PATENT INFRINGEMENT IN OUTER SPACE IN LIGHT OF 35 U.S.C. § 105:

FOLLOWING THE WHITE RABBIT DOWN THE RABBIT LOOPHOLE

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I. INTRODUCTION

Since the 1980s, commentators have prophesized that a new era of human space exploration space was imminently upon us.[1] In more specific terms, these commentators have forecasted that the role of government agencies in space operations was set to diminish and private enterprises would fill the resultant void, at least in regard to activities in Low-Earth Orbit (LEO). However, for the most part, since the 1980s, this bold prediction, vividly represented in scenes of the movie *2001: A Space Odyssey*

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The views expressed herein are those of the authors' and not of the National Aeronautics and Space Administration, Draper Laboratory or any other organization.

[1] *See, e.g.*, Barbara Luxenberg, *Protecting Intellectual Property in Space*, Proceedings of the Twenty-Seventh Colloquium of the Law of Outer Space, International Institute of Space Law of the International Astronautical Federation, AIAA, 84-IISL-19, 1985, at 172; K. Tatsuzawa, *The Regulation of Commercial Space Activities by the Non-Government Entities in Space Law*, IISL-88-083, 1988.

by a Pan Am spaceplane transporting Dr. Heywood R. Floyd to an orbiting Space Station, has not come to fruition … until possibly now.[2]

The confluence of a major policy redirection for the National Aeronautics and Space Administration (NASA) coupled with significant achievements in the development of private commercial space enterprises, occurring in 2010, indicate a subtle but noticeable shift in the structure and lead players of space activities. On February 1, 2010, under its Commercial Crew Development Round 1 project, NASA announced that it had awarded a total of $50M to five commercial companies to partially fund the development of system concepts, key technologies, and capabilities that could ultimately be used in commercial crew human space transportation systems.[3] On June 4, 2010, Space Exploration Technologies Corporation (SpaceX) launched its Falcon 9 rocket for the first time from Cape Canaveral, Florida.[4] On June 28, 2010, the Obama Administration unveiled the United States' new space policy, which mandates that NASA no longer plans to send humans to the Moon.[5] The new space policy effectively halted the Constellation Program's return to the Moon and instead put a substantial emphasis on procuring commercial launch services to meet NASA's needs, including crew and cargo missions to the International Space Station.[6] On October 10, 2010, Virgin Galactic achieved its first piloted free flight and landing of its SpaceShipTwo sub-orbital vehicle.[7] Barely two weeks later, on October 25, 2010, NASA released a solicitation for its Commercial Crew Development Round 2 project valued at up to $200M and designed "to stimulate efforts within the private sector to develop and demonstrate human spaceflight capabilities, … [and to] extend efforts to foster activity leading to the

[2] *See generally* LEWIS SOLOMON, THE PRIVATIZATION OF SPACE EXPLORATION: BUSINESS, TECHNOLOGY, LAW AND POLICY (2008); MICHAEL BELFIORE, ROCKETEERS: HOW A VISIONARY BAND OF BUSINESS LEADERS, ENGINEERS, AND PILOTS IS BOLDLY PRIVATIZING SPACE (2007) (describing the emergence of new entrepreneurial space companies over the last decade).
[3] *See* Brian Berger, *Biggest CCDev Award Goes to Sierra Nevada*, SPACENEWS, Feb. 1, 2010, http://www.spacenews.com/venture_space/100201-biggest-ccdev-award-goes-sierra-nevada.html.
[4] *See Launch Manifest*, SPACEX, http://www.spacex.com/launch_manifest.php (last visited Mar. 11, 2011).
[5] National Space Policy of the United States of America, Jun. 28, 2010.
[6] *Id.* at 11.
[7] *See* Jason Paur, *Update: Virgin Galactic SpaceShipTwo Makes First Glide Flight*, WIRED, Oct. 10, 2010, http://www.wired.com/autopia/2010/10/virgin-galactic-spaceshiptwo-makes-first-glide-flight/.

development of commercial crew transportation systems."[8] On December 8, 2010, SpaceX successfully launched its Dragon spacecraft into LEO atop its Falcon 9 launch vehicle, subsequently reentered the Dragon spacecraft into the Earth's atmosphere, and then safely landed it in the Pacific Ocean where it was retrieved, becoming the first private enterprise to accomplish this task.[9] In the United States, other private companies, notably, Boeing, Sierra Nevada, Orbital Sciences and Bigelow Aerospace, are aggressively developing commercial space vehicles for operations in LEO.[10]

Absent an unexpected rash of commercial failures, the long predicted new era of a commercial space industry appears to be finally upon us and is shaping up to become a *de facto* commercial space race. Because activities in space are inherently technological endeavors, it follows that in shifting from a predominantly governmental role to a substantial role by private enterprise in LEO, traditional terrestrial legal issues associated with intellectual property (IP) law will find increasing applicability to such commercial outer space activities. Chief among these traditional terrestrial legal issues associated with IP law is the infringement of patents. For years, inventors have been filing and obtaining patents for technologies that have either exclusive applicability in outer space or dual-use applicability both on Earth and in outer space. For instance, a simple search of the term "outer space" in the United States Patent and Trademark Office's patent database reveals that almost 4,000 issued patents and over 2,500 patent applications reference this term.[11] This "staking out" of the patent landscape with respect to inventions designed to be used in outer space and the emerging commercial space industry in LEO represents another kind of confluence. It seems that not only a new era of commercial space activities is finally upon us, but a new era of patent litigation may be upon us as well.

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[8] NASA Commercial Crew Development Round 2 Announcement, Oct. 25, 2010, p. 1.
[9] *See supra* note 4.
[10] *See* Clara Moskowitz, *Spaceships Galore! Commercial Space Race to Orbit Heating Up*, SPACE.COM, Oct. 28, 2010, http://www.space.com/9416-spaceships-galore-commercial-space-race-orbit-heating.html, Doug Mohney, *NASA's Commercial Space Revolution*, SATELLITE SPOTLIGHT, Feb. 14, 2011, http://satellite.tmcnet.com/topics/satellite/articles/144505-nasas-commercial-space-revolution.htm.
[11] *USPTO Patent Full-Text and Image Database*, UNITED STATES PATENT AND TRADEMARK OFFICE, http://patft.uspto.gov/netahtml/PTO/search-bool.html (last visited Dec. 10, 2010).

Given that patent law is inherently and traditionally territorial and that a nation's borders do not extend into outer space, commercial space patent litigation raises some important questions: Will a domestic or regional patent afford adequate protection of an invention whose commercial exploitation requires that it be made, used, or sold in outer space? Also, what is the applicability of a patent issued by one Nation in the context of patent infringement in outer space? As for the United States, the answer to these questions lies in a proverbial soup of statutory law, case law, and international treaties that is an adventure, much like Alice's in Wonderland, which begins when one chooses to follow the "white rabbit down the rabbit hole," wherein the answer to one question only leads to more questions.

To explore how U.S. patent law would be applied to patent disputes on activities in outer space, this article will first describe the context in which such disputes will likely be litigated and then examine how an exception in 35 U.S.C. § 105, Inventions in outer space,[12] has seemingly created a jurisdictional loophole that could allow private entities to insulate themselves from patent infringement liability in the United States. This article will conclude that this loophole could hinder the U.S. patent system's ability to incentivize research on space-based technologies and that the loophole is arguably inconsistent with the United States' obligations under the United Nations treaties pertaining to outer space operations. As possible remedies or mitigating tactics, this article proposes potential solutions to render this loophole irrelevant or close this loophole, including amending 35 U.S.C. § 105 to enable the courts to follow or expand principles of extraterritorial patent jurisdiction.

II. THE LEGAL LANDSCAPE: THE INTERSECTION OF PATENT LAW AND SPACE LAW

Determining the applicability of national patent laws to outer space patent disputes requires an understanding of two bodies of law: patent law and space law. Before beginning our journey down the

[12] *Added* by Public Law 101-580, sec. 1(a), Nov. 15, 1990, 104 Stat. 2863.

rabbit hole, we provide a brief overview of the principles of both most relevant to a court's resolution of patent infringement disputes in outer space.

a. Patent Law

In most nations, a patent represents a property right granted by the national government for a fixed period of time to the inventor(s) of an invention. This property right is normally limited to the territorial reach of the granting nation.[13] Hence, patent law is inherently territorial in nature. Once issued, a patent authorizes its owner(s) to exclude others from practicing the claimed invention.[14] The grant and enforcement of patents are based on and governed by national laws, or on occasion by international treaties that have given regional effect to nationally issued patents.[15]

To obtain a patent, an inventor or group of inventors must first file a patent application in a jurisdiction of interest.[16] If the applicant wants to file an application in multiple countries, the application may begin as an international or "PCT" (Patent Cooperation Treaty) application, which enables a domestic application to be filed later in a particular country or group of countries.[17] The filing of a PCT application is merely a placeholder of subsequent rights; a PCT application is incapable of enforcement unless it is subsequently filed with the patent offices of each jurisdiction where the applicant desires to obtain patent protection for its invention.[18]

b. Space Law

[13] *See, e.g.,* Deepsouth Packing Co. v. Laitram Corp., 406 U.S. 518, 532 (1972) (superseded on other grounds by Patent Amendments Act of 1984, Pub. L. No. 98-622, 98 Stat. 3383, and now codified at 35 U.S.C. § 271(f)) [hereinafter *Deepsouth*].
[14] 35 U.S.C. § 154 (2002).
[15] Kurt G. Hammerle & Theodore U. Ro, *The Extra-Territorial Reach of U.S. Patent Law on Space-Related Activities: Does the "International Shoe" Fit As We Reach for the Stars?*, 34 J. Space L. 241, 246 (2008).
[16] *Id*. at 247.
[17] *Id*.
[18] *Id*.

"Space law" refers to the body of national laws and international treaties that govern and apply to activities in and relating to outer space.[19] The founding principles of current space law were largely developed during the height of the Cold War, when the focus was on governing the behavior of the governmental institutions of the major space-faring nations, rather than the activities of the private sector.[20] Consequently, none of the major international space treaties specifically addresses how national patent laws may apply to activities in outer space.[21]

Nonetheless, the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (hereinafter the "Outer Space Treaty"), which is the formative instrument that established the international legal framework for activities conducted in outer space, provides that a space object's country of registration "shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body."[22] This principle is analogous to the "floating island" principle existing in maritime law for ships in international waters.[23] Under the 1975 Convention on the Registration of Objects Launched into Outer Space (hereinafter the "Registration Convention"), which implements the Outer Space Treaty's registration requirements, a space object is registered by a "launching State."[24] A launching

[19] FRANCIS LYALL & PAUL B. LARSEN, SPACE LAW: A TREATISE 2 (2009).

[20] *See* Henry Hertzfeld, *The "Law of Outer Space" is at a Crossroads: Current and Future Issues in International Space Law*, 15 ILSA J. INT'L & COMP. L. 325, 331 (Spring, 2009) ("private ownership and operation of space assets . . . was recognized but too far in the future for the drafters of the [Outer Space Treaty] in the 1960s to be concerned about").

[21] *See* WORLD INTELLECTUAL PROPERTY ORGANIZATION, INTELLECTUAL PROPERTY AND SPACE ACTIVITIES: ISSUE PAPER PREPARED BY THE INTERNATIONAL BUREAU 42 (2004), *available at* http://www.wipo.int/patent-law/en/developments/pdf/ip_space.pdf [hereinafter "WIPO Issue Paper"]. It is important to distinguish activities carried out entirely in outer space and activities relating to outer space that are carried out at least partially on Earth within the territory of a country. The latter would generally be governed by patent laws of the country or countries where such activities occurred under the general territorial principles of patent jurisdiction. *See id.* This article is primarily concerned with activities that occur entirely in outer space and outside the customary reach of the patent laws of any particular nation.

[22] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Oct. 10, 1967, 18 U.S.T. 2410, T.I.A.S. 6347, art. VIII.

[23] Glenn H. Reynolds, *Legislative Comment: The Patents in Space Act*, 3 HARV. J. L. & TECH. 14, 19 (Spring, 1990).

[24] Convention on the Registration of Objects Launched into Outer Space, art. I(a), Jan. 14, 1975, 28 U.S.T. 695, T.I.A.S. 8480.

State is either (i) the country that launches or procures the launching of the space object or (ii) the country from which the space object is launched.[25] Thus, under the Outer Space Treaty and the Registration Convention, launching States are permitted to extend their laws, including their patent laws, to their registered space objects.[26]

Consistent with the framework established by the Outer Space Treaty, the United States in 1990 extended the reach of its patent laws to U.S.-registered spacecraft in 35 U.S.C. § 105. Section 105 provides that "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 [U.S. patent laws]."[27] Therefore, an invention conceived or first actually reduced to practice on a U.S.-registered spacecraft is deemed to have been made in the United States, and a patent infringement lawsuit based on the activities "made, used, or sold" on a U.S.-registered spacecraft must be brought in a U.S. court and would only succeed if the activity is covered by a U.S. patent.

In 1998, the major space powers incorporated the concept of national patent jurisdiction into an intergovernmental agreement concerning cooperation on the International Space Station (ISS).[28] Under this agreement, patent jurisdiction over an activity on the ISS resides in the country of registration of the space station module wherein that activity occurs.[29] Consequently, Japan, Russia and the United States

[25] *Id.*
[26] *See* Lyall & Larsen, *supra* note 19, at 124-27, and Hammerle & Ro, *supra* note 15 (for more in-depth discussions on the application of national intellectual property laws to space objects).
[27] 35 U.S.C. § 105 (1990).
[28] Agreement Among the Government of Canada, Governments of the Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station, art. 21, ¶ 2, Jan. 28, 1998 [hereinafter "ISS Agreement"] (". . . for the purposes of intellectual property law, an activity occurring in or on a Space Station flight element shall be deemed to have occurred only in the territory of the [country] of that element's registry, except that for [European Space Agency]-registered elements any European Partner State may deem the activity to have occurred within its territory").
[29] *Id.*

each has exclusive patent jurisdiction over activities conducted in its respective space station module(s), and any European partner state may claim patent jurisdiction over activities conducted in the space station modules registered to the European Space Agency.

III. DOWN THE RABBIT HOLE: PATENT INFRINGEMENT IN LIGHT OF 35 U.S.C. § 105

a. Extraterritorial Reach of U.S. Patent Law

With the basic principles of patent and space law in mind, our adventure down the rabbit hole begins with an examination of the current state of jurisprudence on the extraterritorial scope of U.S. patent law. Although a comprehensive examination of this topic is beyond the scope of this article,[30] suffice it to say that U.S. courts have struggled with the idea that, as with most national laws, U.S. patent law is strictly territorial. Radically new technologies continue to emerge and develop at seemingly exponential rates, and their manufacture and use have expanded into global systems and applications that reach beyond the borders of the U.S., forcing the historical approach of a strictly territorial application of U.S. patent law, tenuously held by the U.S. Supreme Court in *Deepsouth*,[31] to be tested by such new systems and applications in light of the language of infringing activity defined in § 271 of the Patent Act.[32]

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[30] *See generally* Denise W. DeFranco & Adrienne N. Smith, *Technology and the Global Economy: Progress Challenges the Federal Circuit to Define the Extraterritorial Scope of U.S. Patent Law*, 34 AIPLA Q.J. 373 (2006), John W. Osborne, *A Rational Analytical Boundary For Determination of Infringement By Extraterritorially-Distributed Systems*, 46 IDEA 587 (2006), and Hammerle & Ro, *supra* note 15, at 241-75 (for a more comprehensive discussion of the extraterritorial reach of U.S. patent law).

[31] *Deepsouth*, *supra* note 13, (establishing the traditional approach to U.S. extraterritorial patent jurisdiction in a 5-4 decision; Congress eventually responded to this decision by enacting 35 USC § 271(f) in an effort to close the loophole identified by the Court).

[32] *Compare* NTP, Inc. v. Research in Motion, Ltd., 418 F.3d 1282 (Fed. Cir. 2005), *cert. denied*, 546 U.S. 1157, 126 S. Ct. 1174 (2006) [hereinafter *NTP*] (holding that the global telecommunications system infringed a U.S. patent under 35 U.S.C. § 271(a)), *and* Eolas Techs. Inc. v. Microsoft Corp., 399 F.3d 1325, 73 USPQ 2d 1782 (Fed. Cir. 2005), *cert. denied*, 546 U.S. 998, 126 S. Ct. 568 (2005) (finding software is a component within the meaning of 35 USC § 271(f)), *with* Microsoft Corp. v. AT&T Corp., 550 U.S. 437 (2007) (holding that Microsoft's export of a master disk containing an infringing operating system does not constitute supplying "components of a patented invention" under 271(f) when the software is replicated abroad and installed on computers outside of the United States).

For the most part, U.S. courts have focused on defining the act of "use or using" for purposes of extraterritorial reach of U.S. patent law. One of the leading cases to examine an extension of the extraterritorial reach of U.S. patent law after passage of the 1952 Patent Act is the 1976 U.S. Court of Claims case of *Decca Limited v. United States*.[33] The underlying technology in this case concerned a worldwide radio navigation system known as "Omega" which was operated by the United States Government. The system included components of a system located in foreign countries and called for the placement of receivers in ships and aircraft so as to retrieve positional information while travelling on or over the high seas. In issuing its *per curiam* opinion, the court in *Decca* established that, for "system" or "apparatus" claims to a patent, the determinative factors to consider whether use of the patented system occurs within the United States are: (1) whether "control of a system" occurs on U.S. territory, (2) whether the system is "owned" by a U.S. entity, and (3) whether there is "beneficial use" in the U.S.[34] Based on these factors, the *Decca* court found that the United States Government could be subjected to the court's jurisdiction for an infringement claim on a U.S patent.[35]

In 2005, the United States Court of Appeals for the Federal Circuit, in *NTP, Inc. v. Research in Motion, Ltd.,* modified the approach of *Decca* while interpreting the extraterritorial scope of system and method claims to a patent.[36] Here, the technology at issue related to systems for integrating existing electronic mail systems (wireline systems) with radio frequency ("RF") wireless communication networks to enable a mobile user to receive e-mail over a wireless network using a portable handheld device known as a Blackberry®.[37] One of the relay components of the system was determined to be located in Canada, prompting Research in Motion to argue that its allegedly infringing activity did not

[33] Decca Limited v. United States, 210 Ct. Cl. 546, 544 F.2d 1070 (Ct. Cl. 1976) (per curiam) [hereinafter *Decca*].
[34] *Id.* at 1074-75.
[35] *Id.* at 1083.
[36] *NTP*, *supra* note 32.
[37] *Id.* at 1287.

occur "within the United States" as required in § 271(a) of the Patent Act.[38] The court determined that it needed to consider "whether the using, offering to sell, or selling of a patented invention is an infringement under § 271(a) if a component or step of the patented invention is located or performed abroad."[39] Specifically, the court relied on two of the *Decca* prongs—the place where the control of the system is exercised and the place where beneficial use of the system is obtained—in announcing what might be viewed as a new holistic test: "the place at which the system as a whole is put into service."[40] Relying on its new holistic test, the court found that "use of NTP's asserted system claims occurred within the United States."[41]

With respect to NTP's asserted method claims, however, the court noted that "the concept of 'use' of a patented method or process is fundamentally different from the use of a patented system or device."[42] The court then reasoned that:

> [b]ecause a process is nothing more than the sequence of actions of which it is comprised, the use of a process necessarily involves doing or performing each of the steps recited. This is unlike use of a system as a whole, in which the components are used collectively, not individually. We therefore hold that a process cannot be used 'within' the United States as required by section 271(a) unless each of the steps is performed in [the United States].[43]

The result of this case highlights an important distinction: when any element of a patented claim occurs outside the United States a system claim may be held infringed, but a method claim will not be held infringed in the United States. Hence, under the *NTP* analysis of extraterritorial reach, at least for system or apparatus claims, as long as the underlying space-based technology concerns a product wherein its customer exercises "control" and obtains "beneficial use" of the product in the United

[38] *Id.* at 1311.
[39] *Id.* at 1315.
[40] *Id.* at 1317.
[41] *Id.*
[42] *Id*.
[43] *Id.* at 1317-18.

States, the risk of a U.S. patent infringement claim is feasible, even if necessary components of the product or service are not physically located within U.S. territory.

b. 35 USC § 105: Inventions in Outer Space

An examination of 35 U.S.C. § 105[44] represents our next stop down the rabbit hole. Due to the strict territorial language of 35 U.S.C. § 101(c),[45] rejection of the "floating island" principle for claims based on U.S. patent law began gaining momentum in the courts.[46] The drafters of 35 U.S.C. § 105 took note of this trend and extended the definition of patent infringement to acts[47] in outer space on a "space object[48] or component thereof[49] under the jurisdiction *or control of the United States*,"[50]

[44] "(a) Any invention made, used, or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for the purposes of this title, except with respect to any space object or component thereof that is specifically identified and otherwise provided for by an international agreement to which the United States is a party, or with respect to any space object or component thereof that is carried on the registry of a foreign state in accordance with the Convention on Registration of Objects Launched into Outer Space.
(b) Any invention made, used, or sold in outer space on a space object or component thereof that is carried on the registry of a foreign state in accordance with the Convention on Registration of Objects Launched into Outer Space, shall be considered to be made, used, or sold within the United States for the purposes of this title if specifically so agreed in an international agreement between the United States and the state of registry." 35 U.S.C. § 105 (1990).

[45] "The terms 'United States' and 'this country' mean the United States of America, its territories, and possessions." 35 U.S.C. § 101(c).

[46] *See* SENATE COMM. ON THE JUDICIARY, INVENTIONS IN OUTER SPACE, S. REP. 101-266, at 4 (1990) [hereinafter "S. Rep. No. 266"].

[47] These "acts" are limited to an invention being "made, used, or sold . . ." in outer space. 35 U.S.C. § 105(a).

[48] The term "space object" is intended to be broader than a "vehicle." *See* S. Rep. No. 266, *supra* note 46, at 6 ("The term 'space object' is used as defined in the Registration Convention. It has been substituted for the term 'aeronautical and space vehicle,' first, because it is a term used in the relevant international space treaties, and second, in order to avoid the possibility that the term 'vehicle' may be interpreted more restrictively than the term 'object.'").

[49] The term "component thereof [a space object]" or its equivalent form "component parts" in the Outer Space Treaty is not explicitly defined. The authors contend that a "component thereof [a space object]" can arguably be interpreted by the courts to have a broad meaning. For example, a "component thereof [a space object]" may include items that are not physically located within a space object but are functionally associated with the space object, e.g., solar panels, communication stations, etc. Alternatively, a "component thereof" may also include items that are physically located within a space object but are not functionally associated with the space object, e.g., experimental payloads, laptop computers, supplies, etc.

[50] 35 U.S.C. § 105(a). *See also* Hammerle & Ro, *supra* note 26, at 262-63 (Hammerle & Ro considered the possible significance of the term "of the *United States*." Does "United States" in this context mean the United States Federal Government or the territory of the United States in light of the definition of "United States" in 35 U.S.C. § 100(c) and the multiple uses of "United States" (with arguably, different meanings) in 35 U.S.C. § 105? The paper

(emphasis added) with three exceptions. Two of these exceptions remove a space object from the jurisdiction of U.S. patent law. Specifically, even if a space object is nominally under the jurisdiction or control of the United States, U.S. patent law will not extend to the space object if it is (1) specifically identified and otherwise provided for by an international agreement[51] to which the United States is a party (hereinafter, "Exception 1") or (2) carried on the registry of a foreign state in accordance with the Registration Convention (hereinafter, "Exception 2", and together with Exception 1, the "§105(a) Exceptions").[52] As will be discussed *infra*, Exception 2 seemingly holds the most relevance to private enterprises in the United States because selection of where to register their space objects may be within their discretion.

Assuming one of the §105(a) Exceptions does not apply, another implication of 35 U.S.C. § 105 is its impact to the state of extraterritorial principles in regard to U.S. patent law. For example, note that "control" is a common term used both by the U.S. courts as a factor in determining whether there is an extraterritorial reach of U.S. patent law based on the infringing act of "use" and by §105 in determining applicability of the statute to activities in outer space. Although an intent of 35 U.S.C. § 105 was to define the territorial status of space objects and components thereof, the coincidence of the word "control" being used may result in unintended consequences, such as 35 U.S.C. § 105 effectively further modifying extraterritorial principles with respect to space objects. For instance, to support a finding of extraterritorial application of U.S. patent law to an allegedly infringing use of a system or apparatus under either *Decca* or *NTP*, the elements of "control" from and "beneficial use" in the United States must exist. Much like how *NTP* seemingly removed the consideration of U.S. "ownership" from *Decca*'s

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assumes *arguendo* that "of the United States" in the subject context effectively means "control" takes place "within the territorial borders of the United States.").

[51] S. REP. NO. 266, *supra* note 46, at 6 ("The phrases 'international agreement to which the United States is a party,' and 'an international agreement between the United States and the State of registry,' could include, in addition to intergovernmental agreements, international agreements between a Federal agency of the U.S. Government and their foreign counterparts, including foreign governmental agencies or international organizations.") .

[52] 35 U.S.C. § 105(a).

extraterritorial equation, 35 U.S.C. § 105 apparently removes the consideration of "beneficial use" in the United States from *NTP*'s extraterritorial equation, whereby only the consideration of "control" from the United States remains. Consider the scenario where a space object is not registered under the Registration Convention but is controlled from the United States. Under 35 U.S.C. § 105, one might argue that U.S. courts would have patent law jurisdiction over the space object even without a finding of beneficial use in the United States. A court's acceptance of this argument would effectively modify the state of extraterritorial application of U.S. patent law to a single consideration for space objects.

Another example of the impact of §105(a) is its applicability to space objects if they are under the *jurisdiction* of the United States.[53] From this perspective, 35 U.S.C. § 105 completely supersedes *NTP* and *Decca* with respect to space objects, because neither *NTP* nor *Decca* ostensibly examine the element of "jurisdiction" of the United States. To shed light on this potential impact, consider the scenario where a space object is neither registered under the Registration Convention nor controlled from the United States. Nevertheless, if the space object is licensed in the United States under its regulatory protocols, the United States arguably has jurisdiction of the space object. Under this scenario, the language of §105 would support an interpretation that U.S. patent law would still apply, even if the space object is not controlled from the U.S., has no beneficial use in the U.S., and is not owned by a U.S. entity. By codifying the "floating island" principle for space objects, the drafters of 35 U.S.C. § 105 have effectively hurled the proverbial monkey wrench into the machinery of extraterritorial principles of U.S. patent law.

c. The Rabbit "LoopHole"

Our journey down the rabbit hole continues with another question: in light of the §105(a) Exceptions, can a private enterprise in the United States avoid U.S. patent infringement claims based on

[53] 35 U.S.C. § 105(a) (1990).

making, using, and selling a space object by registering it in a foreign country? Alternatively, does Exception 2 eliminate a U.S. court's ability to rely on the current state of extraterritorial principles even if the space object is "controlled" from the U.S., it has "beneficial use" in the U.S., and it is "owned" by a U.S. company? If so, the attractiveness to a private enterprise of pursuing this type of arrangement is obvious: the risk of being sued in a country with relatively few issued patents is vastly less than in the United States. Do the §105(a) Exceptions represent a loophole for avoiding patent infringement claims in the United States for activities in outer space? Our journey now shifts from following the rabbit down the rabbit hole to exploring the rabbit "loophole." Exception 2 references the Registration Convention, therefore, one must first look to it for answers.

As discussed above, the Outer Space Treaty provides that a space object is subject to the jurisdiction and control of the "State Party to the Treaty on whose registry an object launched into outer space is carried."[54] The Registration Convention defines the "State of Registry" as the "launching State on whose registry a space object is carried in accordance with article II."[55] The "launching State" is defined as "(i) a State which launches or *procures* the launching of a space object; [or] (ii) a State from whose territory or facility a space object is launched."[56] Based on this definition, there are four possibilities to which a country can constitute the "launching State" for a space object: (1) the State which launches a space object, (2) the State that procures the launching of a space object, (3) the State from whose territory a space object is launched, or (4) the State from whose facility a space object is launched.[57]

With respect to the second alternative, it is relatively clear that if a governmental entity procures launch services for a foreign entity such that the actual launch occurs on foreign soil, then the

[54] Outer Space Treaty, *supra* note 22, at art. VIII.
[55] Registration Convention, *supra* note 24, at art. I.
[56] *Id*. (emphasis added)
[57] LYALL & LARSEN, *supra* note 19, at 86.

governmental entity's State can be designated the launching State. But, what if a *private enterprise*, duly licensed within a State, procures launch services from a foreign entity (either governmental or private) wherein the actual launch occurs on foreign soil? Can the private enterprise's home State essentially "step into the shoes" of the private enterprise and still be designated the launching State in this scenario?

In order to answer this question, one first has to consider the interrelationship between the Registration Convention and the Outer Space Treaty. The Registration Convention references the Outer Space Treaty with particular emphasis that "… States shall bear international responsibility for their national activities in outer space."[58] Relative to what constitutes an "international responsibility," the Outer Space Treaty underscores this concept in article VI wherein it states, "States Parties to the Treaty shall bear *international responsibility* for national activities in outer space . . ., whether such activities are carried on by governmental agencies *or by non-governmental entities*, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty."[59] Article VI goes on to state, "The activities of non-governmental entities in outer space . . . shall require *authorization and continuing supervision* by the appropriate State Party to the Treaty."[60] Moreover, article VII further provides that

> [e]ach State Party to the Treaty that launches or procures the launching of an object into outer space . . . and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space.[61]

[58] Registration Convention, *supra* note 24, at pmbl.
[59] *Id.* at art. VI (emphasis added).
[60] *Id.* (emphasis added).
[61] *Id.* at art. VII.

As is apparent in these provisions, once combined, both the Outer Space Treaty and the Registration Convention establish a model of State responsibility that includes not only a State's acts, but also the acts of its non-governmental entities.

Relative to State responsibility, the Outer Space Treaty is more expansive as compared to general international law. As Professor Vladamir Kopel states in a 2003 United Nations Workshop,

> For by the declaration of responsibility that relates equally to State and non-State activities, and also by the requirement of authorization and continuing supervision of the non-governmental entities by the 'appropriate State', the States Parties to the [Outer Space Treaty] assumed what is called in the doctrine of international law a direct responsibility, not only for their space activities, but also for the activities of their non-governmental entities in outer space.[62]

Partially in response to this concept of "direct responsibility," signatory nations to the Outer Space Treaty began to recognize the need for domestic regulations and licensing protocols to fulfill their requirements of "authorization and continuing supervision" of non-governmental entities that conduct activities in outer space.[63] Given the Outer Space Treaty's concept of a State's "direct responsibility" for its non-governmental entities' activities in outer space, a strong argument can be made that if a private enterprise abides by a State's regulatory and licensing protocols, the State "steps into the shoes" of the private enterprise for purposes of "procuring" launch services even though it is actually the private enterprise that is procuring launch services, i.e., executing contracts and paying the bills. A number of specific examples can readily be found of private enterprises having their commercial space objects being carried on the U.S. registry, even though the objects were launched on a foreign rocket from a

[62] Vladamir Kopel, *Introduction to the United Nations Treaties and Principles on Outer Space*, Proceedings United Nations / International Institute of Air and Space Law Workshop on Capacity Building in Space Law, 2003, 10, 14.

[63] *See, e.g., Space Activities Act 1982* (Sweden); *Outer Space Act 1986* (UK); *Commercial Space Launch Act 1984* (U.S.); *Commercial Space Launch Amendments Act 2004* (U.S.); *Law on Space Activities 1993* (Russian Federation); *Space Affairs Act 1993* (South Africa); *Space Activities Act 1998* (Australia).

foreign launch facility and on foreign territory.[64] By process of elimination of the possibilities under the Registration Convention's definition of a "launching State," one may logically conclude that a U.S. registration in these examples can only be supported by an interpretation that the United States "stepped into the shoes" of the private enterprise and "procured" launch services of the foreign State.

He who giveth, also taketh away, so goes the adage. As discussed *supra*, the drafters of 35 U.S.C. § 105 have effectively taken this adage to heart, albeit unintentionally, at least with respect to the potential loophole we now discuss. We suggest that an intent of 35 U.S.C. § 105 was to close a potential loophole to liability for patent infringement for an object operating in outer space due to the strict territorial language of 35 U.S.C. § 101(c).[65] But in the drafters' well-intentioned attempt to ostensibly reconcile 35 U.S.C. § 105 with the Outer Space Treaty, the ironic result is that closing one loophole unintentionally created another.

d. Avoiding Patent Infringement Liability using Flags of Convenience

In light of the arguments *supra*, it is possible that the Outer Space Treaty has laid the groundwork for a "flag of convenience" problem in outer space.[66] Similar to the Outer Space Treaty,

[64] Consider the following commercial space objects carried on the U.S. registry yet launched on foreign soil: Genesis I and II (Bigelow Aerospace) launched on July 12, 2006 and June 28, 2007, respectively from Russia; DirecTV 5, 10, and 12 (DirecTV) launched on May 7, 2002, July 7, 2007, and December 29, 2009, respectively from Russia.

[65] S. Rep. No. 266, *supra* note 46, at 3 (This intent is articulated in the following language: "The *Gardiner* rationale [i.e., the "floating island" principle] was again disapproved by the Court of Claims in a subsequent case, *Ocean Science & Engineering v. U.S*. The court suggested the need for a clear signal from Congress on the matter: … "Perhaps the patent bar will note the possible loophole in the coverage of the U.S. patent laws and will invite the attention of Congress to it.").

[66] *See* Matthew J. Kleiman, *Patent Rights and Flags of Convenience in Outer Space*, 23 AIR & SPACE LAW. 3, 4-7 (2011) (describing the flag of convenience problem as it relates to patent infringement liability); Lyall & Larsen, *supra* note 19, at 94 (comparing the system established by the Registration Convention to "the registry system in international shipping and the concept of the 'flag of convenience'" and explaining that this system will permit "commercial entrepreneurs . . . to avoid the rigors of legal requirements as to supervision and liability [by] setting up shell companies in countries less space-competent than others"); ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, SPACE 2030: TACKLING SOCIETY'S CHALLENGES 177 (2005) (questioning "whether the concept of launching state ...opens the door to a 'flag of convenience' approach to space faring").

under maritime law, a ship operates under the law of its country, or "flag," of registration.[67] The term "flag of convenience" refers to the practice of registering a ship in a country different from that of the ship's owners for the purpose of reducing operating costs and avoiding burdensome regulations.[68] In 2009, when measured in terms of total tonnage, more than half of the world's merchant ships were registered under flags of convenience, with the Panamanian, Liberian and Marshall Islands flags accounting for nearly 40% of the global fleet.[69] Due to lax regulations, minimal oversight and poor recordkeeping in these countries, flags of convenience are often criticized for creating a permissive environment for criminal activities, poor working conditions and environmental damage.[70]

To determine whether the Outer Space Treaty and Registration Convention could enable a U.S. company to avoid patent infringement liability in the United States by utilizing flags of convenience, we will consider three new scenarios:

i. Scenario 1: U.S. company launches and controls a satellite from a facility located outside of the United States

First, consider the scenario where a private enterprise, Acme Corporation, having its principal place of business in the United States, is duly licensed by the United Kingdom to establish a permanent launch facility in the Turks and Caicos Islands (a British Crown Colony in the Caribbean). Acme's satellite

[67] Convention on the High Seas, April 29, 1959, 450 U.N.T.S. 11 art. 6 [hereinafter Convention on the High Seas] ("Ships shall sail under the flag of one State only and, save in exceptional cases expressly provided for in international treaties or in these articles, shall be subject to its exclusive jurisdiction on the high seas").

[68] *See* FLAG OF CONVENIENCE, BUSINESSDICTIONARY.COM, http://www.businessdictionary.com/definition/flag-of-convenience.html.

[69] UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT, REVIEW OF MARITIME TRANSPORT 2009 (2009), *available at* http://www.unctad.org/en/docs/rmt2009_en.pdf.

[70] *See, e.g., What are Flags of Convenience?*, INTERNATIONAL TRANSPORT WORKERS' FEDERATION, http://www.itfglobal.org/flags-convenience/sub-page.cfm (last visited Mar. 11, 2010); EUROPEAN PARLIAMENT DIRECTORATE-GENERAL FOR RESEARCH, THE COMMON MARITIME POLICY § 2 (1996), *available at* http://www.europarl.europa.eu/workingpapers/tran/w14/2_en.htm (last visited Oct. 3, 2010); Sock-Yong Phang, *Quasi-flag of convenience shipping: the wave of the future*, TRANSPORTATION JOURNAL, Dec. 22, 1993, *available at* http://www.allbusiness.com/operations/shipping/416713-1.html.

is launched from the facility and carried on the registry of the United Kingdom in accordance with the Registration Convention. Some level of operational control of the space object is maintained at Acme's headquarters in the United States, but primary operational control is conducted from the Turks and Caicos facility. Further, beneficial use of the satellite exists within the United States in the form of navigational services.

Under Exception 2, the U.S. courts would not have jurisdiction if Acme's satellite infringed a U.S. patent based on the satellite being used in outer space because the satellite is registered with the United Kingdom.[71] However, assuming *arguendo* that Exception 2 does not apply, would extraterritorial principles yield a different result? Under both *Decca* and *NTP*, the United States would also arguably not have jurisdiction if Acme's satellite infringed a patented system based on the act of using the satellite because there is insufficient control exercised over the satellite from the United States, albeit the remaining prong(s) in both analyses exist. Indeed, in 1993, the U.S. Court of Claims addressed a similar situation in *Hughes Aircraft Co. v. United States*, where it held that there was no infringement of a U.S. patent by a satellite, the ARIEL 5,[72] that never entered the United States and was built in and primarily controlled from the United Kingdom, even though NASA's Goddard Space Center in Maryland "was the central communications link for tracking and data acquisition services" for the satellite.[73] Applying *Decca*, the court reasoned that although a certain amount of control was provided from Maryland, "the 'control point' for the spacecraft itself was in England," so the United States had insufficient control over

[71] The acts of making and selling the satellite in outer space are generally unrealistic in the foreseeable future and therefore not examined in this article.

[72] Hughes Aircraft Co. v. United States, 29 Fed. Cl. 197, 243 (1993) [hereinafter *Hughes*]. ARIEL 5 was an observational satellite designed to study the Earth's atmosphere in the X-ray band region of the electromagnetic spectrum. J. F. Smith & G. M. Courtier, *The Ariel 5 Programme*, 350 *PROC. R. SOC. LOND. A.* 421 (1976).

[73] *Id.* at 242.

the spacecraft to establish jurisdiction.[74] We suggest the same analysis would apply to Acme's satellite launched and primarily controlled from the Turks and Caicos as given in this first scenario.

ii. Scenario 2: U.S. company launches a satellite from a facility located outside of the United States, but controls the spacecraft from its headquarters located within the United States

For our second scenario, let us change the facts slightly such that Acme Corporation's satellite is launched from the Turks and Caicos Islands, but it is primarily controlled from Acme's headquarters in the United States, with the same beneficial use as before in the U.S. Again, because the United Kingdom is the "State from whose territory or facility [the] space object is launched," the satellite is properly carried on the registry of the United Kingdom in accordance with the Registration Convention.

Under Exception 2, the United States would not have jurisdiction in the event Acme's satellite infringed a U.S. patent based on the satellite being used in outer space. Note that the level of control is not a consideration with respect to the applicability of Exception 2. However, assuming *arguendo* that Exception 2 does not apply, would extraterritorial principles yield a different result in this scenario? Under both *Decca* and *NTP*, the United States would arguably have jurisdiction in the event the satellite infringes upon a U.S. patented system based on use in outer space because the satellite is primarily controlled from the United States.[75] Indeed, the court in *Hughes* noted that under *Decca*, the United States would have had patent jurisdiction over the ARIEL 5 satellite "had [NASA] actually originated the [satellite control] commands within the United States and then transmitted those commands to the

[74] *Id*. at 243 (distinguishing the level of U.S. control over the ARIEL 5 satellite from the system at issue in *Decca*, where a "master station" for the system was located within the United States).
[75] *Decca*, supra note 33, at 1074-75 (holding that the United States had jurisdiction over a worldwide radio navigation system where the "master station" was located within the United States).

satellite through its STDN system."[76] However, the alleged infringement in *Hughes* took place prior the enactment of 35 U.S.C. § 105, so the court did not address Exception 2. Becuase Exception 2 renders U.S. patent law inapplicable for space objects that are carried on the registry of a foreign state in accordance with the Registration Convention, regardless of whether primary control is exercised from the United States, it is possible that Acme has now insulated itself from patent infringement liability under circumstances in which it would not have been able to do so under the extraterritorial analyses of *Decca* or *NTP*.

iii. Scenario 3: A foreign subsidiary of a U.S. company launches and controls a satellite from a facility located within the United States

For the third scenario, let us change the facts again to a more extreme example. Acme Corporation forms a wholly owned subsidiary, Acme Sub, which is incorporated in and operated from the Turks and Caicos Islands in accordance with all appropriate corporate formalities. Acme Sub purchases a satellite from a U.S. manufacturer, procures launch services from a facility in the United States and controls the satellite from a facility in the United States. Beneficial use of the satellite also occurs in the U.S. Nevertheless, because Acme Sub is incorporated in Turks and Caicos, the United Kingdom agrees to "steps into the shoes" of Acme Sub and be deemed the launching State under the Registration Convention by virtue of being the State that "procured" the launching of the satellite. In sum, the Acme Corporation is relying on a pure "flag of convenience" strategy.

As in Scenario 2, applying the analysis of either the *Decca* or *NTP* decisions would arguably lead to the conclusion that the United States has patent jurisdiction over Acme Sub's satellite's activities in outer space based on the extraterritorial principles of these decisions. Nevertheless, Exception 2 removes Acme Sub's satellite from U.S. patent jurisdiction because the satellite is properly registered on

[76] *Hughes*, supra note 72, at 242.

the U.K. spacecraft registry under the Registration Convention. Using the Exception 2 as a shield, Acme Sub has apparently insulated itself from patent infringement liability in the United States in this scenario notwithstanding the obvious inequities in the result.[77]

IV. Squaring Exception 2 with the United States' Obligations under the Outer Space Treaty

The foregoing discussion has shown how the §105(a) Exceptions have created a loophole in U.S. patent law that could permit private entities to insulate themselves from patent infringement liability in the United States for their outer space operations under circumstances wherein they might otherwise be liable under current U.S. extraterritorial principles. This loophole poses at least two problems. First, allowing companies to avoid liability for infringing U.S. patents could hamper the effectiveness of the U.S. patent system. Patents traditionally play an important role in promoting high technology research and innovation. An ineffective patent system could reduce incentives for private space companies to innovate and cause space companies to protect their inventions as trade secrets instead of disclosing them to the public in patent filings.[78] Second, while a purpose of Exception 2 is to recognize and defer to the United States' obligations under the Outer Space Treaty and the Registration Convention, it is unclear whether completely deferring to the Registration Convention was actually required in order to accomplish this goal. In fact, entirely ceding responsibility for patent infringement by space objects that

[77] The authors reiterate that this analysis is examining patent infringement claims based on patented technologies used only in outer space where none of the claims cover terrestrial operations. In addition, had Acme Sub launched the satellite from the United States, but built and controlled the satellite from outside the United States, it would likely have been protected from patent infringement liability in the United States by the temporary presence defense to patent infringement, which is codified at 35 U.S.C. § 272. *See Hughes*, *supra* note 72, at 240-41 (holding that the temporary presence doctrine provided a "complete defense" to the defendant's infringement of a U.S. patent by a spacecraft that "entered the United States one time for the sole purpose of being launched into outer space").

[78] The negative ramifications of ineffective patent protection for inventions used in outer space are discussed in more detail in Kleiman, *supra* note 66. *See also* Reynolds, *supra* note 23, at 15-17 ("Many of the most promising [space technologies] can only be reduced to practice in outer space, since they rely on microgravity or other unique characteristics of the space environment. Thus, a lack of patent protection would likely forestall research in these fields. …By failing to extend patent protection to space innovations made by smaller firms and research centers, we would systematically be depriving ourselves of our most valuable research resources.").

are operated by U.S. persons or companies may be inconsistent with the United States' obligations under the Outer Space Treaty.

To examine this view further, consider, as stated *supra*, that the Outer Space Treaty provides that "a State Party to the Treaty on whose registry an object launched into outer space is carried *shall retain jurisdiction and control* over such object, and over any personnel thereof, while in outer space."[79] Although the language "shall" suggests a mandatory edict is being placed on the launching State, with respect to "retain jurisdiction," neither the Outer Space Treaty nor the Registration Convention requires that the designated launching State exercise *exclusive* jurisdiction over its registered space objects. The failure of the Outer Space Treaty to vest a single state with exclusive jurisdiction over space objects seems intentional when compared with language in the 1959 Convention on the High Seas, which provides that "Ships shall sail under the flag of one State only and, save in exceptional cases expressly provided for in international treaties or in these articles, shall be subject to its *exclusive* jurisdiction on the high seas."[80] By contrast, the language in article VIII of the Outer Space Treaty is much less restrictive.

Further support in the view that the State of Registry does not necessarily have exclusive jurisdiction over its registered space objects can be found by the fact that the Registration Convention seems to encourage creative jurisdictional arrangements when there are multiple potential launching States. Specifically, the Registration Convention states that the determination of the launching State shall be made "without prejudice to appropriate agreements concluded or to be concluded among the

[79] Outer Space Treaty*, supra* note 22, at art. VIII (emphasis added).

[80] Convention on the High Seas, *supra* note 67, art. 6 (emphasis added). Article 92 of the United Nations Convention on the Law of the Sea, to which the United States is not a party, contains a virtually identical provision. However, even the maritime "law of the flag" is not absolute: national courts are willing to disregard the doctrine in favor of overriding public policy considerations. For instance, the United States Supreme Court held in *Spector v. Norwegian Cruise Line Ltd.* that a foreign flag could not shield a cruise ship from the requirements of the Americans with Disabilities Act while the ship was in U.S. waters. 545 U.S. 119 (2005).

launching States on jurisdiction and control over the space object and over any personnel thereof."[81] A 1986 report by the U.S. Congressional Office of Technology Assessment even speculated that this provision of the Registration Convention could be a basis upon which to establish joint jurisdiction under the Registration Convention for the then-proposed international space station.[82]

Assuming the State of Registry's jurisdiction over its registered space objects is non-exclusive, how might a State other than the State of Registry assert jurisdiction over a space object? There are five principles upon which States have traditionally sought to assert jurisdiction over a person or entity. Jurisdiction based on the geographic territory of a State (Territorial Jurisdiction) is perhaps the most common form of jurisdiction, but a State may also assert jurisdiction beyond its geographic borders based on the nationality of the persons or entities involved (National Jurisdiction), the impact of the acts committed on vital State interests (Protective Jurisdiction), the principle that some crimes are universally condemned (Universal Jurisdiction), and the ability of a State to act with regard to an action by a foreigner outside its territory where that action would substantially affect the person or property of a citizen (The Passive Personality Principle).[83]

The possibility of more than one State having jurisdiction over a spacecraft based on these principles of jurisdiction is already established in current U.S. space law. The U.S. law concerning the licensing of private spacecraft utilizes National Jurisdiction to mandate that all U.S. citizens, U.S. corporations, and foreign corporations that are controlled by a U.S. citizen or corporation must obtain a license from the U.S. government prior to launching a spacecraft, operating a launch site, or reentering a reentry vehicle into the atmosphere, regardless of whether such activities are conducted within or

[81] Registration Convention, *supra* note 24, at art. II, ¶ 2.
[82] OFFICE OF TECHNOLOGY ASSESSMENT, SPACE STATIONS AND THE LAW: SELECTED LEGAL ISSUES (Aug. 1986), available at http://www.fas.org/ota/reports/8627.pdf.
[83] Reynolds, *supra* note 23, at 18.

outside of the United States.[84] When these activities are conducted outside of the United States, the foreign States where the activities are actually conducted would presumably also have Territorial Jurisdiction over such activities. Regardless of which State is designated as the "launching State" under the Registration Convention, absent an agreement to the contrary, the U.S. operator of a spacecraft would still need to obtain a license from the United States to launch or recover a spacecraft or operate a launch facility.[85] If the foreign State is designated as the State of Registry, the application of Exception 2 in a future patent dispute would lead to the incongruous result of a spacecraft being within the jurisdiction of the United States for licensing purposes, but outside of the jurisdiction of United States for patent infringement purposes.

In addition, while article VIII of the Outer Space Treaty focuses on the "State Party to the Treaty on whose registry an object launched into outer space is carried," other sections of the Outer Space Treaty extend responsibility for space activities beyond the formality of registration. As stated *supra*, article VI provides that States shall bear "international responsibility" for outer space activities "carried on by governmental agencies *or by non-governmental entities*" and that the "activities of non-governmental entities in outer space . . . shall require *authorization and continuing supervision* by the appropriate State Party to the Treaty."[86] Article VII further provides that "[e]ach State Party to the Treaty that launches or procures the launching of an object into outer space . . . is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object."[87]

Neither article VI nor article VII takes into account the formality of registration. Rather, both articles expect States to shoulder the burden of responsibility for the activities of its spacecraft, and meeting this responsibility was the primary reason behind the United States asserting National

[84] 51 U.S.C. § 70104(a) (1998).
[85] *Id.* at ¶ (a)(2).
[86] Outer Space Treaty, *supra* note 22, at art. VI (emphasis added).
[87] *Id*. at art. VII.

Jurisdiction over licensing the space-related activities of U.S citizens and corporations, regardless of where these activities take place. For licensing purposes, U.S. law does not distinguish between a spacecraft that is registered with the United States or with another State party to the Registration Convention. It is therefore questionable whether basing patent jurisdiction for infringement lawsuits solely on the space object's State of Registry, without any consideration of extraterritorial patent jurisdictional principles, is necessary under the Registration Convention or consistent with the United States' responsibilities under the Outer Space Treaty.

V. How U.S. Patent Owners May Attempt to Enforce Their Patents Despite the §105(a) Exceptions

At this point in our journey, it would appear that a patent owner would have little recourse against a well-informed, would-be, and cunning patent infringer. The §105(a) Exceptions represent significant legal predicaments. In particular, Exception 2 is analogous to sovereign immunity if an invention is made, used, or sold in outer space on a space object registered in a foreign registry in accordance with the Registration Convention, the alleged infringer is immune from an infringement claim based on U.S. patent law with respect to the acts of making, using, or selling the invention. Exception 2 vastly limits a court's discretionary authority to take into account any other equitable considerations presenting harsh consequences.

Rather than attempting to defeat Exception 2 head-on, a successful litigation strategy for a U.S. patent owner may reside in attacking a would be infringer's reliance on Exception 2. To quote Sun Tzu in the ART OF WAR, "So in war, the way is to avoid what is strong and to strike at what is weak."[88] With this advice in mind, the following potential tactics are presented.

a. Infringing Acts Under 35 U.S.C. § 105 and § 271(a) Remain Unreconciled

[88] Sun Tzu on the Art of War: The Oldest Military Treatise in the World, Translated from the Chinese by Lionel Giles, M.A., Ch. 6, ¶ 30 (1910).

Embedded in the complexity of U.S. patent law resides at least one potential tactic with the power to neutralize the §105(a) Exceptions. This opportunity lurks due to differences between the enumerated acts of infringement identified in 35 U.S.C. § 105, Inventions in outer space, and those given in 35 U.S.C. § 271, Infringement of patent.[89]-[90] 35 U.S.C. § 105 addresses "any invention made, used, or sold in outer space …" Comparatively, 35 U.S.C. § 271(a) addresses the scenarios wherein "whoever without authority makes, uses, *offers to sell*, or sells any patented invention, within the United States, or *imports* into the United States any patented invention . . . ."[91] Because 35 U.S.C. § 105 does not explicitly address the acts of "offering to sell" and "importing," it is arguable that the §105(a) Exceptions would not render U.S. patent law inapplicable for infringement claims based on an offer to sell or importation within or into the United States, respectively. And therefore, even if a space object is registered on a foreign registry in accordance to the Registration Convention or provided for in an international agreement, U.S. courts may establish jurisdiction for patent infringement claims based on the acts of an offer to sell and importation.

Although a comprehensive examination of what constitutes an offer to sell within the United States in the context of an extraterritorial application is beyond the scope of this article,[92] the reality of applying an "offer to sell" within the United States for an object in outer space likely presents practical hurdles. Absent an actual offer to sell the invention later placed in outer space on a space object itself, how far would a court go to hold that a constructive offer to sell has occurred for an invention that is to

[89] "(a) Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States, or imports into the United States any patented invention during the term of the patent therefor, infringes the patent." 35 U.S.C. § 271(a).

[90] Congress amended § 271(a) to include the acts of "offers to sell" and "imports" in response to the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement by way of the Uruguay Round Agreements Act, Pub. L. No. 103-465, § 533, 108 Stat. 4809, 4988 (1994). 35 U.S.C. § 105(a), codified in 1990, was not amended to reconcile its terms with the 1994 amendments to §271(a).

[91] 35 U.S.C. § 271(a) (emphasis added).

[92] *See* Chantal Kuhn Rappi, What Might Have been ... Or Is? The Past, Present and Future of Offer-to-Sell Infringement Jurisprudence and Damages (Mar. 9, 2011) (unpublished manuscript, on file with the Section of Intellectual Property Law of the American Bar Association) (for a more comprehensive examination of this topic).

be used in outer space on a space object? For example, if a company is offering to sell a satellite telephone service in the United States which requires use of a telecommunications satellite (i.e., the space object) registered on the registry of a foreign State, wherein the satellite uses an invention that reads on the claims of a patented system, would a court hold that offering to sell the satellite telephone service is inherently an offer to sell a license to use the invention used on the telecommunications satellite? If so, offering to sell the satellite telephone service would arguably represent a constructive offer to sell the invention used on the telecommunications satellite within the United States. Further complicating this issue, can the acts of an offer to sell and use be mutually exclusive? [93,94] Similarly, does an "offer to sell within the United States" require that performance occur in the United States regardless of where the actual offer was made?[95,96] In the above example, the conclusion is based on a chain of logic that relies on an inherent license to use the space object. In other words, in a majority of cases, the use of the space object may be inseparable from the act of offering to sell it. A reasonable argument can be made that one cannot rely on the act of offering to sell a space object without also invoking the use element, thereby summoning 35 U.S.C. § 105 and the §105(a) Exceptions. In addition, it can be argued that the location where the actual offer occurs is not the pertinent issue, but rather the location of where contemplated or actual performance is determinative.[97] And thus, in the above example, even if the offer occurs within the United States, if the patented invention is made, used, or sold in outer

[93] *See* Transocean Offshore Deepwater Drilling, Inc. v. Maersk Contractors USA, Inc., 617 F.3d 1296, 1309 (2010) [hereinafter *Transocean*] (determining that an offer by a U.S. company to sell a patented invention to another U.S. company for delivery and use in the U.S. constitutes an offer to sell within the U.S.).

[94] *Id*. at 1310 (holding that a contract between two U.S. companies for performance in the U.S. may constitute an offer to sell within the U.S. under § 271(a) even if the offer was negotiated or a contract signed while the two U.S. companies were abroad).

[95] *Id*. at 1309 ("We agree that the location of the contemplated sale controls whether there is an offer to sell within the United States.").

[96] *Id*. at 1310 (holding that a contract between two U.S. companies for the sale of a patented invention with delivery and performance in the U.S. constitutes a sale under § 271(a) as a matter of law).

[97] The *Transocean* court seems to apply the following logic: first, the location of contemplated performance of the invention determines the location of a contemplated sale; second, the location of a contemplated sale determines the location of the offer to sell; hence, the location of contemplated performance of the invention determines the location of the offer to sell.

space on the space object registered in a foreign registry, then the offer to sell occurs in the country of foreign registry.[98]

The act of importation also presents unique issues. Upon first blush, importing an object in outer space into the United States seems unrealistic. However, in light of the International Space Station, where each individual module is on the registry of one of the international partner States,[99] the act of constructive importation into the United States is a practical reality. Consider the scenario where an experimental payload, specifically identified as a Japanese experiment in an intergovernmental agreement, is permanently moved from the Japanese Experiment Module to the U.S. Lab and subsequently used in the U.S. Lab. The experimental payload is effectively imported into the United States from Japan. If the payload reads on the claims of a U.S. patented invention, the patent owner may be able to sue the Japanese owner for infringement and argue that the basis for such a lawsuit is the act of importing the patented invention into the United States. This argument can be made even in light of Exception 1 because the patent owner is relying on the act of importation as opposed to the act of making, using, or selling. However, similar to what was discussed *supra*, are the acts of importing and using mutually exclusive from a practical perspective? In the previous example, a court could easily hold that even though the payload was imported into the United States, it was also used in outer space on a space object under the jurisdiction or control of the United States and therefore, 35 U.S.C. § 105 applies, thereby invoking Exception 1.

[98] *See* Ion, Inc. v. Sercel, Inc., No. 5:06-CV-236-DF (E.D. Tex. Sep. 16, 2010) (motion for judgment as a matter of law on damages based on foreign sales and offers for foreign sales; holding, based on guidance in *Transocean*, that §271(a) does not apply to offers made in the United States to sell patented inventions in Brazil and Canada).

[99] In regard to the European Space Agency (ESA), an activity conducted on an ESA-registered module may be deemed to have occurred within the territory of any European Partner State. ISS Agreement, *supra* note 29, at art. 21.

Further complicating the potential application of this tactic is the holding in *NTP* where the court expounded the principle that only "use" of a patented method can infringe it.[100] At least for method claims, it would seem that the acts of an "offer to sell" and "importation" are indeed inseparable from the act of "use." One would therefore expect that for a patented method, this tactic would only be available for a patent owner to have her day in court, but she would not win her infringement claim based on statutory interpretation.

Although application by the courts of this alternative tactic is uncertain, particularly with respect to a patented system, it does offer flexibility for courts to open the jurisdictional door in patent infringement cases that would otherwise have been closed due to the §105(a) Exceptions.

b. Induced Infringement

The acts defined in 35 U.S.C. § 271(a) are acts of direct infringement. Contrastingly, 35 U.S.C. § 271(b)[101] provides a patent owner a cause of action based on induced infringement. "In order to succeed on a claim of inducement, the patentee must show, first that there has been direct infringement, and second, that the alleged infringer knowingly induced infringement and possessed specific intent to encourage another's infringement."[102] Whether or not an extraterritorial extension of U.S. patent law can be made via induced infringement is an open issue.[103] On the one hand, some courts have held that § 271(b) "applies to exclusively territorial conduct."[104] Yet on the other hand, "[t]he Federal Circuit has not definitively addressed whether inducing activity extraterritorially can give

[100] *See NTP, supra* note 32*,* at 1319 ("Congress has consistently expressed the view that it understands infringement of method claims under section 271(a) to be limited to use.").
[101] "Whoever actively induces infringement of a patent shall be liable as an infringer." 35 U.S.C. § 271(b) (2003).
[102] Minn. Mining & Mfg. v. Chemque, Inc., 303 F.3d 1294, 1304-05 (Fed. Cir. 2002).
[103] Westerngeco, Inc. v. Ion, Inc., No. 4:09-cv-1827, at 77-78 (S.D. Tex. Mar. 2, 2011).
[104] *Id.* at 78 (citing Wing Sing Products (BVI), Ltd. v. Simatelex Manufactory Co., 479 F. Supp. 2d 388, 409 (S.D.N.Y. 2007)).

rise to liability under U.S. patent law . . . ."[105] Reconsider the example discussed *supra* where an offer occurs within the United States to sell a license to use an invention used in outer space on a space object (registered in a foreign registry) comprised of a patented invention. If a court holds that the location of performance of a contemplated sale is determinative with respect to where an offer to sell occurs, a patent owner would not have a cause of action based on a § 271(a) "offer to sell" claim of infringement. However, a patent owner may still have a cause of action based on an extraterritorial extension of induced infringement, even though the act of direct infringement constructively occurs abroad.[106]

c. Attacking the Validity of a Registration in a Foreign Registry

A patent owner may also challenge the underlying basis of Exception 2 or the validity of the registration itself. If the registration is rendered invalid, it logically follows that Exception 2 would not apply. The Registration Convention places certain continuing obligations on a launching State. According to article II.2, where there are two or more possible launching States for a space object, the potential launching States shall jointly determine which one of them shall register the object.[107] Such determination shall "*bear in mind*" the provisions of article VIII of the Outer Space Treaty, which provides that "a State Party to the Treaty on whose registry an object launched into outer space is carried *shall retain jurisdiction and control* over such object, and over any personnel thereof, while in outer space."[108] Merely retaining jurisdiction or merely retaining control is not sufficient. At least in the context of the Outer Space Treaty, it appears that to be a valid launching State, jurisdiction and control of the space object must be retained by the launching State.

[105] *Id.* at 77.
[106] This strategy appears to be tenuous. *See* DSU Medical Corp. v. JMS Co., 471 F.3d 1293, 1305 (Fed. Cir. 2006) (en banc) (quoting with approval jury instruction stating, "Unlike direct infringement, which mush take place in the United States, induced infringement does not require any activity by the indirect infringer in this country, as long as the direct infringement occurs here.").
[107] Registration Convention, *supra* note 24, at art. II, ¶ 2.
[108] *Id*. (emphasis added)

The regulatory and licensing protocols of a nation would seemingly require sufficient personal contacts to support a court's finding that jurisdiction has been retained over a private enterprise. Conversely, it would be more difficult for a launching State to satisfy its continuing obligation to "retain control" over a space object. Retaining operational control would most likely fall within the definition of "retain control." But, is this term limited to operational control? What about financial control? What about administrative control? At the present time, the definition of "control" in the context of article VIII of the Outer Space Treaty is unknown. Moreover, even with respect to operational control, there are various levels of operational control. Recall Scenario 3 where the launching State (i.e., the United Kingdom) retains no operational control of Acme's satellite. Would a court having jurisdiction to adjudicate the validity of a registration recognize the inequities of Scenario 3 and effectively "pierce the veil" of Acme Sub's registration thereby rendering it invalid? The uncertain nature of the answer to this question was best described by the court in *Decca*, who, while discussing the instances of "flags of convenience" addressed by the U.S. Supreme Court in determining whether and when the courts should imply exceptions to it noted: "[s]ometimes it does so, sometimes not."[109] Thus, although the outcome of this strategy is uncertain, the legal basis for rendering a registration invalid theoretically exists under auspices of the Outer Space Treaty and the Registration Convention's reference to it.

VI. CONCLUSION

Given the current language and structure of 35 U.S.C. § 105 and in light of the definition of a "launching State" under the Registration Convention, questions arise as to whether a private enterprise can insulate itself from patent infringement claims in the United States when it launches, controls, or launches and controls, a foreign-registered space object from within the territorial borders of the United States, particularly when there is beneficial use, ownership, or both, from the United States. Even if a

[109] *Decca*, *supra* note 33, at 1073.

private enterprise would otherwise be within the jurisdiction of the U.S. judicial system, absent an amendment, the §105(a) Exceptions may represent a significant loophole that enables a private enterprise to avoid patent infringement claims in the United States with respect to its activities in outer space. Once the commercial space industry comes of age, we may find that this loophole will both decrease the ability of the U.S. patent system to fully incentivize private research and development of space technologies[110] and hamper the United States' ability to satisfy its obligation under the Outer Space Treaty to be responsible for and to supervise its governmental and non-governmental national space activities.

Many commentators have argued that the harmonization of international patent laws or a new outer space patent jurisdiction is required in order to negate the impact of outer space flags of convenience and properly protect space technologies from patent infringement.[111] Yet the "traditional reluctance of terrestrial nations to surrender their sovereignty to international organizations" makes the implementation of such a system unlikely in the foreseeable future.[112] In the meantime, closing the loophole created by the §105(a) Exceptions, with particular emphasis on preventing a use of Exception 2 to create flags of convenience, would be an important intermediate step towards achieving these objectives.

[110] A legislative intent of §105 was to confront "[u]ncertainty as to the application of patent law in [areas where U.S. patent law does not recognize extraterritorial activity such that] may chill prospects for commercial investment in outer space research and manufacturing." S. Rep. No. 266, *supra* note 46, at 4. Hence, the incorporation of Exception 2 with the intent of conforming to the Outer Space Treaty may arguably result in the very chilling effect that § 105 was designed to prevent.

[111] *See, e.g.,* Kleiman, *supra* note 66, at 6 ("the ideal solution to the flag of convenience problem, at least as it relates to effective patent protection, is to create a new multinational patent jurisdiction for filing and enforcing patents in outer space"); Lyall & Larsen, *supra* note 19, at 127 ("general and uniform patent protection for inventions made in outer space would give investors confidence in outer space research and encourage such activities"); WIPO Issue Paper, *supra* note 21, at ¶ 82 ("the best solution [to legal uncertainty regarding intellectual property protection for the space industry is] to declare space and its accessories (for example, launch sites and vehicles) as a single territory with a single and uniform law and with a single and universal enforcement body").

[112] Kleiman, *supra* note 66, at 6.

Because the Outer Space Treaty does not explicitly assign exclusive jurisdiction to the State of Registry, it is doubtful that deferring to the Registration Convention is necessary in order for the United States to extend U.S. patent jurisdiction to certain space objects registered in foreign states. Following extraterritorial principles, instead, could be a more equitable mechanism for determining whether the United States has a legitimate interest in asserting jurisdiction over the extraterritorial patent infringement of U.S. patents. For these reasons, Congress should consider amending 35 U.S.C. § 105 by modifying Exception 2 to require U.S. courts to follow extraterritorial principles when evaluating whether the United States has jurisdiction on a claim of patent infringement by a "foreign-flagged" spacecraft. In addition, the United Nations Committee on the Peaceful Uses of Outer Space, which is currently responsible for maintaining the registry of space objects under the Registration Convention, should consider playing a more active role in evaluating the validity of space object registrations under the Registration Convention, particularly in light of launching States' continuing obligations defined in the Outer Space Treaty.

Our journey is now complete. This article has taken the reader down an adventurous voyage exploring the mishmash of statutory law, case law, and international treaties that make up a legal "Wonderland" known as the extraterritorial reach of U.S. patent law on space-related activities, complete with sensical and nonsensical twists and turns. As humans continue to reach for the stars, the time may be near where patent owners and alleged infringers will, like Alice, have to take their own journey into this Wonderland.