does not necessarily mean the claim will be recognized.

If it were to be recognized, how much sovereign control does the independent actor obtain beyond the physical surface of the object? The principle of the Exclusive Economic Zone ("EEZ") with regard to maritime law acts as a potential solution to this dilemma. The EEZ is an area which nations with coastal territories independently control the economy and resources of the area.[98] In 1983, The United States claimed a 200-nautical-mile EEZ which extends from the nation's coast out towards the ocean.[99] The United Nations' Convention on the Law of the Sea ("UNCLOS") delineated the subdivisions from a nation states' coast.[100] These subdivisions are the territorial sea, the contiguous zone, and the EEZ.[101] The United States is not a party to UNCLOS, but the legislative history of the

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[96] Elizabeth L. Winston, *Patent Boundaries*, 87 TEMP. L. REV. 501, 501 (2015) ("As the limits of technology and geography increase, the delineation of the patent boundaries of the United States becomes increasingly important.").

[97] William C. Pannell, *Pirate Battles in Outer Space: Preventing Patent Infringement on the 8th Sea*, 46 U. MEM. L. REV. 733, 734 (2016); Zakary McLennan, *The Big Bang or A Black Hole? The Nexus Between Outer Space Patent Law and Commercial Investment in Outer Space*, 2019 MICH. ST. L. REV. 833 (2019).

[98] *See* Hanna, *supra* note 43.

[99] *See id.*

[100] *See id.*

[101] *See id.*

treaty demonstrates that the United States was a major player in the treaty negotiations and the treaty's final form.[102]

In the territorial sea, a nation has full sovereign rights.[103] Foreign vessels have the right of innocent passage so long as their travel is "continuous and expeditious."[104] In the contiguous zone, a coastal state nation can apply its laws to foreign vessels. A nation may exercise the control necessary to prevent and punish infringement of its customs, fiscal, immigration, or sanitary laws within the contiguous zone.[105]

The EEZ extends from the baseline of a nation state to 200-nautical-miles from the coast.[106] The EEZ is an area of the sea which the nation has special rights regarding the exploration and use of marine resources.[107] A country can utilize the EEZ in any economic way they see fit.[108]

Even though the EEZ is an area which a country has special rights, commentors have noted that the EEZ, according to a strict textualist perspective, is not within the territory of the United States.[109] However, commentators have suggested the EEZ is within the territory of the United States if one looks to legislative intent and international laws. This would indicate that a cause of action for patent infringement could be made because it meets the territorial requirement.

## III. SOLUTIONS

### A. *United States Causes of Action*

As explained in Part II, A, IV, two major issues exist for the application of United States patent law relating to infringement in outer space: (1) enforcement of patented inventions beyond the jurisdiction or control of the United States and (2) the power of personal jurisdiction.

The first issue requires a specific understanding of what is considered the jurisdiction or control of the United States. While

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[102] *See id.*
[103] *See* Hanna, *supra* note 43.
[104] *See id.*
[105] *See id.*
[106] *See id.*
[107] *See id.*
[108] *See* Hanna, *supra* note 43.
[109] *See id.*

space objects under the direct control or jurisdiction of the United States are considered territories of the United States for the purpose of section 105, there is still difficulties and ambiguities regarding other specific objects. For example, is the atmosphere of a space object or planet considered the territory of the United States, or is there a buffer zone surrounding the space object which is considered the territory of the United States? As the Registration Convention specifically dictates, an object in outer space is under the control or jurisdiction based on the launching State: (1) a State which launches a space object; (2) a State which procures the launching of a space object; (3) a State from whose territory a space object is launched; or (4) a State from whose facility a space object is launched.[110] Like the flags on conveniences principle, this can lead to situations where corporations utilize a launching State definition which is best for them to escape liability.

Nevertheless, for a cause of action to be sustained within the United States, infringement must occur within the territory of the United States. Because the United States will likely continue to view outer space as a new frontier to colonize,[111] it is important to determine what specific territorial claims the United States can make. Therefore, I propose two specific solutions to determine the territory, for the purposes of patent law, of the United States in outer space. First, utilizes the Kármán line for outer space objects that contain an atmosphere. If the United States claims a specific celestial body which contains an atmosphere, the territory of the United States should extend to the Kármán line. The Kármán line can allow a celestial body with an atmosphere act as a self-contained system. Much like an island within the Earth's oceans, the outer edge of the atmosphere will act as the sandy beaches of the island. This delineation can be utilized as a proxy for the territorial necessity of patent law.

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[110] Stevens & Hopfinger, *supra* note 79.

[111] For a discussion on United States' colonial expansion, please see Noam Chomsky, *Noam Chomsky on the cruelty of American imperialism*, THE ECONOMIST (Sept. 24, 2021), https://www.economist.com/by-invitation/2021/09/24/noam-chomsky-on-the-cruelty-of-american-imperialism; *Manifest Destiny*, HISTORY (Nov. 15, 2019), https://www.history.com/topics/westward-expansion/manifest-destiny#:~:text=The%20philosophy%20drove%2019th%2Dcentury,outbreak%20of%20the%20Civil%20War.

Additionally, like the EEZ, there should be a zone which extends beyond the surface of the celestial body which a nation state can have exclusive economic control. However, 200-nautical-miles is much too small in the vast expansion of outer space where the distance between our own planets can span billions of miles.[112] Scientists typically measure distance within our own solar system in Astronomical Units ("AU") where one AU is the average distance between the Earth and its Sun.[113] Therefore, I propose the outer space EEZ ("OSEEZ") be delineated based on the specific celestial body and where it is located. For objects in our Solar System's Asteroid Belt, located roughly between the orbits of the planets Jupiter and Mars, the OSEEZ should extend for one-million-miles or .1 AU. This creates a suitable jurisdictional expansive area for objects in the asteroid belt as the average separation between celestial bodies in this region is roughly three-million-miles or .3 AU.[114] Celestial objects within the Kuiper Belt need to have their own classification. The Kuiper Belt is another outer space area within our Solar System with many asteroids and large celestial bodies.[115] The Kuiper Belt roughly begins at Neptune's orbit at thirty AU from the sun to about one thousand AU from the Sun.[116] The Kuiper Belt is far more remote compared to the Asteroid Belt and the distance between space objects in the Kuiper Belt is much vaster. While the average distance between celestial objects is not necessarily known, given the vast distance the Kuiper Belt spans, the OSEEZ should extend 1 AU.

The second issue requires the court to have specific personal jurisdiction. As explained in Part I, A, I, Rule 4(k)(2) has three elements: (a) the claim must arise under federal law; (b) the defendant is not subject to jurisdiction in any state's courts of general jurisdiction; and (c) the exercise of jurisdiction is consistent with the United States Constitution. In the context of patent law, the first element is easily met as patent law is federal law.

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[112] *Distance Between Plants*, THE NINE PLANETS (Oct. 8, 2019), https://nineplanets.org/distance-between-planets/.
[113] *Id.*
[114] *In science fiction movies, the "asteroid belt" is always pictured as a very crowded place.*, SCIENTIFIC AMERICAN (Sept. 2, 1997), https://www.scientificamerican.com/article/in-science-fiction-movies/.
[115] Nola Taylor Tillman, *The Kuiper Belt: Objects at the Edge of the Solar System*, Space (Apr. 30, 2019), https://www.space.com/16144-kuiper-belt-objects.html.
[116] *Id.*

The second element is relevant within outer space. There could be a specific situation where a defendant is not subject to general personal jurisdiction of any court within the United States. In other words, a defendant does not have such pervasive and systematic contacts with a specific state within the United States to be considered "at home."

The last element is one that could be troublesome in the context of outer space law. The Supreme Court of the United States has not encountered nor ruled on any issue involving Rule 4(k)(2). Therefore, the third element under Rule 4(k)(2) has not been clarified. Circuit courts have suggested courts utilize the familiar "continuous and systematic" standard, first articulated in *International Shoe Co. v. Washington*, 326 U.S. 310 (1946).[117] In other words, a defendant must have continuous and systematic contact with the United States as a sovereign country rather than a specific state within the United States.

This standard could be much easier to meet in the context of patent law as a recent Federal Circuit case explained in *Trimble Inc. v. PerDiemCo LLC*, 997 F.3d 1147 (Fed. Cir. 2021). The *Trimble* court explained that communications from outside the forum can form a basis of personal jurisdiction.[118] Cease-and-desist letters, hiring an attorney or patent agent in the United States, physically entering the United States to demonstrate technology, discussing infringement contentions with the plaintiff, exclusive licensees, and extra-judicial patent enforcement targeting business activities in the United States could all form a basis of personal jurisdiction.[119]

### B. *International Causes of Action*

International causes of action become more difficult. As explained in Part II, B, I, the Outer Space Treaty and its progeny only apply to nation states. As currently written, private actors would not be able to take advantage of any of the procedural remedies the Treaty and its progeny afford. Additionally, the Treaties do not specifically outline a procedural remedy for any intellectual property damage that occurs in outer space. The international community must

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[117] For a historical review of personal jurisdiction, review § 1068.1 Personal Jurisdiction in Federal Question Cases, 4 Fed. Prac. & Proc. Civ. § 1068.1 (4th ed.).
[118] *Trimble Inc. v. PerDiemCo LLC*, 997 F.3d 1147, 1155 (Fed. Cir. 2021).
[119] *Id.* at 1155–56.

clarify if intellectual property is addressed within the Outer Space Treaty and its progeny.

## IV. CONCLUSION

The international community should set up procedural protections for individuals who wish to protect their intellectual property in outer space. Like commentators have suggested, the creation of a unified outer space patent system would greatly benefit individuals who wish to protect their patents within outer space.[120] For the time being, the United States would greatly benefit from clarifying what constitutes its territory if it were to make a claim for any celestial body in outer space.

[120] Juan Felipe Jiménez, *Patents in Outer Space: An Approach to the Legal Framework of Future Inventions*, 98 J. PAT. & TRADEMARK OFF. SOC'Y 447, 458 (2016).