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Transporting a Legal System for Property Rights: From the Earth to the Stars[†]

Rosanna Sattler*

I. INTRODUCTION

By the year 2020, humans will return to the moon and do much more than simply explore its surface. It is anticipated that an infrastructure will be developed to encourage space tourism and commercial operations. The effective use and management of the moon, Mars, and other celestial bodies and their resources are integral to the economic development of space and the expansion of business and industrial enterprise there.

In January 2004, President George W. Bush announced his vision for the future of space exploration and the development of space resources and infrastructure. This vision is infused with “A Renewed Spirit of Discovery”¹ aimed at exploring the moon, Mars, and beyond.² It also encourages space-based commerce and industry. Later that month the President created the Commission on Implementation of United States Exploration Policy (“Commission”). This Commission held public hearings and heard testimony from individuals in

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¹ President’s Commission on Implementation of United States Space Exploration Policy, Report, *A Journey to Inspire, Innovate and Discover* 48 (Appendix A) (June 2004), available online at <<http://govinfo.library.unt.edu/moontomars/docs/M2MReportScreenFinal.pdf>> (visited Jan 22, 2005).

² Id at 6.

industry, education, media, and various agencies and professional organizations³ on ways to expand space exploration, discovery, and commercialization by private entities. In June 2004, the Commission published numerous recommendations in its final report, including ways to streamline and reorganize NASA.⁴ These recommendations called for greater reliance on private industry in space operations, reducing NASA's involvement "to only those areas where there is irrefutable demonstration that only government can perform the proposed activity."⁵ The Commission also addressed ways in which the government could engage private industry and expand commercial involvement in space.

Specifically, the Commission recommended:

[T]hat Congress increase the potential for commercial opportunities related to the national space exploration vision by providing incentives for entrepreneurial investment in space, by creating significant monetary prizes for the accomplishment of space missions and/or technology developments *and by assuring appropriate property rights for those who seek to develop space resources and infrastructure.*⁶

Space holds the promise of vast new opportunities and untapped resources. The Commission recommends that the United States encourage and accelerate the economic development of space. The Commission report lists several incentives that will likely entice private industry to invest their resources and capital in space ventures. Specifically, Recommendation 5-2 recommends that Congress increase the potential for commercial opportunities related to the national space exploration vision by: 1) providing incentives for entrepreneurial investment in space; 2) creating significant monetary prizes for the accomplishment of space missions and/or technology developments; and 3) assuring appropriate property rights for those who seek to develop space resources and infrastructure.⁷

The Commission suggests creating a one hundred million to one billion dollar prize to be offered to the first private entity to place and sustain humans on the moon for a specified period of time.⁸

One incentive has already been shown to spark "entrepreneurial investment" in space technologies. In October 2004, the non-profit X-Prize Foundation awarded a ten million dollar Ansari X-Prize to the spacecraft

³ Id at 2.

⁴ Id at 13–15.

⁵ Id at 19, Recommendation 3-1.

⁶ Id at 33, Recommendation 5-2 (emphasis added).

⁷ Id.

⁸ Id.

SpaceShipOne for achieving suborbital flight twice within one week.⁹ The Commission report estimates that over four hundred million dollars was invested by competitors in developing their technologies, which is a forty to one payoff reward for the development of this technology.¹⁰ Corporate sponsors, including M&M Candies, paid an estimated two million dollars to have their logos on *SpaceShipOne*. Richard Branson, CEO of the Virgin Group, which includes Virgin Airlines and Virgin Records, reportedly agreed to pay up to twenty-one million dollars over the next fifteen years to provide spaceships and technology for a proposed sub-orbital space airline, Virgin Galactic. Discussions are underway for similar deals with four other spaceline operators.¹¹ A director of Virgin Galactic states that the company is prepared to invest another one hundred million dollars to develop this business. The first five-passenger flights are planned for 2008, with ticket prices set at 210,000 dollars.¹² The birth of this nascent commercial space tourism industry is supported by President Bush, who on December 23, 2004 signed into law the Commercial Space Launch Amendments Act of 2004.¹³ This new law will stimulate private investment in sub-orbital space ventures and assist the flight of the American public into space.¹⁴

In 2004, NASA created the Centennial Challenges prize program, which provides up to ten million dollars each year in cash prizes for technological

⁹ Michael Coren, *SpaceShipOne Captures X-Prize: Privately Funded Craft Reaches Altitude Requirement* (Oct 4, 2004), available online at <<http://www.cnn.com/2004/TECH/space/10/04/spaceshipone.attempt.cnn/index.html>> (visited Jan 22, 2005).

¹⁰ President's Commission on Implementation of United States Space Exploration Policy, Report at 32 (cited in note 1).

¹¹ David H. Freedman, *Burt Rutan: Entrepreneur of the Year*, Inc. Magazine 66 (Jan 2005).

¹² Id at 65.

¹³ Pub L No 108-492, 118 Stat 3974 (2004), codified at 49 USC §§ 70101–21 (2004).

¹⁴ This law extends an existing 1984 government indemnification for the commercial space transportation industry, and created an experimental permit process to provide customers and crew with a disclaimer warning that the federal government has not certified the safety of the vehicle. See also Commercial Space Launch Act, Pub L 98-575, 98 Stat 3055 (1984), amended by Commercial Space Launch Act Amendments of 1988, Pub L No 100-657, 102 Stat 3900 (1988), codified at 49 USC § 70112 (2004). The law also eliminates confusion over what government agency should regulate sub-orbital spacecraft, placing the authority under the Federal Aviation Administration ("FAA") Office of Commercial Space Transportation. Under this law, the FAA will regulate the industry over the next eight years, primarily to protect the uninvolved public and the public interest. The FAA will regulate space vehicles to ensure crew and passenger safety only if the operation of those vehicles result in death, serious injury, or a dangerous close call. Beginning in 2012, the FAA can regulate spaceships however it sees fit. The eight-year period will give spaceship developers more freedom to experiment and also allow them to generate revenue by taking on passengers, as long as passengers know the risk. Alan Boyle, *Private-Spaceflight Bill Signed into Law*, MSNBC News (Dec 23, 2004), available online at <<http://www.msnbc.msn.com/id/6682611>> (visited Jan 22, 2005).

advancements. Supporters hope that increasing the amount of the cash prizes available will stimulate private financing of space missions, as the upper limit of NASA's prize-making authority for each award under current law is only two-hundred fifty thousand dollars without additional Congressional approval.¹⁵ Other private entities are offering increased prize amounts for specific accomplishments as well. In November 2004, Bigelow Aerospace announced its "America's Space Prize" which will award a fifty million dollar prize to a United States-based contestant who builds a spacecraft that can carry a crew and dock with an inflatable space habitat developed by Bigelow Aerospace by the January 10, 2010 deadline.¹⁶

The Commission report also promotes the creation of tax incentives for private industry, such as making profits tax-free until they equal five times the original investment, or tying tax incentives to specific milestone achievements.¹⁷ Additionally, it cautions against the over-regulation of this burgeoning industry through overly restrictive occupational safety or environmental regulations.¹⁸

In addition to financial incentives, the report recommends protecting and securing the property rights of private industry in space. The report offers little

¹⁵ NASA has proposed breaking the Centennial Challenge into a series of different prizes, with increasing dollar amounts for more complex projects. See Brian Berger, *Space Technology Prize Bill Stalls in the U.S. Senate*, 15 Space News Intl 1, 1-4 (2004). See also HR 5385, 108th Cong, 2d Sess (Nov 18, 2004); S 2917, 108th Cong, 2d Sess (Oct 7, 2004).

¹⁶ Leonard David, *Bigelow Space Module Flight Gets Government Okay*, Space.com (Nov 24, 2004), available online at <http://www.space.com/news/bigelow_update_041124.html> (visited Jan 22, 2005).

¹⁷ Id. In 2003, the Invest in Space Now Act was introduced into the US House of Representatives. HR 2358, 108th Cong, 1st Sess (June 5, 2003). This Act recognizes the need for immediate development of the US commercial space transportation industry and proposes a tax credit to spur this development. Taxpayers who purchase stock in a US company whose core corporate mission is providing space transportation vehicles or components would receive a tax credit equal to a certain percentage of the price they paid for that stock during that year. In the first year after this Act is passed, taxpayers would receive a tax credit equal to 50 percent of the price they paid for the stock in that year. The percentage would remain at 50 percent for new stock purchased in the following two years and then decrease according to a pre-set timetable. See id.

Also, a Zero Gravity, Zero Tax Act has been introduced to the House and if passed would allow space-related income (income derived from the production of items in space or the provision of services in or from space) to be excluded from taxable gross income. HR 914, 108th Cong, 1st Sess (Feb 25, 2003). Such income would be completely exempt until the year 2012 when the exemption would begin to be slowly phased out based on the number of years an entity has taken advantage of the exclusion. The bill also includes a tax credit for stock in companies involved in space. See id. In 2003, the Spaceport Equality Act was presented to the House and if passed would allow tax-free bonds to be issued for the construction and renovation of spaceport facilities. See HR 644, 108th Cong, 1st Sess (Feb 5, 2003).

¹⁸ President's Commission on Implementation of United States Space Exploration Policy, Report at 33 (cited in note 1).

specific direction as to how property rights in space are to be created and protected, though it does point out that two treaties—the Outer Space Treaty and the Moon Treaty¹⁹—exist that may make such ownership difficult. In fact, the report states:

Because of this treaty regime, the legal status of a hypothetical private company engaged in making products from space resources is uncertain. Potentially, this uncertainty could strangle a nascent space-based industry in its cradle; no company will invest millions of dollars in developing a product to which their legal claim is uncertain. The issue of private property rights in space is a complex one involving national and international issues. However, it is imperative that these issues be recognized and addressed at an early stage in the implementation of the vision, *otherwise there will be little significant private sector activity associated with the development of space resources, one of our key goals.*²⁰

The implementation of the President's vision requires an overhaul of the current treaties and laws that govern property rights in space in order to develop better and more workable models that will stimulate commercial enterprise on the moon, asteroids, and Mars. The expansion of a commercial space sector to include activities on celestial bodies requires the establishment of a regulatory regime designed to enable, not inhibit, new space activity. The development of specific laws, which are consistently applied, will create a reliable legal system for entrepreneurs, companies, and investors. The establishment of a reliable property rights regime will remove impediments to business activities on these bodies and inspire the commercial confidence necessary to attract the enormous investments needed for tourism, settlement, construction, and business development, and for the extraction and utilization of resources.

II. EXISTING INTERNATIONAL SPACE TREATIES ARE UNWORKABLE FOR PROPERTY RIGHTS

Currently there are several treaties in effect that were created to address space exploration. Most of these treaties were drafted during the Cold War, when outer space was seen as the next battlefield and the moon as a potential military outpost. These fears were fueled by the “space race” between the United States and the Soviet Union, each country trying to beat the other to the moon. Other nations feared that the two rising superpowers would dominate space and claim it for themselves. In 1967, in response to these fears, the United Nations drafted the Treaty on Principles Governing the Activities of States in the

¹⁹ Id. These treaties are discussed below.

²⁰ Id at 34 (emphasis added).

Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies ("Outer Space Treaty").²¹

The Outer Space Treaty provides that space exploration is to be for the benefit of all nations, that there shall be "free access to all areas of celestial bodies" for all nations,²² that exploration must be "in accordance with international law,"²³ and that "[t]he moon and other celestial bodies shall be used . . . exclusively for peaceful purposes."²⁴ The Outer Space Treaty also contains several beneficial provisions, such as a requirement that states must "render . . . all possible assistance in the event of accident, distress, or emergency . . ." to astronauts, who are to be viewed as "envoys of mankind in outer space."²⁵

The provision of the Outer Space Treaty which has caused the greatest controversy and discussion is found in Article II: "[o]uter space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."²⁶ There is disagreement about whether this treaty restricts the ability of individuals to hold property rights or whether it simply restricts the rights of sovereign nations to claim portions of celestial bodies.²⁷ Some commentators argue that the restrictions placed on sovereign nations are extended to individuals through their citizenship, and therefore individuals and individual companies may not claim property rights in outer space.²⁸ There is also disagreement as to what appropriation is prohibited. Some argue that the appropriation clause simply bars ownership of the land, not the resources found within the land, which can be extracted and removed as private property.²⁹ Others argue that the resources

²¹ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 18 UST 2410 (1967).

²² Id, art I.

²³ Id, art III.

²⁴ Id, art IV.

²⁵ Id, art V.

²⁶ Id, art II.

²⁷ For a discussion of the history of property rights and sovereignty, see generally Lynn M. Fountain, Note, *Creating Momentum in Space: Ending the Paralysis Produced by the "Common Heritage of Mankind" Doctrine*, 35 Conn L Rev 1753 (2003).

²⁸ For a discussion of sovereignty and the extension of rights to citizens, see generally Wayne N. White, Jr., *Real Property Rights in Outer Space*, 40th Colloquium on the Law of Outer Space (IISL 1997), available online at <http://www.spacefuture.com/pr/archive/real_property_rights_in_outer_space.shtml> (visited Jan 22, 2005).

²⁹ See Eric Husby, Comment, *Sovereignty and Property Rights in Outer Space*, 3 J Intl L & Prac 359, 366, 370 (1994), for an interpretation of the appropriation of resources under the "*res communis* principle" of the United Nations Convention on the Law of the Sea (hereinafter UNCLOS) as applied to outer space treaties.

are part and parcel of the land and cannot be treated separately from it.³⁰ The appropriation provision of the treaty is arguably unclear and undefined and therefore unworkable. Critics argue that the provision is a result of the socialist ideals that were prevalent at the time but it is outdated and at odds with today's prevailing free-market economy.³¹

Several international agreements were enacted that expand specific concepts and language found in the Outer Space Treaty and provide helpful principles which can be revised and clarified in the development of a cohesive legal system applicable to activities on the moon, Mars, and asteroids. In 1968, the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space was signed.³² This agreement requires those nations involved in space operations to conduct rescue operations and return astronauts and spacecraft to the appropriate country. This broad mandate is not accompanied by any specific guidelines and is silent on such matters as which country would retain the financial obligation for such an operation.³³ The Convention on International Liability for Damage Caused by Space Objects was created in 1972 to address questions of financial responsibility in the event that a spacecraft or other object damages other space objects, the earth, or other aircraft.³⁴ Though this Convention does provide a mechanism for dispute resolution through the United Nations, it is limited in application to instances in which both parties are members of the UN.³⁵ In 1975, the Convention on Registration of Objects Launched into Outer Space mandated that each state maintain a detailed record of all objects launched into space and that this record be provided to the UN, further streamlining the determination of liability should the object cause damage in space.³⁶

³⁰ Indeed, the Moon Treaty states that "[n]either the surface nor the subsurface of the moon . . . shall become property of any State," but that this phrase instead should be taken in conjunction with the provisions that provide for an international regime which would ultimately allocate the resources as it sees fit so long as it serves the purpose of "orderly and safe development of the natural resources of the moon . . ." Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereinafter Moon Treaty), art 11, paras (3), (7)(a), 18 ILM 1434 (1979).

³¹ See Fountain, 35 Conn L Rev at 1760 (cited in note 27). There is even some argument that this provision conflicts with the requirements of other multilateral treaties. See Kurt Anderson Baca, *Property Rights in Outer Space*, 58 J Air L & Comm 1041, 1065–66 (1993).

³² 19 UST 7570 (1968).

³³ Ty S. Twibell, Note, *Space Law: Legal Restraints on Commercialization and Development of Outer Space*, 65 UMKC L Rev 589, 595 (1997).

³⁴ 24 UST 2389 (1972).

³⁵ Twibell, 65 UMKC L Rev at 596 (cited in note 33).

³⁶ Convention on Registration of Objects Launched into Outer Space, art 2, 28 UST 695 (1975).

While these treaties further clarified certain provisions of the Outer Space Treaty, many ambiguities remained as space technology continued to advance in the 1970s. A second major treaty, the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies ("Moon Treaty") was signed in 1979 as the expanding US space program led to the possibility of actually using lunar resources.³⁷ This Treaty was not widely accepted, and no major space power has signed it because it further restricts ownership and prohibits any property rights until an international body is created.³⁸ The Moon Treaty does allow "States Parties . . . in the course of scientific investigations [to] use mineral and other substances of the moon in quantities appropriate for the support of their missions"³⁹ and it permits individual states to construct space stations on the moon and retain jurisdiction and control over these stations.⁴⁰ The Outer Space Treaty provides that all stations, installations, equipment, and space vehicles on the moon and other celestial bodies shall be open to other nations who are parties to the Treaty on the basis of reciprocity.⁴¹ Representatives must give reasonable advance notice of a projected visit so that appropriate consultations may be held and so that maximum safety precautions may be taken to assure safety and avoid interference with normal operations in the facility to be visited.⁴²

Both the Outer Space Treaty and the Moon Treaty have proven to be unworkable foundations for the creation of a usable property rights regime in space given their ambiguity and lack of support, and given the controversies surrounding their Cold-War influenced provisions. There are several international agreements and treaties that have been effective in governing land and resources on and close to the earth, however, which are not owned by any one country. Elements of these treaties can provide a framework for governing property rights in space.

³⁷ Cited in note 30.

³⁸ Husby, 3 J Intl L & Practice at 368–69 (cited in note 29).

³⁹ Moon Treaty, art VI (cited in note 30). Some scholars have interpreted this provision to allow the recovery of investments in a mission but this interpretation does not appear to have wide acceptance in the academic community. See Glenn Harlan Reynolds, *International Space Law: Into the Twenty-First Century*, 25 Vand J Transnatl L 225, 230 (1992) (discussing existing commentary on the Moon Treaty).

⁴⁰ Husby, 3 J Intl L & Practice at 367–68 (cited in note 29).

⁴¹ Outer Space Treaty, art XII (cited in note 21).

⁴² Id.

III. OTHER INTERNATIONAL TREATIES AND AGREEMENTS CAN SERVE AS MODELS

A. INTERNATIONAL TELECOMMUNICATIONS UNION

One example is the International Telecommunications Union (“ITU”), a specialized agency of the United Nations that administers both the geostationary orbital slots for satellites and the frequencies for satellite communications.⁴³ The ITU voting membership is comprised only of nation states. Private entities may, however, join the various sectors that correspond to their expertise.⁴⁴ These entities are also able to join in debates and in the drafting of guidelines.⁴⁵ The ITU serves as a trustee for the geostationary orbit. It has been criticized, however, for using the first-come, first-served approach to handing out fixed satellite orbital slots and for allowing those nations providing the least financial contributions to have the same level of voting power as those who contribute the most to the Union.⁴⁶

The ITU is a highly specialized agency and provides numerous guidelines for nations and private sector members. Each sector has its own advisory board and “study group” that examine potential issues. The ITU’s legal framework is found in its constitution and the constitutions of its sectors, as well as the attendant regulations and the Optional Protocol.⁴⁷ The Optional Protocol of the ITU specifies compulsory arbitration as a means of settling disputes among member states.⁴⁸ The ITU is an example of international cooperation, but it does not face many of the challenges that must be overcome in the commercialization of space. For example, space commercialization will involve the removal of resources from celestial bodies as well as the construction of necessary infrastructure. The use of geostationary orbits, though a limited resource,⁴⁹ is not as permanent, however, because the existing satellites can be removed and

⁴³ Fountain, 35 Conn L Rev at 1765–66 (cited in note 27).

⁴⁴ International Telecommunication Union (“ITU”), *ITU Overview*, available online at <<http://www.itu.int/aboutitu/overview/membership.html>> (visited Jan 22, 2005).

⁴⁵ Id.

⁴⁶ Fountain, 35 Conn L Rev at 1766–67 (cited in note 27). This criticism also extends to outer space and the deep seabed as developing nations fear that resources in both places will be allocated to industrialized nations before they can develop the technology necessary to harvest these resources. For further discussion of this issue, see generally Barbara Ellen Heim, Note, *Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space, and Antarctica*, 23 Vand J Transnatl L 819 (1990).

⁴⁷ ITU, *ITU Overview* (cited in note 44).

⁴⁸ ITU, *ITU Optional Protocol*, available online at <<http://www.itu.int/aboutitu/basic-texts/optional/index.html>> (visited Jan 22, 2005).

⁴⁹ Joel D. Scheraga, *Establishing Property Rights in Outer Space*, 6 Cato J 889, 890–92 (1987).

replaced with others. Additionally, the expense of placing a satellite into orbit is known, or at least capable of reasonable estimation, whereas space construction and mining of resources would be a novel undertaking. Thought to be very high, the actual cost of such operations is almost impossible to estimate at the present time.

B. THE ANTARCTIC TREATY SYSTEM

A second example of an existing legal structure which could be transported to and applied in space is the system of management of Antarctica. The Antarctic Treaty System provides even more guidance for the governance of space resources than does the ITU.⁵⁰ Like the moon, Mars, and asteroids, the continent of Antarctica is also a vast expanse of land that is undeveloped and contains mineral deposits. The development and utilization of Antarctica, like the development of these celestial bodies, is expensive, requires great technical innovations, and provides unique challenges to humans working in that environment.⁵¹ The development of and claims of sovereignty over Antarctica, however, are restricted by a series of treaties known as the Antarctic Treaty System. Prior to the enactment of these treaties, several countries claimed portions of Antarctica. Those claims were then suspended by the Antarctic Treaty of 1959 in favor of a legal regime that protected the fragile environment and fostered scientific research in the region.⁵² The Antarctic is governed by twenty-seven nations, known as "Consultative Parties," who gather annually and vote by a consensus on various matters. To become a Consultative Party, a nation must agree to the terms of the treaty and it must undertake "substantial research activity" on the continent.⁵³ Other nations who do not meet the criteria may attend as "Observers" and participate in discussions, but they may not vote on the issues.⁵⁴

⁵⁰ The International Treaty System governing the Antarctic consists of several agreements, collectively called the Antarctic Treaty System: Antarctic Treaty, 12 UST 794 (1959); Agreed Measures for the Conservation of Antarctic Fauna and Flora, 17 UST 996 (1964); Convention for the Conservation of Antarctic Seals, 29 UST 441 (1972); Convention and Conservation of Antarctic Marine Living Resources, 33 UST 3476 (1980).

⁵¹ Fountain, 35 Conn L Rev at 1769 (cited in note 27).

⁵² *Id* at 1770.

⁵³ *Id* at 1771. Though the treaty does not specifically define the phrase "substantial research activity," it does list "establishment of a scientific station or the dispatch of a scientific expedition" as examples. See Antarctic Treaty, art IX(2) (cited in note 50). If this concept is to be applied in space (for example, in the active development of the area listed in the permit or license), it should be defined with great precision and list very specific instances of acceptable development.

⁵⁴ Fountain, 35 Conn L Rev at 1771 (cited in note 27).

The Antarctic Treaty System regulates scientific study, provides for the exchange of information between parties, and provides guidelines for other management operations.⁵⁵ Several provisions address the handling of waste and the protection of native species.⁵⁶ The Treaty System also provides crucial guidelines for the safety and rescue of humans on Antarctica.⁵⁷ It outlines a detailed plan for tourism, requiring advance notification and post-visit reporting as a means of monitoring human traffic.⁵⁸ These provisions address areas of concern similar to those identified in Article XII of the Outer Space Treaty. The tourism resolution gives tourists a specific checklist of what they can and cannot do in Antarctica.⁵⁹ Although these measures are in place, the Antarctic treaty lacks an administrative body to ensure the compliance of its members, but it provides for dispute resolution using negotiation or arbitration. Further, by agreement of all parties, any dispute may be brought before the International Court of Justice.⁶⁰

An international space governing body could perform similar functions. While the structure of the Antarctic Treaty is similar to that of the ITU and would seem to be an ideal model given its widespread acceptance and substantive provisions, it fails to deal with a crucial aspect of space development—the mining of minerals. In fact, a separate treaty, the Convention on the Regulation of Antarctic Mineral Resource Activities was drafted to address this issue.⁶¹ This treaty, however, has not been ratified by any nation. Instead, mining is governed by the Antarctic Treaty,⁶² whose stringent environmental protocol effectively prohibits any development of Antarctica's mineral resources by designating Antarctica as a natural reserve.⁶³

⁵⁵ Id at 1770.

⁵⁶ Protocol on Environmental Protection to the Antarctic Treaty, annex I, 30 ILM 1461, 1473 (1991).

⁵⁷ See Fountain 35 Conn L Rev at 1770 (cited in note 27).

⁵⁸ See, for example, Antarctic Treaty Consultative Meeting XXI, *Standard Form for Advance Notification and Post-Visit Reporting on Tourism and Non-Governmental Activities in Antarctica*, Res No 3 (1997), available online at <<http://www-old.aad.gov.au/goingsouth/tourism/Research/TreatySys/ATCM/Year/1997ATCM21/ATCM21Rec3.asp>> (visited Apr 1, 2005).

⁵⁹ See Antarctic Treaty Consultative Meeting XVIII, *Tourism and Non-Governmental Activities*, Recommendation 1, Attachment A, *Guidance for Visitors to the Antarctic* (1994), available online at <<http://www-old.aad.gov.au/goingsouth/tourism/Research/TreatySys/ATCM/Year/1994ATCM18/ATCMrec1b.asp>> (visited Apr 1, 2005).

⁶⁰ Antarctic Treaty, art XI (cited in note 50).

⁶¹ 27 ILM 868 (1988).

⁶² Fountain, 35 Conn L Rev at 1770 (cited in note 27).

⁶³ See generally Protocol on Environmental Protection to the Antarctic Treaty, 30 ILM at 1461 (cited in note 56).

C. UNITED NATIONS CONVENTION ON THE LAW OF THE SEA

There is an example of a legal regulatory regime that does address mining issues in a way that provides for commercial exploitation and that is the law governing the deep seabeds of the earth's oceans. The seabed is rich in minerals that are found in secretions on the ocean floor as well as in the crusts of the deep sea.⁶⁴ Collecting and mining these minerals is expensive and requires sophisticated technology capable of reaching the great depths.⁶⁵ As in Antarctica, there are concerns for the environment.⁶⁶

The United Nations began drafting documents pertaining to the deep sea in the 1950s, but these documents did not deal with undersea mining because the necessary technology had not yet been developed.⁶⁷ In 1982, the United Nations Convention on the Law of the Sea ("UNCLOS") was created to monitor the exploration of deep seabeds and oceans that are located farther than two hundred miles from the coast of any nation.⁶⁸ This area and its resources have been declared "the common heritage of mankind."⁶⁹ UNCLOS created an International Seabed Authority ("ISA") to license and regulate the mining of this portion of the ocean.⁷⁰ Unlike the Antarctic Treaty, membership in UNCLOS is not limited to those involved in active exploration, and each member may cast one vote.⁷¹ UNCLOS provides detailed regulations for deep sea mining. In addition to the regulations, UNCLOS created an intergovernmental mining company, Enterprise, to compete with the private entities granted licenses by the ISA.⁷² UNCLOS also allows for various means of dispute resolution, including adjudication by a specialized tribunal, the Seabed Disputes Chamber of the International Tribunal.⁷³ Nevertheless, because UNCLOS required mandatory transfers of technology, employed an economic model that preempted free-

⁶⁴ Heim, 23 Vand J Transnatl L at 822–23 (cited in note 46).

⁶⁵ Id at 823.

⁶⁶ Id at 824.

⁶⁷ Id at 825.

⁶⁸ 21 ILM 1261 (1982). See also Heim, 23 Vand J Transnatl L at 825 (cited in note 46) (discussing the Convention).

⁶⁹ Id at 821.

⁷⁰ Id at 825.

⁷¹ Id.

⁷² Id at 826.

⁷³ Marjorie Ann Browne, *The Law of the Sea Convention and U.S. Policy* 5, CRS Issue Brief for Congress (Sept 29, 2003), available online at <http://lugar.senate.gov/CRS%20reports/Law_of_the_sea_convention.pdf> (visited Jan 22, 2005).

market enterprise,⁷⁴ failed to assure access to future deep seabed resources, and included a voting structure that gave all nations equal control regardless of their technological capabilities or contributions to undersea exploration,⁷⁵ the United States and other industrialized nations refused to ratify the 1982 agreement.⁷⁶

In an effort to add the industrialized nations to its membership, the UN renegotiated the mining provisions in 1994, creating the Agreement Relating to the Implementation of Part XI of the UNCLOS Convention.⁷⁷ The United States took an active role in the negotiations, and as a result, the 1994 Agreement guarantees the United States a seat on the decisionmaking body, requires actual development by those mining companies granted a permit, and recognizes the current claims of those companies holding US licenses. Transfers of technology are no longer mandatory.⁷⁸ The United States signed the amended UNCLOS in 1994 and accepted provisional membership which was then extended in 1996.⁷⁹ Despite these favorable changes, the United States failed to ratify UNCLOS and the incorporated 1994 agreement by the deadline in 1998 and lost its provisional membership.⁸⁰ Though this amended treaty has had the support of presidential administrations from Ronald Reagan to George W. Bush, and has some Senate supporters, it has not yet been ratified by the United States Senate. In fact, until 2003, UNCLOS had not even been reviewed by Senators outside the membership of the Senate Foreign Relations Committee.⁸¹

D. DEEP SEABED HARD MINERAL RESOURCES ACT

During the debate preceding the creation of UNCLOS in 1982, the United States passed its own Deep Seabed Hard Mineral Resources Act ("Seabed Act") to govern undersea mining.⁸² This Seabed Act makes clear that it is merely a temporary measure to be used until "a widely acceptable Law of the Sea Treaty"

⁷⁴ James E. Mielke, *Deep Seabed Mining: U.S. Interests and the U.N. Convention on the Law of the Sea*, CRS Rep No 95-471 (Apr 7, 1995), available online at <<http://cnie.org/NLE/CRSreports/Marine/mar-33.cfm>> (visited Jan 22, 2005).

⁷⁵ Browne, *The Law of the Sea Convention and U.S. Policy* at Summary (cited in note 73).

⁷⁶ Mielke, *Deep Seabed Mining* (cited in note 74).

⁷⁷ 33 ILM 1311 (1994).

⁷⁸ See United Nations Convention on the Law of the Sea, S Exec Rep No 108-10, 108th Cong, 2d Sess 1 (Mar 11, 2004), available online at <http://frwebgate.access.gpo.gov/cgi-bin/useftp.cgi?IPaddress=162.140.64.88&filename=er010.pdf&directory=/diskb/wais/data/108_cong_reports> (visited Feb 21, 2005).

⁷⁹ Browne, *The Law of the Sea Convention and U.S. Policy* at 8 (cited in note 73).

⁸⁰ Id at Summary.

⁸¹ Id at 2.

⁸² 30 USC § 1401 et seq (2000).

is created, “which will provide a new legal order for the oceans covering a broad range of ocean interests, including exploration for and commercial recovery of hard mineral resources of the deep seabed.”⁸³

The Seabed Act states that the creation of an acceptable international regime, such as a modified UNCLOS, will not be accomplished very quickly. Commercial mining operations would also take time to set up, however, and, therefore, technology development must begin as soon as possible in order to begin mining when the minerals are needed.⁸⁴ The Seabed Act proposes that the standard for exploration and commercial use of the seas should be “a duty of reasonable regard to the interests of other states” and that any uses should be in line with recognized principles of international law.⁸⁵

Similar to UNCLOS, the Act requires that undersea mining companies apply for permits and licenses to mine the deep seabed. It also describes instances under which such licenses may be revoked or renewed and provides environmental protection provisions, accident provisions, and available legal actions.⁸⁶ The Seabed Act also requires those companies in possession of a permit to diligently recover minerals within ten years of receiving their twenty-year permit or the permit will be terminated.⁸⁷ Such a provision ensures development of the area instead of dormant claims that leave an area unproductive. Though these provisions provide an extensive framework for mining, the Seabed Act advocates transitioning to an international mining regime.⁸⁸

Recently, the United States Senate has begun to reconsider the questionable provisions of UNCLOS. In March 2004, the Senate Environment and Public Works Committee heard testimony advocating for the adoption of UNCLOS, which includes the 1994 Agreement.⁸⁹ In the past, members of the Senate objected to the treaty because it lacked additional benefits not already enjoyed by the United States under the Seabed Act while imposing additional obligations in terms of financial contributions to the ISA and the possibility that a future decision made by the ISA would require the US to undertake additional commitments.⁹⁰ At the hearings in March 2004, however, it was argued that

⁸³ Id at § 1401(a)(8).

⁸⁴ Id at § 1401(a)(10)–(11).

⁸⁵ Id at § 1401 (a)(12).

⁸⁶ Id at §§ 1401–28.

⁸⁷ Id at § 1417.

⁸⁸ Id at §§ 1441–44.

⁸⁹ United Nations Convention on the Law of the Sea, Hearings before the Senate Committee on the Environment and Public Works, 108th Cong, 2d Sess (Mar 26, 2004).

⁹⁰ Browne, *The Law of the Sea Convention and U.S. Policy* at 8–9 (cited in note 73).

acceding to UNCLOS at this point would be fairly easy because it would not require the enactment of new implementing legislation, as the extensive Deep Seabed Mineral Resources Act already contains practices and regulations compatible with UNCLOS.⁹¹ The 1994 Amendment also gives the United States and other industrialized nations enough power to block or veto any new regulations that would further restrict mining.⁹² Beginning in 2003, supporters urged ratification of UNCLOS as a means of protecting domestic security by fostering international cooperation to prevent acts of terrorism, piracy, and smuggling.⁹³ If the United States ratifies UNCLOS and the 1994 Agreement, the resulting international body could serve as a model for such a body to govern mining activities on the moon, asteroids, and Mars.

However, as the Deep Seabed Mineral Resource Act acknowledged, the creation and implementation of an international governing body can take many years, and in all likelihood would not be in place before the technology becomes a reality. Given the President's vision of sending another human expedition to the moon by 2020, it seems likely that an international agency will not be created by that time. Therefore, other short-term measures must be created to bridge the gap.

IV. INTERIM SOLUTIONS

A. AN INTERNATIONAL AGREEMENT MODELED ON THE INTERNATIONAL SPACE STATION INTERGOVERNMENTAL AGREEMENT

For the short term, the International Space Station Intergovernmental Agreement ("IGA") provides the most workable model for a property rights regime in outer space.⁹⁴ The IGA was signed in 1989 and has a "hub and spoke structure." NASA serves as the hub and has signed the agreement with the Canadian Space Agency, the European Space Agency, and the Government of Japan. NASA then signed other bilateral agreements, called Memoranda of Understanding ("MOUs"), with other national space agencies to provide

⁹¹ Id.

⁹² Senator Richard G. Lugar, *The Importance of Acceding to the Law of the Sea Convention*, Speech to the Brookings Institution, Washington, D.C. (May 4, 2004), available online at <<http://www.lugar.senate.gov/pressapp/record.cfm?id=221083>> (visited Jan 22, 2005).

⁹³ See, for example, The UN Convention on the Law of the Sea, Hearings before the Senate Committee on Foreign Relations, 108th Cong, 1st Sess (Oct 14, 2003) (opening statement of Senator Richard G. Lugar), available online at <<http://foreign.senate.gov/testimony/2003/LugarStatement031014.pdf>> (visited Mar 27, 2005).

⁹⁴ Agreement concerning Cooperation on the Civil International Space Station, Hein's No KAV 5899 (1998).

guidelines for the technical and administrative functions of the space station. In 1993, Russia joined the IGA and an updated agreement was signed in 1998.⁹⁵

The IGA governs the use of the International Space Station ("ISS"), which is a research lab placed into low-Earth orbit for the purpose of conducting scientific research in a low gravity environment. The members of the IGA contribute funds and technology, and each owns some portion of the space station.⁹⁶ The country with the ownership interest retains control of its particular physical module and its crew. The nation may contract with other countries that wish to use its portion for scientific research.⁹⁷ The work that takes place on the module then remains subject to the laws of that nation and is considered to be within its jurisdiction.⁹⁸ For instance, if scientific data is produced using an instrument supplied by the Russian space agency, then that data is subject to the patent laws of Russia. NASA serves as the coordinator for the various operations and provides the same oversight that would be supplied by an international organization, though it is not involved in dispute resolution.⁹⁹ Disputes are adjudicated by either the International Court of Justice or the World Trade Organization, depending on the whether or not the particular claim involves international trade law.¹⁰⁰

Twenty years ago, NASA was asked to advance commercial activity in space.¹⁰¹ No explicit statutory policy existed, however, until 1984.¹⁰² On that date Congress amended the Space Act and required NASA to seek and encourage to the maximum extent possible the fullest commercial use of space.¹⁰³

In 1998, Congress passed the Commercial Space Act, which directs NASA to use the ISS as a springboard for space commerce.¹⁰⁴ The Act promotes the use of commercial launch services and emphasizes the importance of

⁹⁵ Fountain, 35 Conn L Rev at 1768 (cited in note 27).

⁹⁶ SPACEHAB, *ISS as the Launch Pad for Space Commerce: A Commercialization Strategy* 4 (on file with CJIL).

⁹⁷ Fountain, 35 Conn L Rev at 1768 (cited in note 27).

⁹⁸ Id.

⁹⁹ Id at 1769.

¹⁰⁰ SPACEHAB, *ISS as the Launch Pad for Space Commerce* at 6 (cited in note 96).

¹⁰¹ See generally Judy A. Rumerman, ed, *NASA Space Applications, Aeronautics and Space Research and Technology, Tracking and Data Acquisition/Support Operations, Commercial Programs, and Resources*, 1979-88, 6 NASA Historical Data Books 355-62 (1999), available online at <<http://history.nasa.gov/SP-4012/vol6/cover6.html>> (visited Jan 22, 2005).

¹⁰² See National Aeronautics and Space Administration Authorization Act of 1985, Pub L No 98-361, 98 Stat 422, codified at 42 USC § 2451 (2000).

¹⁰³ Id.

¹⁰⁴ 42 USC § 14701 (1998).

commercial providers in the operation, servicing, and use of the space station.¹⁰⁵ It also provides some guidelines for space commercialization. Following adoption of the 1998 Act, NASA produced a "Commercial Development Plan" to implement its provisions. This plan calls for a nongovernmental organization ("NGO") to manage future commercialization of space, but the plan description is almost silent as to how commercialization will actually be advanced by the organization.¹⁰⁶ Much like the Deep Seabed Mineral Resources Act can serve as the implementing regulations for UNCLOS, the Commercial Space Act could provide the regulations for an expanded IGA.

The IGA could easily be applied to space tourism, settlement, development, and bases of operation on asteroids, the moon, and Mars. NASA could continue to serve as the coordinator unless an NGO is agreed upon by the participating nations. Other countries would contribute funds and place technology on the moon through their space agencies. These space agencies would secure the technology and funding from private businesses that enter into contracts for such services with these agencies. In accordance with the terms of the IGA and the Outer Space Treaty, each individual country, or space agency, would retain jurisdiction over its crew, its spacecraft, and any structures or equipment.

Export Control Impediments

If the IGA model is to be employed as an interim legal system in space, one major impediment to the development of a property rights regime for the commercialization of space must be removed: the existing United States export controls on items that could have, potentially, both commercial and military uses. To protect national security and US foreign policy interests, the export of US technology, commercial space products, services, and commodities to the fifteen partner countries involved with NASA in the ISS Program is controlled through a system of licenses issued by the Department of Commerce ("Commerce") or the Department of State ("State"). Under the authority of the Export Administration Act ("EAA"),¹⁰⁷ Commerce established a licensing system to issue licenses for the export of dual-use items—those items that have both commercial and military applications—on the Commerce Control List.¹⁰⁸ Similarly, under the authority of the Arms Export Control Act ("AECA"),¹⁰⁹ and

¹⁰⁵ Id.

¹⁰⁶ SPACEHAB, *ISS as the Launch Pad for Space Commerce* (cited in note 96).

¹⁰⁷ 50 USC § 2401, appendix (1994).

¹⁰⁸ See Commerce Department's Export Administration Regulations, 15 CFR §§ 730–74 (2004).

¹⁰⁹ 22 USC § 2778 (2002).

pursuant to the International Traffic in Arms Regulations (“ITAR”),¹¹⁰ State issues licenses and monitors and controls the export of military and dual-use technologies, goods, and services. The statutory authority to issue regulations regarding the export of dual-use items and defense articles and services is delegated to the Secretaries of Commerce and State. Commerce and State publish the Export Administration Regulations (“EAR”) and the ITAR, respectively, implementing the Acts. NASA must ensure that its ISS export activities conform to these laws and regulations as it implements them. Given the overlap between the ITAR and the EAR, it is difficult to determine which controls are applicable in a given case.

The United States is also a party to a number of international agreements regarding dual-use technologies and goods. The series of agreements governing the ISS Program involving the fifteen partner countries and their five cooperating space agencies provided the occasion to develop a comprehensive clause on the exchange of technical data and goods, which has since regularly served as a model for agreements covering other fields of space exploration. Certain ISS agreements are reduced to the simplified form of an exchange of letters.

Export controls restrict the ability of US companies to freely share with, sell, or convey to other nations commodities, technologies, goods, and services relating to space. Under these laws, items and services that could be used for military purposes are evaluated and then deemed to be defense articles or defense services if they do “not have predominant civil applications” or are not equal in form, fit, or function to an established article or service used for civil applications.¹¹¹ The Departments of State and Commerce conduct case-by-case evaluations of articles and services which include a review of the nature, function, “variety and predominance” of its civil or commercial applications as compared to the nature, function, and possible capability of military use.¹¹² The arbitrary practice of classifying technologies and destinations results in an administrative practice of case-by-case evaluation of license applications with predictably arbitrary results.

The regulations state that launching a vehicle or payload is not considered exporting; but selling or transferring the contents of the vehicle or the vehicle itself “may” be subject to the controls.¹¹³ The regulations allow for temporary imports of dual-use items to be brought into the United States from a foreign

¹¹⁰ 22 CFR §§ 120–30 (2003).

¹¹¹ *Id.* at § 120.3.

¹¹² *Id.* at §120.4(d)(1)(i).

¹¹³ *Id.* at § 120.17(a)(6).

country and then later returned to that country.¹¹⁴ Critics argue that the regulations regarding export controls are too vague and reflect Cold War era alliances and enemies rather than today's global economy. For instance, the prize-winning SpaceShipOne may well have difficulties because, as a supersonic rocket, it may be subject to the ITAR restrictions.¹¹⁵ These restrictions severely limit the ability of multinational companies to develop and trade the sophisticated technology necessary for space exploration and development. The United States government is walking a tightrope between protecting the world and encouraging space development.¹¹⁶

Additionally, if NASA continues to act as the coordinating agency and provides launch services, it may be very difficult to then transfer the launched materials to other countries and foreign companies in space. Continually seeking licensing for what could become routine work would be cumbersome, expensive, and ultimately inhibit the development of space. Alternatively, companies would look to the launch services provided by other space agencies—such as the Russian, European, or Canadian Space Agencies—as a means of launching dual-use technologies into outer space. In that event, United States companies providing the same services would lose their market share.

If the ISS/IGA model is applied to celestial bodies in space, with individual countries retaining jurisdiction over their crew and space objects, items brought from a foreign country to the United States for launching would return to the country from which they came if they are sent to an area in space under the control of that country through the IGA or its MOUs. It is possible, therefore, that these items could be considered merely temporary imports. However, an import license would still be needed, unless the items fall within an exception.¹¹⁷ Further examination of this issue is necessary given the complexity of the ITAR regulations and the wide discretion granted to State in classifying articles.

B. EXCLUSIVE ECONOMIC ZONES

While the IGA could serve as a springboard for a property rights regime in space, there is another property management system already in use on Earth that incorporates many of the same principles of the IGA, but is more expansive and sensitive to the needs of individual nations. Despite failing to ratify UNCLOS,

¹¹⁴ Id at § 120.18.

¹¹⁵ Taylor Dinerman, *Space Tourism Meets ITAR*, Space Rev (Oct 11, 2004), available online at <<http://www.thespacereview.com/article/245/1>> (visited Jan 22, 2005).

¹¹⁶ Id.

¹¹⁷ 22 CFR §§ 123.3, 123.4.

the United States opted to create an Exclusive Economic Zone, a concept found in Part V of UNCLOS.¹¹⁸ Under UNCLOS, a country may declare an area between its coast and two hundred nautical miles as its “exclusive economic zone” (“EEZ”).¹¹⁹ The country then has the exclusive right to explore, exploit, conserve, and manage the natural resources found in this area, including the resources found in the seabed. The country may also construct artificial islands and other installations or structures in its EEZ as long as doing so does not interfere with established sea lanes or otherwise compromise the safety of other ships using the waters. Other countries, however, must be allowed to navigate through the waters, fly over the area, and lay pipelines or other cables on the seafloor in accordance with other international treaties. Ships passing through the EEZ of another country may not conduct research, catch fish, pollute the area, or in any way take resources from that EEZ except in the case of an emergency. A country may also grant licenses or permits to other nations to fish the waters, make other uses of the resources found there, or impose quotas or taxes to limit foreign fishing. UNCLOS encouraged countries to form regional and bilateral agreements with landlocked nations and other countries who cannot claim EEZs of their own.¹²⁰

Currently, the United States EEZ has not been open to offshore commercial “aquaculture” such as the development of extensive fish farming techniques or “ocean ranches” in the open waters.¹²¹ There are several reasons for this, including a lack of clear regulations and permitting procedures, existing legislation restricting foreign investment and use of the United States EEZ, and the expense of developing extensive structures in the deep sea. Both private and public research has been ongoing in this area, however, including Sea Grants funded by Commerce through its National Oceanic and Atmospheric Administration (“NOAA”) to study the offshore aqua culture of fish and other marine life for commercial use.

In addition to funding experimental projects, NOAA is drafting “offshore aquaculture legislation” that will address many of the impediments to commercial aquaculture. This legislation will establish a permitting process, create long-term leases for such activity, and provide exemptions from existing legislation so that foreign companies may obtain leases and invest in aquaculture in the United States EEZ. This legislation was expected to be sent to Congress in 2004, but as of December 2004, it had not yet been filed. As an interim measure, NOAA has created a voluntary Code of Conduct for commercial

¹¹⁸ UNCLOS, 21 ILM at 1280 (cited in note 68).

¹¹⁹ *Id.*, art 57.

¹²⁰ *Id.*, arts 55–57.

¹²¹ Craig Cox, *The Great Open Ocean Sell-Off* 13–14 (Utne 2004).

aquaculture which provides guidelines for companies. A final draft of the Code, however, has not yet been published.¹²² There is support in the Senate for strengthening and redefining US policy regarding aquaculture. In June 2003, a resolution was introduced in the Senate calling on the federal government to promote aquaculture and to achieve five times as much aquaculture production by the year 2025.¹²³

EEZs could be created in space, giving each nation the option of building a structure on a celestial body or occupying an orbit with spacecraft, and then claiming up to a certain amount of area around their structure or craft for their use. As mentioned above, countries participating in the ISS have already secured small safety zones around their vessels. The amount of area to be claimed would have to be agreed upon prior to occupation. These zones would be modeled after those on Earth, allowing the nation to contract or lease portions of the area to other nations, such as those countries which lack the technology to launch spacecraft into outer space. The EEZ of one nation would allow other nations to pass through to its own EEZs so long as those countries did not disturb or remove resources as they move through the area.

Additionally, each nation would retain jurisdiction over its EEZ and could create its own regulations and permitting procedures. If the ITAR provision discussed above allows for temporary imports to be transported back to the country of origin without special licensing requirements, then items from other countries could be shipped from the United States to portions of the US EEZ in space that have been given to those nations through long-term leases or licenses.

While NOAA retains control over the use and licensing of the US EEZs on Earth, an international government organization, similar to INTELSAT¹²⁴,

¹²² SeaWeb.org, *Aquaculture Trends and Developments* (Spring 2004), available online at <http://www.seaweb.org/resources/sac/pdf/Trends_Spring2004.pdf> (visited Jan 22, 2005).

¹²³ S Res 160, 108th Cong, 1st Sess 3 (June 5, 2003).

¹²⁴ The International Communications Satellite Consortium has a structure and operation governed by the Multilateral International Telecommunications Satellite Agreement of 1973, 23 UST 3813 (1973). At the time that the agreement was arrived at, INTELSAT had been operating for several years already, under an interim arrangement, in which the US participant, the Communications Satellite Corporation ("COMSAT") provided management and technical services. After the Agreement, these services were gradually taken over by INTELSAT, with well over one hundred member countries which are all part owners, with their ownership share varying according to their use of INTELSAT facilities. Members meet bi-annually to decide issues of long-term importance. The Meeting of Signatories is made up of designated representatives of member countries who are telecommunications providers, such as COMSAT from the US. The Board of Governors meets four times a year to make executive decisions, while the Executive Organ, headed by the Director General oversees the day-to-day operations of INTELSAT. Glenn H. Reynolds and Robert P. Merges, *Outer Space: Problems of Law and Policy* 218-19 (Westview 1997).

ITU¹²⁵ or UNCLOS may be a more appropriate regulatory body to manage the utilization of property and economic development in space. It has been possible to devise in the ITU an international organization capable of dealing with allocation and sharing of electronic spectra. It should be no more difficult to develop a pragmatic infrastructure to stimulate and expand the space economy. No single model necessarily fits the needs of a future special or general international space organization. There would be a need to accommodate the views of nations with space resources and those in the process of development.

V. CONCLUSION

Many countries with government space programs are rapidly becoming technologically and economically capable of implementing a viable space industry. Companies and entrepreneurs play an integral role in this multi-billion dollar enterprise.¹²⁶ A comprehensive legal system governing operations on celestial bodies, however, does not yet exist. Substantial investments of capital are needed to launch a viable space industry on the moon, Mars, and asteroids. Stimulation of the massive investments required for such commerce can only occur where there is a reliable system governing legal rights and obligations.

In the future, it may be more desirable to create an NGO or an international governing body to administer a legal system governing celestial bodies by combining and refining elements of the international regimes of the ITU, INTELSAT, IGA and UNCLOS if it gathers enough support from the industrialized nations. Such a body would handle the issuing of licenses or permits as well as develop guidelines for space exploration, mining of resources, accident liability, and legal claims to be resolved—perhaps by a specialized Space Tribunal. Such a governing body and legal system must also avoid the pitfalls of the failed attempts to successfully develop Antarctica and the deep seabed. Since the President's year 2020 deadline is rapidly approaching, the foundations of a legal system must today make that giant leap into outer space.

¹²⁵ The ITU accords to each of its members a single vote in its periodic world administrative radio conferences.

¹²⁶ Fountain, 35 Conn L Rev at 1787 (cited in note 27).