COMMENTS

Assessing the Need for an International Patent Regime for Inventions in Outer Space

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When deep space exploration ramps up, it'll be the corporations that name everything, the IBM Stellar Sphere, the Microsoft Galaxy, Planet Starbucks
—Jack, Fight Club[1]

I. INTRODUCTION

In 2009, Virgin Galactic will initiate the first privately manned spaceflights from its spaceport in New Mexico.[2] This marks the beginning of what is sure to become a robust industry of space tourism. What will follow is the almost certain proliferation of private spacecraft and, eventually, private space stations in outer space, for purposes as varied as tourism, research, manufacturing, and perhaps even mining. Currently, space law is a creature of international law, largely governed by treaty, whose application to purely private enterprises in outer space

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1. FIGHT CLUB (20th Century Fox 1999), *available at* http://www.dailyscript.com/scripts/fightclub_2_98.html.

2. Jacqui Goddard, *Up, Up, and Ka-Ching!*, NEWSWEEK INT'L ED., Feb. 11, 2008, *available at* http://www.newsweek.com/id/107550.

may be questionable.[3] This uncertainty gives rise to innumerable legal problems. The focus of this Comment will be the future of patents on processes developed in outer space, their subsequent enforcement, and assessing the need for an international agreement governing outer space patents.

A likely scenario would be where a corporation owns a space station on which a process, like a medical procedure that can only be performed in zero gravity environments, is developed. Then, the employees of a neighboring privately owned space station begin using the same process. By examining this scenario, several key questions arise. What intellectual property laws will govern, and who should be responsible for enforcement? How much flexibility should private corporations be given in determining what laws will apply aboard their spacecraft? And, does this scenario highlight the necessity of extending the international patent agreements into outer space to deal effectively with these problems? Because of the enormous investment in outer space research and development, private corporations and investors should be able to rely on a more certain and universal legal standard that will prevent launch forum shopping. Additionally, in order to encourage building the necessary infrastructure to facilitate private commercial activity in space, space-faring nations should be assured of their obligations under international law. Therefore, it is imperative that the United States and other space-faring nations develop a workable standard in the immediate future to foster private sector investment in outer space research.

II. THE PLAYERS

Currently, China, Russia (the USSR before it), and the United States have accomplished a manned space flight.[4] The European Space Agency (ESA) did not list manned spaceflight as one of its original goals, but now has voiced its intention to join the exclusive club of space-faring nations.[5] The ESA is an organization comprised of seventeen

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3. Michael Gerhard, *National Space Legislation—Perspectives for Regulating Private Space Activities*, *in* ESSENTIAL AIR AND SPACE LAW 75-76 (Marietta Benko & Kai-Uwe Schrogl eds., 2005).

4. Spacefaring—Wikipedia, http://en.wikipedia.org/wiki/Spacefaring (last visited Sept. 8, 2008).

5. Michael A. Taverna & Frank Morring, Jr., *Pilot in the Loop; Europe Tries To Force Discussion on Station Endgame in Sign of Growing Space Ambitions*, AVIATION WK. & SPACE TECH., Jan. 21, 2008, at 28.

member states that oversees European space exploration.[6] Of these seventeen member states, all but three (Iceland, Norway, and Switzerland) are members of the European Union. Additionally, Japan and India, who currently have some launch capabilities, have voiced their desires to begin manned spaceflight.[7] It is entirely possible that, in the next twenty-five years, there will be five nations and one supranational entity with the capability for manned launches into space. The aforementioned nations, including all those that are members of the ESA, have ratified the OST.[8] With the exception of the Moon Treaty, subsequent outer space treaties have enjoyed relatively broad support among these nations.[9] Despite the recent attempt to harmonize international patent law, there is still the possibility of six intellectual property regimes at work in outer space, illustrating the need for greater cooperation between space-faring nations to create legal certainty for would-be private investors in outer space research and development.

III. THE CURRENT STATE OF SPACE LAW

A. The Outer Space Treaty and Its Progeny

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, or Outer Space Treaty (OST), was originally ratified in 1966 by the United States, the United Kingdom, and Soviet Union.[10] Since then, ninety-nine countries have signed and ratified the Treaty, with ratification pending on the signatures of an additional twenty-six.[11] The stated purpose of the OST is to facilitate the cooperation between nations

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6. CONVENTION OF THE EUROPEAN SPACE AGENCY (2005), http://www.esa.int/esapub/sp/sp1300/sp1300EN1.pdf.

7. *China: Lunar Probe Blasts Off Amid Much Fanfare*, INTERPRESS SERVICE, Oct. 29, 2007, *available at* http://ins.onlinedemocracy.ca/index.php?name=News&file=article&sid=10224; *Springboard for Ambition*, AEROSPACE AM., Nov. 2007, at 12-13.

8. UNITED NATIONS TREATIES AND PRINCIPLES ON OUTER SPACE AND RELATED GENERAL ASSEMBLY RESOLUTIONS ADDENDUM STATUS OF INTERNATIONAL AGREEMENTS RELATING TO ACTIVITIES IN OUTER SPACE AS AT 1 JANUARY 2008 (Jan. 1, 2008), http://www.unoosa.org/pdf/publications/ST_SPACE_11_Rev2_Add1E.pdf [hereinafter STATUS OF INTERNATIONAL AGREEMENTS].

9. ESA New Member States, http://www.esa.int/SPECIALS/About_ESA/SEMP936LARE_0.html (last visited Sept. 8, 2008).

10. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205 [hereinafter OUTER SPACE TREATY].

11. STATUS OF INTERNATIONAL AGREEMENTS, *supra* note 8.

to peacefully explore outer space for the "benefit of all peoples irrespective of the degree of their economic or scientific development."[12]

Article VIII provides that member states shall retain "jurisdiction and control" over any object on its national registry launched into outer space and over any persons on board.[13] When the OST was written, it was primarily directed to state actors, as the participation of private entities in outer space activities was not yet contemplated.[14] However, article VI suggests that member states will retain some level jurisdiction over private spacecraft on their respective registries, stating that member states will "bear international responsibility for national activities in outer space . . . whether such activities are carried on by government 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."[15] While the term "non-governmental entities" appears to apply to all private actors, it is less clear that "national activities" encompass all outer space activities that are purely commercial in nature.[16] It has been suggested that "national activities" should encompass all activities by nationals of any country aboard a spacecraft that is registered with the member state.[17] Under this interpretation, member states will be faced with a legal construct in which they are essentially liable for the acts of a legal person or corporate entity on a privately owned spacecraft.[18]

Jurisdiction in outer space is most often defined by nationality rather than by territoriality.[19] This concept of nonterritoriality is enshrined in the OST, which requires member states to maintain a registry of objects launched into space.[20] The Registration Convention of Objects Launched into Outer Space (Registration Convention) was

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12. Outer Space Treaty, *supra* note 10, art. 1.

13. *Id.* art. 8.

14. *Id.* art. 1.

15. *Id.* art. 6.

16. Gabriel Lafferranderie, *Basic Principals Governing the Use of Outer Space in Future Perspective*, *in* ESSENTIAL AIR & SPACE LAW: CURRENT PROBLEMS AND PERSPECTIVES FOR FUTURE REGULATION 5, 16 (Marietta Benko & Kai-Uwe Schrogl eds., 2005) ("Now it is well understood that the 'non-governmental entities' wording also covers private persons.").

17. Bin Cheng, *Liability Regulations Applicable to Research and Invention in Outer Space and Their Commercial Exploitation*, *in* RESEARCH AND INVENTION IN OUTER SPACE: LIABILITY AND INTELLECTUAL PROPERTY RIGHTS 86-89 (Sa'id Mosteshar ed., 1995).]

18. Lara L. Manzione, *Multinational Investment in the Space Station: An Outer Space Model for International Cooperation?*, 18 AM. U. INT'L L. REV. 507, 521 (2002).

19. Dan L. Burk, *Protection of Trade Secrets in Outer Space Activity: A Study in Federal Preemption*, 23 SETON HALL L. REV. 560, 573 (1993).

20. Outer Space Treaty, *supra* note 10, art. 8.

adopted in 1974 and entered into force in 1976.[21] With the exception of members of the ESA (Finland, Ireland, Portugal, and Luxembourg), all the previously mentioned major players in the forthcoming exploration of outer space are parties to this agreement.[22]

The Registration Convention elaborates on how parties to the OST should manage their registries and defines the term "launching state."[23] The result is that "the appropriate state party to the Treaty" as outlined in the OST has become the "launching state" under the Registration Convention.[24] Therefore, the "launching state" is charged with the responsibility to ensure that a private actor in outer space is acting in conformity with the OST. According to the Registration Convention, a launching state is defined as (1) a State which launches or procures the launching of a space object or (2) a State from whose territory or facility a space object is launched.[25] The "launches or procures the launching of" language is somewhat ambiguous and therefore provides a potential means for a private actor to escape the obligations set forth in the OST.[26] In other words, a private commercial entity might be able to select which jurisdiction applies aboard its spacecraft by where it is headquartered, where its production facilities are located, or even where it chooses to register the spacecraft. This language was likely intended to apply to launches made from international waters or from international airspace in the cases of a two-stage launch. Or, perhaps it was designed to facilitate the launching of objects registered by nations without launch capability so that those nations could still retain jurisdiction and liability in relation to its space objects.

It has been argued that while subsection two of article 1 of the Registration Convention is based on the territorial aspect of the launch,[27] subsection one focuses on the actual activity of a member state.[28] Bernhard Schmidt-Tedd and Michael Gerhard suggest that the launching state could be one "without whose explicit authorization, contribution, or

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21. United Nations Office of Outer Space Affairs Overview of the Registration Convention of Objects Launched into Outer Space, *available at* http://www.unoosa.org/oosa/en/SORegister/regist.html (last visited Sept. 8, 2008) [hereinafter Registration Convention].

22. STATUS OF INTERNATIONAL AGREEMENTS, *supra* note 8.

23. Registration Convention, *supra* note 21.

24. Bernhard Schmidt-Tedd & Michael Gerhard, *Registration of Space Objects: Which Are the Advantages for States Resulting from Registration?*, *in* ESSENTIAL AIR & SPACE L. 126 (Marietta Benko & Kai-Uwe Schrogl eds., 2005)]

25. Registration Convention, *supra* note 21, art. 1.

26. Schmidt-Tedd & Gerhard, *supra* note 24, at 126.

27. Registration Convention, *supra* note 21 (defining a launching state as a "State from whose territory or facility a space object is launched").

28. Schmidt-Tedd & Gerhard, *supra* note 24, at 132-33.

omission of an originally necessary licensing and/or positive decision on the approval and/or non-approval the space object would not have reached outer space."[29] This appears to still apply to a state owned spacecraft rather than one that is privately owned.

Although this legal scheme gives rise to innumerable scenarios, it is instructive to examine one in particular. Consider a private commercial actor has satisfied the territorial criteria set forth in subsection two by launching from the territory of *State A*, but has also satisfied the aforementioned requirements set forth by Schmidt-Tedd and Gerhard as to a *State B*.[30] Presently, it is unclear which state will be charged with responsibility for ensuring that private actor's compliance with the principles enshrined in the OST.

The OST, as well as subsequent treaties dealing with outer space, incorporates the core principle of "non-appropriation." This principle forbids nations from claiming territory or resources in outer space or on celestial bodies.[31] The nonappropriation principle is intended to effectuate the OST's other goal of exploring and exploiting outer space resources for the benefit of all nations regardless of their level of development.[32] There is a debate as to whether the principle of nonappropriation is applicable to private commercial actors.[33] This principal, however, is most easily applicable to claims made against tangible property, namely, those of territory and of natural resources.[34] It has been suggested that certain intangible property rights, specifically intellectual property rights, fall outside the ambit of the nonappropriation principle.[35] This was confirmed by the Agreement concerning the International Space Station.[36]

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29. *Id.* at 133.

30. *Id.*

31. Steven Freeland, *Symposium: Issues in Space Law: Up, Up, and . . . Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space*, 6 CHI. J. INT'L L. 1, 11-12 (2005); Leo B. Malagar & Marlo Apalisok Magdoza-Malagar, *International Law of Outer Space and the Protection of Intellectual Property Rights*, 17 B.U. INT'L L.J. 311, 345 (1999).

32. Freeland, *supra* note 31, at 11-12.

33. *See id.* (contending that nonappropriation does apply to private commercial actors).

34. *Id.*

35. Lafferranderie, *supra* note 16, at 13.

36. Agreement Among the Government of Canada, Governments of 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, Jan. 29, 1998, 1998 U.S.T. LEXIS 212 [hereinafter Space Station Agreement].

B. The Patents in Space Act

The United States Congress has indicated that some intellectual property rights should be protected and enforced in outer space by enacting section 105 of the Patent Code. Section 105 of the Patent Code was enacted in 1990 and is known as the Patents in Space Act.[37] The Patents in Space Act states that inventions made aboard a spacecraft that is in the United States will be considered under the "jurisdiction or control" of the United States and protected by the patent laws of the United States the same as would any invention made on U.S. territory. Space objects of foreign registry will not be considered under the jurisdiction of the United States.[38] The Patents in Space Act also allows for the United States to enter into a future agreement with another OST member state which would allow the United States to retain jurisdiction and control over patents aboard a spacecraft on that member state's registry.[39]

C. The Space Station Agreement

In 1998, Canada, the ESA, Japan, Russia, and the United States entered into a multilateral agreement concerning the International Space Station.[40] Of the aforementioned nations most likely to be space-faring in the next thirty years, only China and India are not party to this agreement.[41] Their absence, however, does not necessarily imply any opposition to the principles enshrined in the agreement, specifically those concerning intellectual property rights. The Space Station

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37. Patents in Space Act, 35 U.S.C. § 105 (1990), states:

(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.

38. *Id.*
39. *Id.*
40. *See* Space Station Agreement, *supra* note 36.
41. *See id.*

Agreement is an international agreement that contains explicit protections for intellectual property rights.[42] It is noteworthy that it received little criticism from other less developed OST member states.

It would appear that there is a general consensus that the principle of nonappropriation is a limited one. Article 21 is devoted entirely to intellectual property rights aboard the space station and is particularly focused on patent protection.[43] The International Space Station is divided into modules, or elements, each under the jurisdiction and control of a nation participating in the project.[44] Under article 21 of the Space Station Agreement, each module is the territory of the state to which the module is registered for purposes of intellectual property law.[45] Additionally (recognizing that disclosure requirements for obtaining patents vary from state to state), article 21 forbids Partner States from imposing the procedural requirements concerning the secrecy of patents on nationals of other states.[46] Lastly, article 21 forbids recovery of damages for infringement in multiple ESA member states for intellectual property created in an ESA element.[47]

The Space Station Agreement is the latest multilateral agreement that addresses the issue of private property rights in space and articulates two fundamental principles. First, despite the lack of territoriality on which terrestrial intellectual property rights are based,[48] there is a right to protection of intellectual property in outer space.[49] Second, the parties to the Agreement are presently content to extend quasi-territorial jurisdiction to objects under their direct control in outer space without having to adopt a universal intellectual property regime for outer space. Whether state parties will be willing or able to extend such quasi-jurisdiction to private spacecraft for the creation and protection of intellectual property remains to be seen.

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42. *Id.* art. 21.

43. *Id.*

44. *Id.* art. 6.

45. *Id.* art. 21 ("[F]or 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 Partner State of that element's registry, except that for ESA-registered elements any European Partner State may deem the activity to have occurred within its territory.").

46. *Id.*

47. *Id.*

48. Sa'id Mosteshar, *Issues Arising in Determining the Legal Regime Applicable to Intellectual Property Rights in Outer Space*, *in* RESEARCH & INVENTION IN OUTER SPACE: LIABILITY AND INTELLECTUAL PROPERTY RIGHTS 133-134 (1995).

49. *See* Space Station Agreement, *supra* note 36, art. 21.

D. The Moon Treaty

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, or Moon Treaty, was adopted by the U.N. General Assembly in 1979.[50] Only thirteen countries have signed and ratified the Moon Treaty.[51] None of these countries are considered space-faring nations, although Austria, Belgium, and the Netherlands, which are member states of the European Space Agency (ESA),[52] will likely contribute to that organization's future space-faring enterprises.[53] Additionally, France, an ESA member state, has signed but failed to ratify the Moon Treaty.[54] The ESA, like most of its members, has not declared acceptance of the agreement.[55] The Moon Treaty was written to further define international rights and obligations that were first set forth in the Outer Space Treaty.[56] Specifically, article XI of the Moon Treaty forbids the right of private ownership of any part of the surface of the moon as well as private ownership of lunar resources.[57] Article XI also calls for the establishment of an "international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible."[58] Although the regime is intended to ensure that the exploration/exploitation of outer space serves the "common heritage of mankind,"[59] it is this provision that is commonly faulted for the failure of the overwhelming majority of the signatories of the Outer Space Treaty to sign and ratify the Moon Treaty.[60]

It has been suggested that the failure of broad support for the Moon Treaty is born of concerns that an international regime that appears to reject all notions of private property ownership would extend beyond the moon and serve as a bar to private investment in the exploration of

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50. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 21 [hereinafter Moon Treaty].

51. STATUS OF INTERNATIONAL AGREEMENTS, *supra* note 8.

52. ESA New Member States, *supra* note 9.

53. Taverna & Morring, *supra* note 5.

54. *Id.*; *see also* ESA New Member States, *supra* note 9; STATUS OF INTERNATIONAL AGREEMENTS, *supra* note 8.

55. STATUS OF INTERNATIONAL AGREEMENTS, *supra* note 8.

56. Moon Treaty, *supra* note 50.

57. *Id.* art. 11.

58. *Id.*

59. *Id.*

60. John S. Lewis & Christopher S. Lewis, *A Proposed International Legal Regime for the Era of Private Commercial Utilization of Space*, 37 GEO. WASH. INT'L L. REV. 745, 753 (2005) ("The phrase 'common heritage of mankind,' with its air of economic redistribution, managed to draw opposition even from the Soviet Union.").

space.[61] This lack of support from the international community indicates a tacit recognition that both private and public actors have a role to play in the exploration and exploitation of outer space. Given that subsequent agreements have recognized certain private property rights, it is unlikely that any of the previously mentioned major players—space faring nations—will sign and ratify the Moon Treaty.

IV. PATENTS AND INTERNATIONAL PROTECTION

Patent rights are "strictly territorial," meaning that patent rights are limited to the jurisdiction of the state that has granted them.[62] Several international agreements have been ratified to meet the need for international patent protection in the emerging global economy.

The first of these is the Paris Convention for the Protection of Industrial Property, which requires a state to grant nationals from other contracting states the same level of patent protection as it affords its nationals.[63] Additionally, the Paris Convention gives the patent holder the right to file in another contracting state within a year of his original application and retain his original filing date.[64] All prospective space-faring nations have ratified the Paris Convention.[65]

The Patent Cooperation Treaty (PCT) was concluded in 1970 and represents the first attempt to create an international patent system.[66] It provides for the filing of a PCT application in any of the designated receiving offices in contracting states.[67] The filing of an application will have the effect of the application being filed in all contracting states. The PCT does not specify what is patentable material, but rather leaves that decision up to the individual contracting states.[68]

The Agreement on Trade Related Aspects of Intellectual Property Rights, or the TRIPS agreement, was enacted in 1994 as a part of the

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61. *Id.* at 754.

62. JON O. NELSON, INTERNATIONAL PATENT TREATIES 1 (2007).

63. Paris Convention for the Protection of Industrial Property, Aug. 20, 1910, 1910 U.S.T. LEXIS 30 [hereinafter Paris Convention].

64. *Id.*

65. *See* Contracting Parties to the Paris Convention, *available at* http://www.wipo.int/treaties/en/ShowResults.jsp?lang=en&treaty_id=2 (last visited Sept. 8, 2008).

66. Summary of the Patent Cooperation Treaty (1970), http://www.wipo.int/treaties/en/registration/pct/summary_pct.html.

67. Patent Cooperation Treaty (June 19, 1970), *available at* http://www.wipo.int/pct/en/texts/articles/atoc.htm [hereinafter PCT].

68. *Id.*

Uruguay round of the General Agreement on Tariffs and Trade (GATT).[69] It is applicable to all members of the World Trade Organization (WTO),[70] which includes all the aforementioned potential space-faring nations with the exception of Russia.[71] The TRIPS agreement mandates general compliance with the Paris Convention, as well as expanding the scope of international patent protection.[72] Specifically, it requires twenty-year patent protection for most inventions.[73] It also subjects signatories to the WTO's dispute resolution mechanisms outlined in the GATT Treaty, which is perhaps the most powerful international enforcement mechanism for intellectual property rights.[74]

The most recent international agreement regarding patents is the Patent Law Treaty, concluded on June 1, 2000.[75] This agreement seeks to "harmonize and streamline formal procedures in respect of national and regional patent applications and patents, and thus to make such procedures more user-friendly."[76] Specifically, it has set forth standardized forms, universal filing date requirements, procedures for failure to comply with the sanctions and foundational principles for putting electronic filing into practice.[77] The Patent Law Treaty has enjoyed less broad support than its predecessors, considering that, to date, China, Japan, Russia, and India have yet to sign the agreement, and the United States has yet to ratify it.[78]

Even in the wake of the latest round of harmonizing measures addressing the procedural aspects of patent law, there are still crucial substantive issues that remain unresolved.[79] Perhaps the most contentious is the split between the United States, which follows a first-to-invent patent system, and the majority of other nations, including those who are currently, and are most likely to be space-faring, who follow a first-to-

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69. Agreement on Trade Related Aspects of Intellectual Property Rights (Apr. 15, 1994), *available at* http://www.wto.org/english/docs_e/legal_e/27-trips.pdf [hereinafter TRIPS Agreement].

70. *Id.*

71. WTO Members and Observers, http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm (last visited Sept. 8, 2008).

72. TRIPS Agreement, *supra* note 69.

73. *Id.*

74. WTO Summary of the TRIPS Agreement, http://www.wto.org/english/docs_e/legal_e/ursum_e.htm#nAgreement (last visited Sept. 8, 2008); Nelson, *supra* note 62, at 18.

75. Summary of the Patent Law Treaty (2000), http://www.wipo.int/treaties/en/ip/plt/summary_plt.html.

76. *Id.*

77. Nelson, *supra* note 62, at 17.

78. Contracting Parties to the PLT, *available at* http://www.wipo.int/treaties/en/ShowResults.jsp?lang=en&treaty_id=4 (last visited Sept. 8, 2008).

79. *Id.* at 14.

file patent system.[80] Additionally, it has been suggested that substantive harmonization of patent law is not truly feasible nor advisable until developing nations are better equipped to meet their obligations under the existing international agreements.[81] While there are many obstacles that stand in the way of international harmonization of patent law, a discussion of a harmonized patent regime in outer space may better inform the terrestrial discussion.

V. POTENTIAL PATENTS IN SPACE TREATY

An additional international agreement that ensures patent protection and enforcement aboard privately owned spacecraft may be necessary to provide the legal certainty and incentive to invest in outer space research and development. The current state of the law lays the groundwork for courts to reach reasonably similar, but likely not uniform, conclusions on questions of jurisdiction, liability, and the duty of launching states to enforce patents in the outer space environment. Given the enormous amount of capital that will be required to conduct outer space research, multinationals and their investors should be afforded a level of legal certainty that equals, if not exceeds, the level found when engaging in terrestrial activities.

A patent agreement for outer space would be in step with the spirit and purpose of previous outer space agreements, with the exception of the Moon Treaty. As noted above, the "common heritage of mankind" language is commonly credited with the failure of the Moon Treaty to obtain broad support in the international community.[82] The broad rejection of the Moon Treaty, especially by space-faring nations, evinces a desire by the international community to protect intangible property rights in outer space. Subsequent treaties, such as the Space Station Agreement with its explicit protection of intellectual property rights, confirm this.[83]

One of the core principles enshrined in the OST is that the exploration and exploitation of outer space should be done for all nations, regardless of their level of development.[84] The international

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80. *Id.*

81. Jerome H. Reichman & Rochelle Cooper Dreyfuss, *Harmonization Without Consensus: Critical Reflections on Developing a Substantive Patent Law Treaty*, 57 DUKE L.J. 85, 91 (2007).

82. Lewis & Lewis, *supra* note 60.

83. *See* Space Station Agreement, *supra* note 36, art. 21.

84. *See* Outer Space Treaty, *supra* note 10, art. 1 ("The exploration and use of outer space . . . shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development.").

community has often attempted to draft instruments of international law to be inclusive of, and advantageous to, developing nations. Specifically, the international community has done so in regards to intellectual property. This core principle can be found in the preamble of the PCT.[85] Even the preamble to the TRIPS agreement acknowledges the role of international harmonization of intellectual property regimes in helping developing nations "create a sound and viable technological base."[86]

Perhaps the most critical issues that a patent space agreement could solve are those involving jurisdiction. The overarching goal of any substantive provisions regarding jurisdiction should be to prevent launch forum shopping. Acts aboard a privately owned spacecraft, either that of creating or infringing, could be deemed for legal purposes to have taken place in any number of jurisdictions. The two most obvious jurisdiction choices are the state from which the spacecraft is launched, or the state in which the owner of the craft is domiciled. The latter choice is problematic because the commercial entities best equipped to invest in and foster private research and development in outer space are multinational corporations. Because of the increasing complexity of these organizations, terrestrial jurisdiction has been difficult to ascertain.[87] The home state of a parent company may be different from that of any of its subsidiaries, who in turn may be domiciled in different states, which creates problems in determining jurisdiction.[88] To determine jurisdiction based on the spacecraft owner's home state would encourage a form of back door launch forum shopping by allowing a multinational parent company to ostensibly select its launch state by setting up subsidiaries in the jurisdiction of choice. This is of particular concern given the pressure that multinationals have been known to exert on developing nations.

For the purposes of patent protection, pinning the jurisdiction of a spacecraft to the state from which the spacecraft is launched is preferable for several reasons. First, it prevents the type of launch forum shopping described above. Second, it guarantees for the reasonably foreseeable future that the launch state will be a space-faring nation who is also a

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85. PCT, *supra* note 67, pmbl. ("Desiring to foster and accelerate the economic development of developing countries. . . .").

86. TRIPS Agreement, *supra* note 69, pmbl.

87. Jennifer A. Zerk, *Multinationals Under National Law: The Problem of Jurisdiction*, *in* MULTINATIONALS AND CORPORATE SOCIAL RESPONSIBILITY 104 (James Crawford & John S. Bell eds., 2006) ("Multinationals are often said to 'fall through the crack' of the international regulatory system.").

88. *Id.* at 112-13 (suggesting that extraterritorial regulation of foreign subsidiaries has proved difficult).

signatory to the major patent treaties (not being the case with the supranational ESA, although its member states are signatories).[89] This will create the kind of legal certainty needed to encourage investment in outer space research and development.

One area of particular concern can be found in the Patents in Space Act. Subsection (b) specifically authorizes the United States to enter into an international agreement with another state assigning jurisdiction to that state even though the spacecraft is launched from United States soil.[90] This provision has never been challenged legally, but assuming that it passes muster under international law, it does appear that jurisdiction of a spacecraft could be assignable at least as far as state-controlled spacecraft are concerned. An agreement governing patents in space would do well to restrict such assignments to public actors, requiring private actors to adopt the jurisdiction of the launch state. However, even if this loophole remained open, it seems unlikely that a launch forum of any of the other major players (such as the United States) would enter into any such agreement with a developing nation simply to satisfy the whims of one private commercial entity.

It should be noted that the substantive differences between space-faring nations' terrestrial patent regimes might encourage some limited launch forum shopping. For example, a private commercial entity may prefer a first-to-file jurisdiction and opt to launch from Europe or China rather than the United States. These inconsistencies in terrestrial patent regimes have not sent inventors fleeing to one jurisdiction or the other, nor have they appeared to hinder development. This would likely not be any different for research and development in outer space. Lastly, this would leave the jurisdictional question relatively settled, which would make it easier to determine the scope of the launching state's liability and duty to enforce patent law aboard the private spacecraft.

An agreement on patent protection in space would have to address effectively the issues of enforcement and state liability. The OST appears to hold member states liable for some private activities in outer space.[91] An outer space patent treaty would have to effectively relieve the member state of actual liability of the acts of spacecraft launched from its territory, shifting it onto the commercial entity that owned the spacecraft. This would essentially extend extraterritorial jurisdiction to any private

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89. States Party to the PCT and the Paris Convention and Members of the World Trade Organization, *available at* http://www.wipo.int/export/sites/www/pct/en/texts/pdf/pct_paris_wto.pdf (last visited Sept. 8, 2008).

90. Patents in Space Act, *supra* note 37.

91. *See* Cheng, *supra* note 17.

spacecraft launched from the member state. Although this does contradict the notion of non-territoriality inherent in much of space law,[92] it serves the broader purposes of fostering robust private investment in outer space research and development, which arguably benefits all of humankind. It also further facilitates the common goal of the fraternity of space-faring nations to protect intangible property rights in outer space.[93] Additionally, member states would not feel obligated to offset the liability by passing domestic statutes that would most certainly not be uniform, in turn encouraging launch forum shopping by private commercial entities. Member states would not, however, be relieved of the duty to enforce intellectual property rights aboard private spacecraft launched from their territory.

An agreement to protect patents in space would have to provide for an enforcement mechanism. A multilateral treaty through the United Nations would necessitate the creation of a separate regime for the enforcement of intellectual property rights in space. Although the OST and its progeny were created through the United Nations, this international agreement would be best enacted through the WTO, and would specifically incorporate the terms of the TRIPS agreement to make them applicable to commercial activities in outer space. The current and likely future space-faring nations, with the exception of Russia, are already parties to the TRIPS agreement.[94] However, WTO accession for Russia will likely take place within the next few years.[95] Assuming this occurs, both member states and private commercial actors will be dealing with a familiar international intellectual property regime. This would serve the goal of maximizing legal certainty in order to foster investment in outer space research and development. Additionally, the GATT dispute resolution mechanism would allow for effective adjudication of claims arising from outer space activities as it does for claims arising from terrestrial activities.[96]

VI. CONCLUSION

Because of the current remaining disparities in terrestrial patent law, an agreement applying to outer space activities that is universal both procedurally and substantively is not probably realistic. However, an

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92. *See* Outer Space Treaty, *supra* note 10, art. 8.

93. *See* Space Station Agreement, *supra* note 36, art. 21.

94. WTO Members and Observers, *supra* note 71.

95. Russia Could Join the WTO in 2009, *available at* http://news.xinhuanet.com/english/2008-03/11/content_7768087.htm (last visited Sept. 8, 2008).

96. Nelson, *supra* note 62.

agreement that allows some of the questions of jurisdiction and liability to be answered is not only feasible, but also advisable. Private investment in space tourism is already afoot,[97] and further commercial endeavors in outer space are sure to follow. To facilitate and encourage research and development in outer space, space-faring nations should enact an international agreement that effectively extends their jurisdiction to privately owned and manned spacecraft launched from their respective territories.

97. *See* Goddard, *supra* note 2.