

A Review Of Challenges To Corporate Expansion Into Outer Space

Christopher M. Hearsey*

The American University, Washington, D.C., 20016

The monopoly on human spaceflight has been held by a handful of governments and their space programs for over the last fifty years. With the successful launch of Scaled Composite's *SpaceShipOne*, corporations may soon be able to take advantage of new launch vehicle technologies and end governmental monopoly of human spaceflight. Private human spaceflight will enable corporations to expand their reach beyond Earth, entering a new economic era with as much uncertainty as ever in the expanding commercial frontier of outer space. However, legal challenges will present the major obstacle to corporations operating in outer space. Outer space is a high risk environment and given the dangerousness of such economic activity corporations will not be allowed to operate without some rules or regulation. Moreover, without the ability to profit, corporations will lose their incentive to engage in outer space commerce. Therefore, outer space law must balance corporate and public interests to ensure safety, equity and market efficiency. In turn, the shape of future civilization in outer space will depend on how national and international law develops over time in response to the pressures of corporate expansion. This paper thus seeks to perform two tasks: first, to critically review the major legal challenges facing corporate expansion into outer space, particularly United States and international space law; and second, provide an evaluation of "laissez-faire" proposals for human expansion into outer space and their impact on future space society.

I. Introduction

The monopoly on human spaceflight has been held by a handful of governments and their space programs for over the last fifty years. With the successful launch of Scaled Composite's *SpaceShipOne*, corporations may soon be able to take advantage of new launch vehicle technologies and end governmental monopoly of human spaceflight. Private human spaceflight will enable corporations to expand their reach beyond Earth, entering a new economic era with as much uncertainty as ever in the expanding commercial frontier of outer space.

Corporations are well established in outer space. Many private space firms develop, build and launch vehicles and payloads, while working closely with governments. Nevertheless, many corporations are confined to specialized sectors of space commerce due to the economically prohibitive nature of human spaceflight. However, legal challenges will present the major obstacle to corporations operating in outer space. Outer space is a high risk environment and given the dangerousness of such economic activity corporations will not be allowed to operate without some rules or regulation. Moreover, without the ability to profit, corporations will lose their incentive to engage in outer space commerce. Therefore, outer space law must balance corporate and public interests to ensure safety, equity and market efficiency. In turn, the shape of future civilization in outer space will depend on how national and international law develops over time in response to the pressures of corporate expansion. This paper thus seeks to perform two tasks: first, to critically review the major legal challenges facing corporate expansion into outer space, particularly United States and international space law; and second, provide an evaluation of "laissez-faire" proposals for human expansion into outer space and their impact on future space society.

* Graduate Student, The American University, Department of Justice, Law & Society, 1220 Blair Mill Road, Silver Spring, MD, 20910 USA, AIAA Student Member.

On October 4, 1957, the Soviet Union launched *Sputnik I* into orbit around the Earth. In response a few months later, the United States launched its first satellite, *Explorer I*, into orbit. Thus the “space race” was instigated.[†] But the “race” itself began without any national or international legal regime behind it. In fact, the “space race” was and is no different than other human endeavors into a new era of exploration. And like so many times before in human history, where there are new frontiers, there are new opportunities for wealth and prestige, if not tragedy and exploitation.

While the United States and the Soviet Union used their ever increasing technological capabilities to claim national superiority, private firms began to see incentives in outer space. The aerospace industry has played an integral role in the development of rocket engines, which have had a direct impact on the commercialization of outer space. Nonetheless, other industries have played a critical role in the development of the space industry as well. For example, the entertainment industry has played a crucial role in peaking society’s interest in outer space through television shows like *Star Trek*, movies like *Star Wars*, and books like *2001: A Space Odyssey*. Early science fiction stories fed society’s curiosity about space and led many to invest their lives in the critical sciences that would make space flight possible. It is the allure of outer space and its fantastic possibilities that have driven engineers, mathematicians, physicists, industrialists, pop stars, adventure seekers, and entrepreneurs to invest time and money into the “space race.” The possibility of regular private human spaceflight is on the cusp of fruition, but the idea is only as realizable as the technology is practical.

In the fifty years since the launch of *Sputnik I* and *Explorer I*, the space industry has transformed from a national endeavor to a private commercial project. The last Apollo mission to the moon occurred in 1972. Between 1972 and 2007 no sovereign nation has sent human explorers to the Moon. Only China has independently developed the technology to launch a person into low Earth orbit, joining the United States and Russia as space-faring nations. Other nations have agreed to cooperate with the three major space agencies: National Aeronautics and Space Administration (NASA), the European Space Agency (ESA), and the Russian Federal Space Agency (RKA). However, on September 29, and October 4, 2004, pilots Mike Melville and Brian Binnie, respectively, became the first private citizens to successfully fly above one hundred kilometers in their craft *SpaceShipOne* within two weeks of each other, winning the Ansari X-Prize.[‡] This was and remains the only instance of private human spaceflight as of July 2008.[§]

The true reflection of change in the American space industry comes from the reorientation of NASA’s goals in the last twenty-five years. The National Aeronautics and Space Act of 1958¹ (Space Act) proclaimed as official policy that “activities in space should be devoted to [sic] peaceful purposes for the benefit of all mankind.” This declaration changed in 1984 to accommodate the changing realities of space exploration when Congress enacted amendments to the Space Act with the following provisions: “The General Welfare of the United States of America requires that [NASA] seek and encourage to the maximum extent possible, the fullest commercial use of space.”² Hence, the reality of commercial exploitation replaced the promulgated principle of “peaceful exploration.”

The success of NASA has been mixed. Commentators have pointed out that NASA is “a federal administrative agency and therefore susceptible to many problems faced by government bureaucracies.”^{**} In the early years, NASA’s budget was based upon performance rather than cost. The agency alone spent an estimated \$170 billion (in 2005 dollars) on the Apollo program.^{††} The total cost of a single Space

[†] It has been claimed that the real “space race” began with either the Gagarin flight into low Earth orbit or President Kennedy’s commitment to go to the Moon. I contend that the tit-for-tat progression of space vehicle launches between the United States and the Soviet Union, beginning with the launch of *Sputnik I*, instigated the necessary will to move beyond basic military use of rockets towards human spaceflight, leading to the eventual commercialization of outer space.

[‡] To win the \$10 million Ansari X-Prize, the X-Prize foundation designated 100 km as the edge of outer space, because there is no formal definition of the boundary between sky and space.

[§] Binnie and Melville were awarded commercial astronaut wings by the Federal Aviation Administration in 2004.

^{**} “Commercialization of Space: Commercial Space Launch Amendments Act of 2004,” *Harvard Journal of Law & Technology*, 17 Harv. J. Law & Tech. 2 (2004).

^{††} Congressional Budget Office, “A Budgetary Analysis of NASA’s New Vision for Space Exploration,” September 2004, www.cbo.gov/doc.cfm?index=5772, accessed July 29, 2008.

Transport System, or Space Shuttle, is around \$1.5 billion.^{‡‡} Since the Shuttle began operating in 1981, NASA has been criticized for dedicating too much money to a program with small benefits relative to other programs. Current NASA Administrator Dr. Michael Griffin said in a 2005 interview with USA Today that NASA lost its way in the 1970's after the end of the Apollo program. Dr. Griffin believes the Shuttle program and the International Space Station (ISS) were mistakes.^{§§} As such, NASA has developed a "new vision" outlined by President Bush in 2005 calling for a return to the Moon and the decommissioning of the Shuttle fleet by 2010.^{***} This "new vision for space exploration" has been seen as the next step in the development of the commercial space industry. As government operations in outer space recede into a regulatory and contracting role, corporations will be able to design new innovative products from infrastructure to launch vehicles ending decades of government control in all aspects of outer space operations.

During the 1980's private space launch enterprises began to incorporate. The first private commercial space firm, Space Services, Inc., launched *Conestoga I* in 1982. Over the last two and a half decades, the commercial space industry has grown to over a hundred firms worldwide, each firm specializing in various services. Launching firms are the backbone of the commercial space industry with Russia (41%), the United States (29%), and Europe (10%) accounting for the majority of commercial payloads launched in 2006.^{†††} Other firms dedicated to funeral, tourism, and inter-terra-lunar transport have found investors and are beginning to advance the space industry further.^{†††} But the industry itself has not developed easily, nor has the market for the commercial use of outer space been anything but oligopolistic, if not monopolistic.

The commercial space industry is quickly approaching a critical stage in its development. As the cost of launching payloads dramatically decreases and NASA starts to decommission its Shuttle fleet, there will be a window for private space ventures to exploit the absence of government run space operations and take to the heavens providing a wide range of services. However, many issues need to be dealt with first; among them are real property rights, indemnification, technology transfers, passenger, crew and launch vehicle safety, national and international tax implications, as well as treaty obligations.

This paper is divided into five sections excluding the introduction. Section II will outline the rationale for corporate expansion into outer space and the major reasons provided by leading space firms. The last five years have proven to be the beginning of a new era. China has developed its own capabilities to send their 'Taikonauts' into outer space, the International Space Station is near completion, and the first privately funded human spaceflight took off in the Mojave Desert in 2004. NASA has already granted contracts to several private firms to conduct various operations in space. Private foundations like the Ansari X-Prize have spurred private research and development with the hopes of huge future pay-outs for their technologies. Behind all these events private corporations have maneuvered for a position in the 'new space race.' Their ideas and aspirations are reshaping the commercial space industry.

Section III will discuss the major international treaties and conventions that form the *corpus iuris spatialis in iuri gentium* (body of space law in international law) that will affect corporate expansion into outer space.^{§§§} There are currently four major international legal instruments governing conduct related to outer space: the Outer Space Treaty, the Liability Convention, the Registration Convention, and the Rescue

^{‡‡} "Frequently Asked Questions," Space Shuttle and International Space Station, *NASA website*, http://www.nasa.gov/centers/kennedy/about/information/shuttle_faq.html#1, accessed July 29, 2008.

^{§§} Watson, Tracy, "NASA administrator says space shuttle was a mistake," *USA Today online*, http://www.usatoday.com/tech/science/space/2005-09-27-nasa-griffin-interview_x.htm, accessed July 29, 2008.

^{***} Space.com Staff, "Space Shuttle: The Final Missions," *Space.com website*, July 08, 2008, <http://www.space.com/missionlaunches/080708-shuttle-schedule.html>, accessed July 29, 2008.

^{†††} Federal Aviation Administration, "Commercial Space Transportation: 2006 Year in Review," *FAA website*, January 2007, http://www.faa.gov/about/office_org/headquarters_offices/ast/media/2006YIR.pdf, accessed July 29, 2008.

^{†††} Space Frontier Foundation, "Commercial Space Companies," *SFF website*, <http://www.space-frontier.org/commercialspace/>, July 29, 2008.

^{§§§} Space law is commonly known by its Latin phrase, *corpus iuris spatialis*. For this article, I wish to distinguish the international elements from the national legislation of states. While national space law is commonly referred to as space policy, I contend absent explicit international rules, national space law will help shape international norms as developed from common state practices and corporate expansion into outer space.

Agreement. There is another major instrument, the Moon Agreement; however, its relevance and ability to legally oblige parties is debatable. Other minor instruments include the Agreement on the International Space Station, including several Memoranda of Understanding related to criminal jurisdiction and space tourism.

Section IV will discuss the major United States laws that form the *corpus iuris spatialis in iuri municipalis* (body of space law in national law) that will affect corporate expansion into outer space. Amendments to the Space Act reoriented the policy goals of NASA and permitted civilian use of some NASA systems and infrastructure, including private contracting for launch services and payloads to the ISS.^{****} The Federal Aviation Administration (FAA) and NASA are slowly enacting their own policies and regulations according to need, which has not sufficiently helped in the development of the private human spaceflight industry. The real concern for corporations is how national and international law will affect their future profits and business models. There are six major legal obstacles for corporations operating in the U.S. These include: technology transfer, taxation, passenger, crew, and craft safety, launch certification, liability, and property rights. However, recently Florida and Virginia passed legislation addressing issues of liability, tax, infrastructure development, and the creation of industry prizes. Many more U.S. states are expected to enact commercial space legislation to fill in the legal void at the federal level.

Section V will discuss and critique various laissez-faire proposals for human expansion into outer space that could affect corporations and directly impact future space society. Many laissez-faire advocates call for the elimination or prevention of legal barriers to outer space commercialization. The proposals include a tax moratorium on profits, a restructuring of the corporate tax system to accommodate space ventures, as well as withdrawing from international obligations. Other commentators argue for the development of real property rights established by a charter system similar to those used by European monarchs during the era of colonization, or by the principle of *uti possidetis*.^{††††}

In Section VI, I will conclude by analyzing how the movement into outer space will affect the corporation and the future legal regime of space societies. The transition into outer space will not come in a uniform or ordered manner. The shape of future civilization in space will depend on how the *corpus iuris spatialis* will develop and sustain over time by the pressures of corporate expansion into outer space. Based upon historical precedent, we can expect unforeseen tragedies and opportunities that will impact the path of the commercial space industry but will not prohibit its expansion. The role of corporations in defining how national and international legislation is developed should not be taken lightly.

II. Corporate Rationales for Expanding into Outer Space

There are two main reasons for expansion into outer space. First, outer space is a unique place, providing a new frontier for human exploration. Second, the Solar System provides many resources to exploit for humanity's benefit. Exploration and exploitation go hand in hand in any new frontier. Under these two premises, space firms have developed business models that take advantage of private interest in outer space.

Corporate expansion into outer space is built upon the commercial vision led by the United States. The current structure of the industry is centered on commercial launch firms. As of July 2008, the FAA has registered twelve active launch licenses to five companies, and five active launch site operator licenses to five companies, with more licenses pending application.^{††††} Private launch firms compete for NASA, ESA, and RKA contracts, as well as private contracts. For example, NASA's Commercial Orbital Transportation Services Project (COTS) has spurred competition to develop a new transport system to replace the Space Shuttle and deliver cargo to the ISS. However, the COTS program is nothing more than a bid on a government contract to develop a cheap and reliable launch vehicle. Moreover, the launch industry is

^{****} It is not my intention to discount the U.S. military's role in the creation of the commercial space industry. The history of joint military-civilian ventures in the development of manned and unmanned spaceflight is extensive and beyond the scope of this article.

^{††††} The Latin phrase *uti possidetis* means "as you possess," i.e. as you possess a territory you continue to possess. This derives from Roman law in the belligerent acquisition of territory.

^{††††} Federal Aviation Administration Commercial Space Data, "Active Commercial Space Licenses," *FAA website*, http://www.faa.gov/data_statistics/commercial_space_data/current_licenses/, accessed July 29, 2008.

controlled by a small number of firms that mostly end up bidding on or collaborating for government contracts. But the launch industry, as well as the entire commercial space industry, is starting to expand due to technology innovation and increased competition. Nevertheless, launch firms are only one factor in the creation of a viable private commercial space sector. The development of better propulsion systems has led to a reduction in launching costs and the creation of new capital resources as a means to opening up space to the general public.

In the last ten years, a confluence of wealthy entrepreneurs have come together to influence the scope and future of space society. Below I outline the visions of several leading space entrepreneurs.

Modeled after early twentieth century aviation prizes, the X-Prize Foundation has been the symbol of a successful non-governmental foundation promoting many scientific endeavors, most notably, the Ansari X-Prize and the Google Lunar X-Prize.^{§§§§} The success of the Ansari X-prize has spun off a new era in commercial space ventures. The innovative technologies created in pursuit of the \$10 million Ansari X-Prize has led Richard Branson to wholly invest in Scaled Composites, the private firm that designed and flew *SpaceShipOne*.

Richard Branson's Virgin Galactic seeks to launch customers into outer space by December 2009.^{*****} This ambitious business plan calls for the construction of several launch vehicles designed after Scaled Composite's patented technology. The research and development is spearheaded by Burt Rutan (one of the original designers of *SpaceShipOne*). Virgin Galactic's website expresses Mr. Branson's vision noting, "[i]t is in mankind's interest to develop our knowledge and understanding as well as our access to space; for this reason we have undertaken to develop and commercialise the completely new approach to manned space travel made possible by Burt Rutan and *SpaceShipOne*."^{†††††} The partnership between Virgin Galactic, Scaled Composites and the State of New Mexico will achieve this end with the construction of Spaceport America.^{†††††} The spaceport is scheduled to be completed by 2009 for the launch of VSS Enterprise, the first commercial spaceship.^{§§§§§}

In 1999, hotel and financial mogul Robert Bigelow founded Bigelow Aerospace to develop expandable space station modules for NASA. In light of Scaled Composites accomplishments, Bigelow Aerospace has also reacted to the change in the commercial space market. Mr. Bigelow's business plan calls for the creation of commercial space habitats that could be used as hotels, science stations, or future office buildings orbiting above Earth by 2015. As Mr. Bigelow's website explains, "Bigelow Aerospace is dedicated to developing next-generation crewed space complexes to revolutionize space commerce and open up the final frontier to all of humanity."^{*****}

Since 1998, Space Adventures has managed the accounts of wealthy "space tourists" wanting to go to outer space. Co-founder, President and CEO of Space Adventures Eric Anderson's vision for his corporation is simple: "open spaceflight and the space frontier to private citizens."^{†††††††} He has successfully launched five people into outer space, taking them to the ISS and the former Russian space station MIR.^{†††††††} Mr. Anderson's "goal is to benefit not only the private citizens who fly to space, but facilitate the creation of new vehicles and markets that will open up the resources of space for human benefit."^{§§§§§§§} Space Adventures has worked closely with the RKA and is trying to develop commercial spaceports in the United Arab Emirates and Singapore. Space Adventures conservatively estimates the space tourism industry will grow to over \$10 billion in the next several years.

^{§§§§} X-Prize Foundation, <http://www.xprize.org/>, accessed July 29, 2008.

^{*****} This is Virgin Galactic's goal as of July 2008.

^{†††††} Virgin Galactic, "Overview: Why Virgin? Why Space?" *Virgin Galactic website*, <http://virgingalactic.com/flash.html>, accessed July 29, 2008.

^{†††††} Spaceport America, <http://www.spaceportamerica.com/>, accessed July 29, 2008.

^{§§§§§} On Monday July 28, 2008, Virgin Galactic unveiled *WhiteKnightTwo*, which will launch SpaceShipTwo "the world's first private, environmentally benign, space access system for people, payload and science."

^{*****} Bigelow Aerospace, *Bigelow Aerospace website*, <http://www.bigelowaerospace.com/>, accessed July 29, 2008.

^{†††††††} Space Adventures, "About Us," *Space Adventures website*, http://www.spaceadventures.com/index.cfm?fuseaction=Our_Vision.welcome, accessed July 29, 2008.

^{†††††††} The company announced last year that it will offer a spacewalk feature to its package, which will undoubtedly create more interest in going to the ISS.

^{§§§§§§§} *Ibid* ^{†††††††}

Founded in 2002 by PayPal co-founder Elon Musk, SpaceX is a space transportation start-up company designed to “help make humanity a space faring civilization.”^{*****} SpaceX is one of two companies to be awarded a contract for NASA’s Commercial Orbital Transportation Services (COTS) competition. As part of the COTS program, SpaceX is developing three rockets to transport payloads to the ISS: *Falcon 1*, *Falcon 9*, and *Falcon 9 (heavy)*. Additionally, SpaceX is developing a seven person transportation vehicle, *Dragon*, for crew exchange with the ISS. Elon Musk’s vision is to provide reliable and cost effective transportation for government and business operations in outer space.

A major goal of these entrepreneurs is to open outer space to humanity. Even so, as technological innovators, they all realize their investments will produce significant returns once the technologies are established and available for licensing. Taken together each entrepreneur’s business plans build upon one another to create the beginning of a viable private commercial space sector. Each entrepreneur is staking their own fortune and reputation on developing the technology required to implement their vision and getting their products to market. With the success of *SpaceShipOne*, the industry is one step closer to expanding beyond low Earth orbit and providing humans with the means to explore and acquire wealth within the Solar System.

III. International Space Law: *Corpus Iuris Spatialis in Iuri Gentium*

The *corpus iuris spatialis* (body of space law) is traditionally formulated as international law. The history of the *corpus iuris spatialis* is beyond the scope of this paper, but the treaties and conventions (i.e. instruments) are considered part of customary international law. This is sufficient when dealing with the various obligations of states under international law. The question is whether there exists sufficient evidence to show that a particular state is bound by a particular legal instrument. Such evidence would be found in the ‘regular’ action (or conduct) of a state relative to the instrument, within an instrument’s signing statements, by written or verbal communication from a state’s government (i.e. position and interpretation of an instrument), by obligations under another instrument or international norm, or by codification into national law.⁺⁺⁺⁺⁺

There are four major legal instruments that comprise the *corpus iuris spatialis in iuri gentium* (*ius gentium*). On October 10, 1967 the first instrument to enter into force was the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty).³ The Outer Space Treaty created the legal regime for outer space under the auspices of the United Nations.⁴ ⁺⁺⁺⁺⁺ Its major principles include that

“exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind; outer space shall be free for exploration and use by all States; outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means; States shall not place nuclear weapons or other weapons of mass destruction in orbit or on celestial bodies or station them in outer space in any other manner; the Moon and other celestial bodies shall be used exclusively for peaceful purposes; astronauts shall be regarded as the envoys of mankind; States shall be responsible for national space activities whether carried out by governmental or non-governmental activities; States shall be liable for damage caused by their space objects; and States shall avoid harmful contamination of space and celestial bodies.”^{*****}

The second instrument to enter into force was the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement) in December 3,

^{*****} SpaceX, “Company Overview: Frequently Asked Questions,” *SpaceX website*, <https://spacex.com/company.php>, accessed July 29, 2008.

⁺⁺⁺⁺⁺ As of July 2008, case law considering questions within the purview of space law is minimal. Additionally, the many scholarly points of view make it difficult to say with certainty which general principles of international law are in harmony with the *corpus iuris spatialis*. Additionally, it should be pointed out that a norm, in general, is a rule that is socially enforced. Therefore, absent world government, the social actors at the international level are states; hence, legal rules are enforced by states, and states are bound by their agreements *bona fide* (i.e. by the international legal principle of *pacta sunt servanda*, “agreements must be kept”).

⁺⁺⁺⁺⁺ Between 1959 and 1969 there were several United Nations General Assembly (UNGA) resolutions that expressed the will of the international community regarding outer space and they have been recognized as ‘instant customary international law.’ See Cheng (1965).

^{*****} United Nations Office of Outer Space Affairs, “Outer Space Treaty,” *UNOOSA website*, <http://www.unoosa.org/oosa/SpaceLaw/outerspt.html>, accessed July 29, 2008.

1968.⁵ The Rescue Agreement “provides that States shall take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching State, and that States shall, upon request, provide assistance to launching States in recovering space objects that return to Earth outside the territory of the Launching State.”*****

On September 1, 1972, the Convention on International Liability for Damage Caused by Space Objects (Liability Convention) became the third instrument to enter into force.⁶ The Liability Convention “provides that a launching State shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft and liable for damage due to its faults in space.”††††††††

The last major instrument to enter into force was the Convention on Registration of Objects Launched into Outer Space (Registration Convention) on September 15, 1976.⁷ The Registration Convention requires launching states to provide:

“[the] [n]ame of launching State; [a]n appropriate designator of the space object or its registration number; [a] date and territory or location of launch; [some] [b]asic orbital parameters, including: [n]odal period (the time between two successive northbound crossings of the equator - usually in minutes); [i]nclination (inclination of the orbit - polar orbit is 90 degrees and equatorial orbit is 0 degrees); [a]pogee (highest altitude above the Earths surface - in kilometers); [p]erigee (lowest altitude above the Earths surface - in kilometers); [and the] [g]eneral function of the space object.”††††††††

However, there is a fifth instrument that has *per se* entered into force, which is the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement).⁸ While the treaty entered into force on July 11, 1984, none of the space-faring nations have signed or ascended to the Moon Agreement. §§§§§§§§ The absence of the United States, Russia, or China as parties renders it a failed treaty and non-parties are not necessarily required to uphold the treaty’s obligations. Therefore, the Moon Agreement is not considered part of the major international legal instruments on outer space because states have not sufficiently obliged themselves of its legal provisions.

The Moon Agreement is contentious because it amends the legal status of the Moon, from the ‘province of all mankind’ under the Outer Space Treaty, to the ‘common heritage of mankind.’ Article 11 of the Moon Agreement stipulates that the Moon and other celestial bodies, including their resources, are the ‘common heritage of mankind,’ and “that in effecting the equitable -- but not equal -- sharing of such benefits “special consideration” is to be given to the “interests and needs of the developing countries as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon.”****

Many international legal scholars have interpreted the shift from ‘exploration with free access to all’ to a principle whereby any exploitation or appropriation of the Moon or any celestial body must accompany an apportionment of profits gained to be given to the least developed nations. Subsequently, it was the introduction of the “common heritage” principle that led the United States to withdraw and not sign the Moon Agreement. Scholar Carl Christol has interpreted Article 11 to mean that “no constraints on exploitative activity shall be placed on the legal persons who engage in exploitative activity. Only a state may set the conditions under which its own national entities may engage in exploitation.”†††††††† But the change in principle does not alter the principles under the Outer Space Treaty, which prohibit national appropriation of outer space for any nation or any private entity, only that there might be a regime in the future that will deal with the exploitation of resources gathered from outer space. The predicted regime has not developed and remains a major issue of contention in the *corpus iuris spatialis*.

***** United Nations Office of Outer Space Affairs, “Rescue Agreement,” *UNOOSA website*, <http://www.unoosa.org/oosa/SpaceLaw/rescue.html>, accessed July 29, 2008.

†††††††† United Nations Office of Outer Space Affairs, “Liability Convention,” *UNOOSA website*, <http://www.unoosa.org/oosa/SpaceLaw/liability.html>, accessed July 29, 2008.

†††††††† United Nations Office of Outer Space Affairs, “Registration Convention,” *UNOOSA website*, <http://www.unoosa.org/oosa/SORegister/regist.html>, accessed July 29, 2008.

§§§§§§§§ The Moon Agreement only needed five signatures for it to enter into force. As of January 2007, only 17 states have signed and 13 have ratified the Moon Agreement. For a full list see Moon Agreement, *UNOOSA website*, http://www.unoosa.org/pdf/publications/ST_SPACE_11_Rev1_Add1_Rev1E.pdf, accessed July 29, 2008.

***** Christol, Carl Q., “The Moon Treaty: Fact and Fiction,” *Christian Science Monitor*, April 2, 1980, CSM website, <http://www.csmonitor.com/1980/0402/040234.html>, accessed July 29, 2008.

†††††††† *Ibid*

Other instruments within *ius gentium* are the agreements of partnership regarding the International Space Station (ISS), including the various Memorandum of Understanding regarding criminal jurisdiction, intellectual property and patents, and space tourism. The Agreement Concerning Cooperation on the Civil International Space Station^{††††††††} (IGA) was signed on January 28, 1998 by fifteen governments and includes a Memorandum of Understanding (MOU) between NASA and the four major partners to the ISS.^{§§§§§§§§}

Nonetheless, the legal structure is complicated by four layers of agreements and the independent legal status of each module that comprises the ISS. Article 5 of the IGA stipulates that “each partner shall retain jurisdiction and control over the elements it registers and over personnel in or on the Space Station who are its nationals.” However, the ESA module has a more complicated legal structure. Since the ESA comprises many European governments, the ESA has recently declared that jurisdiction over any criminal action within ESA modules will be exercised by the perpetrator’s government.^{*****} In addition, the IGA partnership maintains sovereign immunity for most civil torts, but there are exceptions which may provide for legal claims of injury or death suffered by individual astronauts against the organization which caused the harm.^{††††††††} The IGA also provides for the patenting of intellectual property developed on the various modules. All patent rights on the IGA are registered with the government the particular module is controlled by.

There is another agreement developed by the RKA and NASA regarding “space tourists.” In 2002, partners of the ISS agreed on a new definition for “space tourists,” designating them “spaceflight participants.”^{††††††††} The FAA adopted the same terminology to designate future passengers on spaceflights. This new designation was meant to distinguish those space travelers from astronauts on missions who were in the service of their respective space agencies. However, the new legal definition creates a new legal problem because “space tourist” or “spaceflight participant” are not definitionally covered under any of the major *ius gentium* instruments.

This creates a complex web of issues. First, only ‘astronauts’ are covered under *ius gentium*. Second, there is no definition of ‘astronaut’ by any of the *ius gentium* instruments.^{§§§§§§§§} Therefore, it is left to states to define astronauts. Third, most nations will not waive sovereign immunity for state employees, meaning if you are working under government contract and you die from spacecraft module decompression, your family may not sue the government for damages.^{*****} Fourth, under the Rescue

^{††††††††} Agreement Among the Government of Canada, Governments of the Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning the Cooperation on the Civil International Space Station, signed on Jan. 29, 1998, recognized by the Diet on April 24, 1998, and deposited Instruments of Accession with the US on Nov. 17, 1998, http://www.jaxa.jp/library/space_law/chapter_4/4-2-2-16/index_e.html, accessed July 29, 2008.

^{§§§§§§§§} Archimedes Institute Library for Space Law and Policy Research, “Bilateral Space Station Agreements,” *Archimedes institute website*, <http://www.permanent.com/archimedes/LawLibrary.html#US%20INSTRUMENTS>, accessed July 29, 2008.

^{*****} Hsu, Jeremy, “Europe Lays Down the Law for the New Space Lab,” *Space.com*, <http://www.space.com/news/071204-columbus-spacelaw.html>, accessed July 29, 2008.

^{††††††††} *Ibid*

^{††††††††} Principles International Space Station Multilateral Crew Operations Panel, “Principles Regarding Processes and Criteria for Selection, Assignment, Training, and Certification of ISS (Expedition and Visiting) Crewmembers,” signed Jan. 31, 2002, <http://www.spaceref.com/news/viewsr.html?pid=4578>, accessed July 29, 2008 from www.spaceref.com.

^{§§§§§§§§} “Astronaut,” *Solar Navigator website*, http://www.solarnavigator.net/aviation_and_space_travel/astronaut.htm, accessed July 29, 2008. “In the United States, people who travel above an altitude of 50 miles (approximately 80 kilometers) are designated as astronauts. The Fédération Aéronautique Internationale (FAI) defines space flight as over 100 km (approximately 62 miles).” Fédération Aéronautique Internationale, *FAI website*, <http://www.fai.org/>, accessed July 29, 2008.

^{*****} Unless a plaintiff could show that there existed some foreseeable gross negligence on the part of the flight crew, e.g. they knowingly launched the spacecraft with faulty engines. Currently, most standards

Agreement, ‘astronauts’ are extended diplomatic status. In general, states will not recognize non-governmental personnel traveling into outer space as having diplomatic status. Hence, future space tourists may not be covered by a sovereign immunity clause, and therefore may bring tort claims against governments and/ or private corporation’s party to the tort. For example, in case of catastrophic failure resulting in death, not necessarily attributable to negligence, families of victims could sue for damages. However, there are different standards of fault and liability depending on which state has jurisdiction or if a plaintiff has standing. Therefore, conflict of laws could provide varying results.+++++

Even so, under the Liability Convention, a state is still “absolutely liable” for the actions of entities under their jurisdiction, especially those entities which launched from a state’s jurisdiction. Furthermore, national and international law may be in tension because it is unclear whether space tourists are not wholly part of the *ius gentium* even though the major space-faring nations have enacted their own legislation to redefine astronauts. States are still responsible for juridical persons within their range of authority.

The U.S. is party to all of the above conventions and treaties except for the Moon Agreement. The U.S. agrees in principle to all of the provisions of the Outer Space Treaty and has codified many of the provisions into U.S. law. However, the “common heritage of mankind” principle in the Moon Agreement and the development of a future international regime governing outer space have been historically rejected by the U.S. Regardless, the U.S. government has taken the position that the Moon and other celestial bodies do not belong to one state and should be open to all states, not necessarily all people.

Positions relating to the legal status of property in outer space have varied historically. The Outer Space Treaty and Moon Agreement designate the Moon and celestial bodies as *res communis*. The *res communis* principle says that the Moon and other celestial bodies are the common property of humanity. This distinction prohibits the national and private appropriation of resources and territory in outer space. There is nothing in the Outer Space Treaty or Moon Agreement that would prohibit a renegotiation of the non-appropriation clauses. For example, if space-faring states developed an international instrument similar to the Antarctic Treaty, which could govern operations on the Moon or on specific “celestial bodies” between space-faring states, then that instrument would change the non-appropriation norm in the *corpus iuris spatialis*. Even so, the *res communis* principle would still stay in effect until there is sufficient international agreement, because such an agreement may be narrow in scope and not applicable to all objects in the Solar System. While states may be reluctant or unwilling to consider these issues today, the development of technologies enabling corporations, and in general, people to move freely beyond low Earth orbit will instigate new resolve for legal rules, thus establishing new norms for outer space.

Each *ius gentium* instrument establishes the basic framework for expansion into outer space. The *ius gentium* instruments require: free access to all; non-appropriation of territory or resources; establishment of liability; fostering of international cooperation; designation of safety standards; and the publishing of public information of launches. Moreover, states must develop and enact their own legislation to compliment their treaty obligations. The *ius gentium* instruments require space-faring states to show that, one, the activity occurs, and two, that there is a sufficient obligation to obey legally recognized rules or actions in accordance with that activity.+++++ Under international law, states must either maintain good faith in their treaty obligations or show that a particular international norm is not and has not been part of state conduct. The principles in the Outer Space Treaty, Moon and Rescue Agreements, the Liability and

of negligence would not meet the threshold to negate many types of immunity or indemnification clauses because it is assumed the participants of the flight understand they are engaging in a dangerous activity.+++++ This could also include tortuous or criminal acts resulting from the violation of the non-appropriation norm under the *corpus iuris spatialis*. For example, asteroid appropriation could be enough to start earthly litigation or prosecution, especially, if the appropriated asteroid slammed into the surface of the earth. In such a case, standing, jurisdiction, criminal responsibility and standards of liability, negligence or fault may not be easily shown to be dispositive.+++++ This is based upon the Latin phrase *opinio iuris sive necessitates*, meaning “the opinion of the law.” In international law, *opinio iuris* is the subjective element which is used to judge whether the practice of a state is due to a belief that it is legally obliged to do a particular act. It can sometimes be difficult to establish *opinio iuris*, but where there is consistent practice over a period of time, the need for *opinio iuris* is decreased. Where there is more sporadic state practice, the presence of *opinio iuris* becomes more important. In addition, the existence of custom in general need not be global, but may also be restrained to a particular region. Customary international law is defined as a source of international law under Article 38(1)(b) of the Statute of the International Court of Justice.

Registration conventions, and the Intergovernmental Agreements on the ISS are all codified in national law or are established as accepted international norms. To radically diverge from those principles would be difficult to justify and potentially disrupt international peace and security. It is therefore important to maintain these principles and only instigate change when necessary and only with the support of the international community. Nevertheless, corporate expansion into outer space will challenge these principles and force states to rethink the *corpus iuris spatialis*.

IV. Space Law in the United States: Corpus Iuris Spatialis in Iuri Municipalis

The U.S. is party to the four major *ius gentium* instruments and has enacted various federal statutes and regulations governing commercial space ventures. One recent U.S. law passed dealing with space commerce was the Commercial Space Act of 1998 (CSA),⁹ which directed NASA to use private launch firms to send cargo and satellites into orbit. The CSA allowed for the use of ballistic missile technology for private use, so long as there were no national security issues related to the technology. Additionally, the CSA called for the federal government to indemnify contractors from any third party liability. However, the United States has not extended indemnification beyond government contractors or employees. Nevertheless, U.S. laws relating to outer space are still minimal and prohibitive to future corporate expansion into outer space. Below I outline seven major legal issues in the U.S. that bear directly on corporate expansion into outer space.

First, the United States has enacted legislation that prohibits vital technology transfers to firms outside the United States. These export controls have delayed the expansion of the commercial space industry and created great risk to national and foreign investors. All licensing and technology transfer applications are processed by either the Commerce Department (Commerce) or the State Department (State). The Arms Export Control Act¹⁰ (AECA) gives the Secretaries of State and Commerce the statutory authority to regulate export of military and dual-use technologies that must conform to the International Traffic in Arms Regulations¹¹ (ITAR). Additionally, the Export Administration Act¹² (EAA) establishes a licensing system for the export of dual-use technologies. State publishes ITAR and Commerce publishes the Export Administration Regulations¹³ (EAR). This creates difficulties for corporations in need of dual-use technologies because there is overlap between the ITAR and EAR, since State and Commerce publish the regulations, respectively.

All private space firms in the United States, including NASA are subject to the ITAR and EAR. Rosanna Sattler has noted that “[e]xport 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.”¹⁴ The problem is State and Commerce each makes a case by case determination of technologies, which can be arbitrary. Consequently, applications for dual-use items take a very long time to process. For example, consider specifications of rocket nozzles. If you needed a rocket nozzle to be manufactured with a certain alloy that is cheaper to make outside the U.S., you would be prohibited from sending the specifications to the manufacturer without getting a waiver under either ITAR or EAR.

Commerce and State have the statutory authority to make some exceptions to ITAR and EAR. An exception can be made on a case by case basis for foreign technologies that are imported in for a short period of time. The only requirement is that the imported technology must be sent back to its origin. However, if a specially designed microchip were imported from Taiwan and that item is not to the specifications of the importer or the item arrives damaged, then the process has to be reinstated with a new application, which would mean more delays.

On the other hand, accepting foreign investment requires the corporation to keep secret technical specification from their investors. This places limits on who could invest in any private space corporation. Critics argue the current regulation regime is outdated and represents a Cold War mentality. At the Space 2007 conference in Long Beach, California, I asked Burt Rutan if he could think of one legal restriction that he would prefer changed. In response, Mr. Rutan said flatly, no. Then added he prefers the current regime because he can take “Mr. Branson’s money, and not have to tell him what [he is] doing with it.”^{*****} But it is doubtful many investors would agree to give money so freely without seeing where it

***** Hearsey, Christopher, Question posed to Burt Rutan, September 19, 2007, at the American Institute of Astronautics and Aeronautics Space 2007 Conference. Audio file is on record with author.

is going or how it is being used. Hence, export controls can be a double edge sword. Nevertheless, the arbitrariness of the import/ export designations is cumbersome for private space firms.

Second, in a note from the Harvard Journal of Law & Technology, the authors comment on the Commercial Space Launch Act of 2004 (CSLA).^{15, 16} The CSLA established a regulatory regime tailored to commercial space launch businesses, streamlining the regulations from the FAA, NASA, and other executive agencies, to allow the private sector to attack the “hegemony of NASA.” The CSLA officially recognized human spaceflight as a distinct industry, providing definitions for the terms “crew” and “spaceflight participant” and amended existing commercial launch legislation.

For all of NASA’s short-comings, the real “turf war” is brewing between the FAA and private launch firms. The authors of the Harvard note point out that “for the suborbital space flight industry in particular, the regulatory muddle is further complicated by the nature of the vehicles that have been developed thus far; while these vehicles are rocket-powered and designed to enter space, they “take off and land like airplanes.”” This has led to “an ongoing turf fight within the [FAA] over which [office] will regulate human suborbital space flight.”

The regulations of the FAA’s Office of the Associate Administrator for Commercial Space Transportation (FAA-AST) are problematic. On the one hand, the licensing for spacecraft is based upon non-reusable rockets. On the other hand, FAA-AST regulations only address “one shot expendable launch systems,” and does not address “whether and how passengers and crew should be regulated.”” Additionally, the FAA’s Regulation and Certification Group (FAA-AVR) regulates experimental aircraft. The regulatory regime of the FAA-AVR is expensive and will continue to be a barrier to entry into the commercial spacecraft market.

Even with the FAA’s complicated regulatory regime, the various export control regulations further frustrates the commercial space market. As noted above, Rosanna Sattler has pointed out the problems with the current export regime. She believes the International Space Station’s Intergovernmental Agreement (IGA) could be a temporary solution to export control issues, but due to the sensitivity of dual-use technology it is unlikely that the IGA could provide a long term solution. Ms. Sattler has identified several areas, including property rights that would benefit from the establishment of a separate non-governmental organization (NGO) to handle the development of the commercial space industry. She points out that an interim solution, with regard to export controls, could be found through the IGA, if exports can be reclassified temporary imports as allowed in the IGA. But this does little for private firms outside the purview of the IGA.

Third, the U.S. tax code operates under a nationality based taxation structure. This has major implications for U.S. based space firms. The Tax Reform Act of 1986¹⁷ (TRA 1986) taxes income from outer space as if it originated in the U.S. Moreover, “the ratio and the allowable foreign tax credits are reduced,” where the limitation on credits varies by the types of “baskets” of income. Income derived from outer space is “placed in a basket for shipping income.” William Lee Andrews points out that there are several problems with this classification of income derived from space.¹⁸ First, before TRA 1986, “space income was treated as foreign source income,” and “this made the foreign source to worldwide income ratio higher, thus allowing a larger credit against other US taxes.” Second, the TRA 1986 does not define “the term “space,” nor does the statute indicate how far from Earth one must go before the special space source rules apply.” Third, because space income is placed in a basket for shipping income, the tax on foreign source income is still taxed on a nationality basis, meaning U.S. corporations will incur 100% of their foreign based income as U.S. based income. Fourth, the taxation from foreign governments will amount to double taxation with a smaller foreign tax credit against U.S. taxes.

Under the Registration Treaty, all spacecraft must be registered, “flagged,” to the launching state. If two or more states are participating in the launch, the states must decide which one of them will register the spacecraft. Therefore, U.S. based corporations operating outside the U.S. could have their income taxed under the U.S. tax code no matter where they operate on Earth or in outer space.

Fourth, the FAA has focused extensively on passenger and craft safety. In December 2006 and April 2007, the FAA published new guidelines for passenger and crew safety, and finalized new guidelines for obtaining experimental launch permits, respectively.^{*****} However, the focus on passenger safety has overlooked the development of commercial space piloting rules and more comprehensive regulations for spaceports and launching and landing procedures. The FAA has not issued guidelines for spacecraft pilots,

***** Federal Aviation Administration, “Commercial Human Space Flight,” *Fact Sheet*, April 6, 2007, http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=8023, accessed July 29, 2008.

and has only issued two commercial astronaut wings. Regardless, the terminology used to describe pilots puts the ISS agreement on “spaceflight participants” in question. Is the FAA giving astronaut designation to private spacecraft pilots or are they “space participants”? The answer is not clear. Furthermore, how will private spacecraft pilots be certified? The FAA is still developing polices to address these issues, but they will most likely extend current commercial Federal Aviation Regulations (FAR) to private spacecraft pilots.

Fifth, a major issue for any business in outer space is the risk involved in operations. Since start up and research and development costs are very high, any business will want to recoup those costs by providing some product or service as cheaply as possible. To this end, private space firms will seek insurance from underwriters in case of some catastrophic failure. Currently, a spacecraft flagged in the United States is under the jurisdiction of the United States. Therefore, under the Liability Treaty, any failure in outer space that results in injury to foreign nationals or their property is absolutely attributable to the United States.

Furthermore, under U.S. law the tortuous corporation is not entitled to sovereign immunity and could be liable under the Federal Tort Claims Act or the Alien Tort Claims Act.^{19, 20} The Federal Tort Claims Act (FTCA) permits private parties to sue the United States in a federal court for torts committed by persons acting on behalf of the United States. Liability under the FTCA is limited to “circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred.” The Alien Tort Claims Act (ATCA) grants jurisdiction to U.S. Federal Courts over “any civil action by an alien for a tort only, committed in violation of the law of nations or a treaty of the United States.” Arguably, any harm caused to a natural or juridical person resulting from corporate conduct in outer space, either in violation of U.S. or international law, could be attributable to the United States. In contrast, NASA has had a history of paying claims for torts as a result of Shuttle accidents.²¹ But in general, the U.S. does not waive sovereign immunity and cannot be a party to a suit for a civil action in U.S. courts.

Sixth, a real concern in regards to future space ventures is that the U.S. does not have a registering agency for private spaceflights. Under the current system, the FAA gives licenses for launch and certifies the craft for flight. There are no government agencies with which to register flight plans when private space firms decide to go to the Moon. Furthermore, if a corporation wished to go to the Moon, then the firm that owned the spacecraft is not obligated under U.S. law to announce to any government agency their intentions to fly beyond Earth orbit. This is a violation of the Registration Treaty. It is the responsibility of the launching state to notify all relevant governments and international agencies, including the United Nations Office of the Secretary-General.

Seventh, given private human spaceflight capabilities, there is concern that occupants of the spacecraft may remove resources from the surface of the Moon. If occupants of the spacecraft do remove resources from the Moon and return them to the Earth, several legal issues come into play. First, the Outer Space Treaty prohibits the appropriation of resources from the Moon. Second, the Moon Agreement prohibits the appropriation of resources from the Moon, but also stipulates that the resources themselves are the “common heritage of mankind,” and subsequently any profits derived from the resources should be distributed to the least develop nations on the planet via an international regime. However, there are no enforcement mechanisms at the national or international levels. Third, it is not clear whether the United States government could legally remove private or corporate custody of the Moon resources. The United States has approximately three hundred pounds of Moon rocks from the Apollo missions. Arguably, the appropriation of the Moon rocks by NASA is not only *de minimis*, but legal under the Outer Space Treaty since the United States has given scientists access to the Moon rocks and their appropriation was in conjunction with the principle of exploration under *ius gentium* instruments. But large scale appropriation by a private corporation could lead to an international complaint and could result in a seizure of any materials removed from outer space or celestial body. Would the U.S. be obliged to pay compensation for the seizure? This is unclear since there are no defined property rights in outer space. Fourth, it is also unclear how contaminants may be handled by corporations or individuals operating independently of government oversight.

The issue of real property has been discussed by many commentators within *corpus iuris spatialis*. Other than the principles specified in the *ius gentium* instruments, the United States has not enacted any federal or state legislation prohibiting the private appropriation of the Moon or “celestial bodies.” Nevertheless, Dennis Hope, head of the Lunar Embassy, sent NASA in 2001 a bill for \$19.99 and daily

parking fees for landing the NEAR spacecraft on the asteroid Eros.^{††††††††††} In response, NASA's legal department forwarded the inquiry onto the State Department, unsure how to address the issue. The State Department instructed NASA that Mr. Hope had no claim since he had not occupied the asteroid Eros and could not establish an ongoing occupation of the asteroid in accordance with international law.^{††††††††††} Regardless, Mr. Hope could not claim Eros because it is prohibited by the non-appropriation clause of the Outer Space Treaty. Any claim to celestial objects may only be promulgated by the U.S. government and not private entities. This case is currently considered trivial, and private claims may have no standing in U.S. courts.

Despite a lack of interest in Congress to the current human spaceflight movement, two states within the U.S. have enacted their own legislation addressing many of the issues discussed above. In July 2007, Virginia signed into law the Space Liability and Immunity Act (SLIA).²² The SLIA requires: limited immunity for spaceflight entities, including "manufacturers or suppliers of components, services or vehicles that have been reviewed by the FAA;" informed consent for "spaceflight participants" with statutory language warning potential participants of the dangers of spaceflight; signing a waiver that says the "spaceflight participant" understands that they are engaging in a dangerous activity and will not sue "space flight entities" in the case of an accident; and allocation of state funds for capital improvement of space service infrastructure. Additionally, the SLIA has a sunset clause set to July 1, 2013. To complement the SLIA, Virginia passed a Zero G/Zero Tax law in March 2008 that grants state income tax exemption for income resulting from launch and resupply services.²³

In June 2008, Florida passed a similar bill titled Informed Consent For Spaceflight Act (ICFSA).²⁴ The ICFSA requires: release from liability for spaceflight entities, but limits them only to those entities actually holding an FAA license; there be no cause of action for injury occurring during spaceflight; statutory warning and waiver for "spaceflight participants;" keying Florida law to Federal Aviation Regulations (FAR) in defining "spaceflight activities" as limiting the reach of the statute to sub-orbital flights only; tax refunds for new spaceflight businesses; the creation of Reusable Space Vehicle Industry Prize; and the appropriation of state funds to support commercial space activities. The Florida and Virginia laws are already having an impact on business decisions. For example, Space Adventures has purchased Zero-G, Orbital Science's choice of launch site for COTS. Several state legislatures, such as California, Hawaii and New Mexico are expected to address similar issues in the near future.

Private spacecraft and space habitats will soon become a viable product and their uses will provide private firms and their client's opportunities to move beyond Earth orbit. Corporations will press governments to identify real property rights, call for some form of indemnification from liability, encourage investment through tax incentives, and enact or augment regulations from transfer of technology to aviation, which will help rather than prohibit the development of the commercial space industry. Due to the federal system of government in the United States, it is possible for the *corpus iuris spatialis* to grow and enable corporations to expand their services and create new markets by innovating necessary technologies for private human spaceflight. Even so, there are many ways to achieve this, but the outcome will depend upon whose interests are being served.

V. A Review of Laissez-Faire Proposals for Outer Space

Corporate expansion into outer space is on the cusp of fruition. This new frontier has many legal obstacles that will limit how far firms will be willing or able to go into outer space. Laws on Earth have outlined the legal boundaries of outer space, but the details will be filled in along the way. To this end, many commentators have proposed various ideas to fill in those details, as well as called for the adoption of new principles to govern outer space. These laissez-faire proposals envision human expansion with the least amount of regulation. Below I outline several proposals.

^{††††††††††} Listner, Michael J., "The Ownership and Exploitation of Outer Space: A Look at Foundational Law and Future Legal Challenges to Current Claims," Regent Journal of International Law, 1 Regent J. Int'l L 75 (2003). Pop, Virgiliu, "Lunar Real Estate: Buyer, Beware!", Paper presented at the First Convention of Lunar Explorers, Palais de la Découverte, Paris, 8-10 March 2001, http://www.spacefuture.com/archive/lunar_real_estate_buyer_beware.shtml, accessed July 29, 2008.

^{††††††††††} See the discussion of the Island of Palmas case below.

In a study on the effects of international taxation, William Lee Andrews, writes on the germaneness of why corporations should pursue space commerce. Mr. Andrews writes the Frontier Thesis of Frederick Jackson is part of the American experience. Quoting Jackson: “[s]ince the days when the fleet of Columbus sailed into the waters of the New World, America has been another name for opportunity, and the people of the United States have taken their tone from the incessant expansion which has not only been open but has even been forced upon them.” “Space is a special kind of place—a frontier,” says Andrews; as such, he believes the best solution to open the frontier and relieve some of the uncertainties associated with commercial space is to protect private space ventures “from the tax burden in preparation for the development of space industry.” His solution is “a tax holiday for new space related activities... [including] space asset capital gains.” Consequently, private space corporations “would be subject to no income tax liability, so long as the preponderance of its gross revenues stemmed from actual space activities” occurring beyond 90-100 kilometers from the Earth’s surface. §§§§§§§§§§ These solutions will help reduce the tax burden for private space corporations in the United States operating anywhere in space or on Earth.

There is some support in Congress for Mr. Andrews’ proposals. The proposed Zero-Gravity, Zero Tax Act of 2001²⁵ contains many of the features Mr. Andrews proposes. ***** Though, the central question is whether the tax proposal creates a subsidy of sufficient power to attract investors. If passed, it is questionable whether the act would have an effect, given the difficulties of making a profit in space.

Even so, Mr. Andrews’s proposal seems the logical path to take. A short period moratorium on income from outer space operations seems reasonable in light of the prohibitive research and development costs, and limitations on transfer technology licensing. It could spur investment capital, which can be reinvested in developing innovative technologies.

The most debated and contentious principle is the Outer Space Treaty’s prohibition on appropriation of the Moon and other celestial bodies. Since the Outer Space Treaty requires free access to all by all to the Moon and celestial bodies, the legal status is complicated. Things are further complicated by the role of states in defining restrictions on government and non-government uses of resources in outer space.

In a law review note in 2005, Jonathan Thomas advocates for the abolishment of the *ius gentium* instruments.²⁶ In place of the *ius gentium* instruments Mr. Thomas proposes a charter system not unlike the system developed under European monarchs. He argues a charter system creates the best regime because under the Outer Space Treaty and the Moon Agreement, the *res communis* principle that governs appropriation “goes against [sic] capitalistic methods of conducting international relations in a free-market global economy.” However, it is not clear how a charter system could be achieved. In the U.S., Congress or the President could implement a charter system for resource appropriation. Arguably, a congressional act or executive order could work, but given international obligations and current bi and multi-lateral agreements a charter would be politically unfeasible and very difficult to enforce. Furthermore, a charter would create a separation of powers issue. Would a congressional charter violate the presidential prerogative to conduct foreign relations? Or would an executive order violate the congressional prerogative to regulate commerce?

The charter system Mr. Thomas envisions will require individual nations to grant corporations a charter. The charter would address safety, corporate governance, and stipulate the purpose of the business venture. †††††††††† To achieve a charter system, states must “mutually consent” to terminate the current *ius gentium* instruments. Mr. Thomas’ suggestion is highly dubious. It is unreasonable to think states would mutually consent to end any treaty so easily. Furthermore, Mr. Thomas discounts the value of custom and precedent in international law.

Mr. Thomas does concede that the charter system is not perfect. The system will create inequalities and “undue compensation to others.” Mr. Thomas believes that a free-market based approach in which “traditional property jurisprudence” can be implemented to govern property rights can only be achieved by abandoning the *ius gentium* instruments. Nevertheless, the charter system is based on a normative understanding of what “traditional property jurisprudence” entails. Every nation on Earth has a separate system of dealing with real property. For example, the United States has a common law approach to maintaining private property rights and granting due process when those rights are violated. On the other

§§§§§§§§§§ This is considered the lower limit perigee for low Earth orbiting satellites.

***** As noted above, Florida and Virginia have enacted legislation for tax moratoria on business operations relating to outer space; however, the Congress has not.

†††††††††† There are plenty of examples in history of the short and long term failures of charters in seizing wealth. See Watson, Adam, *The Evolution of International Society*, Routledge, New York, 2005, Chaps. 17-23.

hand, the People's Republic of China has a state-owned property system, developed under socialist based civil codes. These property systems are too different to synthesize into one "traditional property jurisprudence."

Mr. Thomas contends that the *res communis* doctrine is idealistic and human nature will never allow it to operate as a global principle. His reasoning is that under community ownership, "an entitlement for persons who do not labor or invest" creates incentive to do nothing, "thus destroying their incentive to produce." However, in his note, Mr. Thomas offers no empirical evidence that the *res communis* doctrine is a direct barrier to corporate resource appropriation. It may be that the true disincentive to produce is the enormous technological capacity needed to utilize resources from outer space. In addition to the Outer Space Treaty, two current international agreements establish the *res communis* doctrine over the sea, the sea-bed, and Antarctica. These are: The Law of the Sea Convention and the Antarctic Treaty, respectively.^{27, 28} Neither agreement has stopped governments or corporations from conducting scientific exploration or operating commercial enterprises on the sea, on the sea-bed, or in Antarctica.

Many states and their private corporations and state businesses are producing wealth from operations in and relating to outer space commerce. Even under the *res communis* principle, developed nations are balancing their interests with the reality that under-developed nations benefit without participating in the direct annexation of resources in outer space or on Earth. Nevertheless, authority over a territory is a separate question and the *res communis* doctrine can be augmented, but unilateral appropriation is prohibited under current international law.

Every state has a different view of how title to property is acquired and how property should be distributed and used once title is created. Moreover, a state cannot act unilaterally to appropriate territory or resources at the international level without violating international peace and security. A charter system or private annexation would violate more than the Outer Space Treaty, it would violate general principles of international law that has a foundation in over seventy years of international jurisprudence. In 1928, the Permanent Court of Arbitration in The Hague, Netherlands, decided a territorial dispute between the United States and the Netherlands.²⁹ The question was whether the Island of Palmas (Miangas), in its entirety, was part of the territory of the United States or the Netherlands. The Treaty of Paris (1898) ended the Spanish-American War and transferred title for the Island of Palmas to the United States from Spain. However, the Netherlands claimed the island was not maintained by nor a part of Spain, and therefore Spain had no right to transfer title to the United States. The Court found in favor of the Netherlands. While the Court acknowledged Spain's right to acquire the island because it was deemed *terra nullius* in the fifteenth century, the Spanish title was deemed inchoate, i.e. it was incomplete.†††††††††† The Court argued that for a state to maintain initial title from discovery, a state must exercise authority either by planting a flag or having a continual presence on the island. The Court ruled Spain did not exercise authority over the island after making an initial claim after discovery. Therefore, since the Netherlands had exercised authority over the island since 1677, they had maintained title.

The Island of Palmas case established three general principles to territorial acquisition. First, title based on contiguity has no standing in international law. Second, title by state discovery is only an inchoate title. Third, if additional states exercise continuous and actual authority, and the discovering state does not contest additional claims, provided in good faith and publicly announced, then the claim by the state that exercises authority is greater than a title based on mere discovery.

It is important to note that states are the primary actors in territorial acquisition. Individuals do not have rights of territorial acquisition at the international level since they cannot independently establish title. Hence, Mr. Hope's claim to Eros is unjustified, illegal and without merit. Therefore, corporations desiring to acquire any natural object beyond Earth cannot independently establish title because it will require the extension of state sovereignty. Of course, extension of state sovereignty is a violation of the *res communis* principle and the Outer Space Treaty.

A proponent of a true laissez-faire approach is Jim Benson of SpaceDev. Jim Benson is a strong advocate for unfettered access to outer space. In an interview in 2000, Mr. Benson was quoted as saying with respect to the United States and the United Nations positions on real property: "I don't believe they have an official position, and if they did, I wouldn't care because I don't believe they have legal standing in

†††††††††† The Latin phrase *terra nullius* means "land belonging to no one" or "empty land." It refers to the acquisition of land by states in the absence of recognized title. The concept is European and was used to justify the taking of territory by European powers during the era of colonization. *Terra nullius* is based upon the natural law principle that it is against the law of nature to let land spoil.

space – they are Earth based.”²⁹ Mr. Benson has signaled his intention of appropriating an asteroid between Earth and Mars, and believes there is little the United Nations or the United States could do to prohibit the private annexation of an asteroid. If Mr. Benson could appropriate an asteroid such as Eros, he would claim the principle of *uti possidetis* as the prevailing justification. But, *uti possidetis* is an Earth based norm developed over two thousand years as a means of acquiring something by belligerent means. Moreover, the Outer Space Treaty extends current international law into outer space. Therefore, Mr. Benson would still be subject to the laws of Earth and the U.S.

In a paper to an AIAA conference in 2005, Thomas Gangale and Marilyn Dudley-Rowley (Gangale, *et al.*) pointed out that “property rights exist only if they are granted or recognized by a government and subject to the protection of the law.”³⁰ The authors elaborate this point by saying “[s]uch grant, recognition, or protection is an act of state, and as such is an exercise of state sovereignty.” Gangale, *et al.*, criticize Jim Benson’s approach by noting that “title cannot come out of thin air (or the vacuum of space).” In light of Jonathan Thomas’ charter scheme, states can grant charters as they have done in the past; however under the logic of Gangale, *et al.*, if Congress or the President decided to grant a charter to a corporation to appropriate an asteroid, it would still “be an act of state sovereignty, and therefore a violation of international law under the provisions of the Outer Space Treaty.” What seems to be lost among laissez-faire proponents is that in absence of explicit U.S. law, international law “shall be the supreme law of the land” under Article VI of the U.S. Constitution.³¹ Nevertheless, corporations are hemmed in by either *ius gentium* or *ius municipalis* instruments. The question remains whether corporations will test the perimeter of international norms and become rent seekers or play along with governmental control of the commercial space industry.

Gangale, *et al.*, believe the greatest problem to commercial space corporations “is the huge capital investment that is required to develop a trans-planetary infrastructure.” While some may believe that “government is the problem,” the reality is that developing a private infrastructure will require the utilization of a great amount of resources. Free-market economics cannot operate in such high cost and high risk environments, nor can private firms be expected to take on such large projects alone. Building partnerships between governments and corporations to develop such infrastructure will enable an economic and legal balance providing sufficient solutions without economically overburdening either the public or private sector. To achieve any profit in outer space an economic incentive must be established. Therefore, it will take the collective will of governments and corporations to find the best strategies to implement a viable commercial market for corporations and sustain human presence in outer space. The international norms promulgated by the *ius gentium* are not directly a barrier for corporations, but merely an element of the market since it can only be the political will that may reshape the commercial space industry.

VI. The Future of the Corporation, *Corpus Iuris Spatialis* and Society

Any legal regime in outer space will require a global effort to sustain enforcement mechanisms. The adoption of *ius gentium* instruments by states will help create the necessary norms at the international level to pressure the adoption of *ius municipalis* rules at the national level. The interdependency between the international norms and the national rules will be largely shaped by the tension between corporate profit seeking and broad normative values relating to outer space. Underlying these issues will be the safety of the commercial space industry, both economically and physically.

True competition in outer space is a goal of the commercial space industry, but the complications of human spaceflight negate a free and open market. National and international regulations prohibit corporations from freely taking advantage of new resources and profit opportunities. The *ius gentium* instruments are sufficient to establish balanced legal and economic perimeters for corporations. The burden is on governments, like the United States, to enact legislation to fully complement the spirit of the Outer Space Treaty and its sister instruments.

The United States is currently the leader in outer space. While NASA manages the ISS, its Shuttle fleet is due to be decommissioned in 2010. This will leave Russia’s Soyuz craft as the only government spacecraft with the ability to service the ISS. NASA is not due to put the Shuttle’s replacement into service

²⁹ As quoted from Gangale, Thomas, and Marilyn Dudley-Rowley, “To Build Bifrost: Developing Space Property Rights and Infrastructure,” American Institute of Aeronautics and Astronautics (2005).

until sometime in 2013. This will allow private launch firms to take advantage of a major shift in the space market and provide additional incentives to invest and utilize new innovative technologies.

The importance and necessity of a productive and profitable future space-faring society will depend upon the path nations take in expanding their sovereignty over the ‘heavenly bodies.’ Will this be a cooperative endeavor or will nations seek their own way in entering outer space? The barriers are not gravity and cost, but the willingness to include, rather than exclude, corporations and other governments from outer space. Corporations will undoubtedly play a defining role in national and international legislation, and as such should not be taken lightly.

On the other hand, humanity must be cognizant of historical indiscretions. The history of human expansion across the Earth is not entirely a just history. As Gangale, *et al.* point out: “we should be wary of any person or faction to whom the ends justify the means, for it then becomes all too reminiscent of Manifest destiny and Lebensraum.” To this end, it is vitally important that cooperation between nations be the rule and not the exception in outer space. Otherwise, corporations or private citizens will try and establish themselves on a particular celestial body and await their respective governments to establish absolute or functional jurisdiction over their claimed territory.

Furthermore, governments and private firms should not be allowed to have absolute free reign in outer space. The potential for disaster and failure are real problems. If governments or private firms try to go alone into the void of space, they will only serve to create hostility on Earth and give rise to “tit-for-tat” reprisals in outer space. It is in the collective interest that commercial space corporations be given the proper direction by governments, at the national and international levels, to achieve the consensus goal of exploring the unknown, as well as acquiring profits from exploitation of resources. This balance can only be maintained through international cooperation.

We are at a phase in human history where governments will not be the only integral source of exo-terrestrial transportation. Corporations will be counted on to take supplies and people to places beyond Earth. For space entrepreneurs to facilitate their vision of open access to outer space they must call on governments to design explicit rules for conduct and operations. In turn, states must demand that corporations abide by these rules and take all necessary precautionary measures to ensure that they stay within the legal perimeters of international norms.

Practical and sufficient solutions to legal problems in outer space are under review. The *corpus iuris spatialis* is a developing field in international law. Therefore the *corpus iuris spatialis* must balance the goals of human exploration with those of corporate expansion. There is hope that reasonable solutions to problems associated with outer space can find their way out to the ether and promulgated across the Solar System.

Acknowledgements

Christopher Hearsey thanks Professor Howard McCurdy for his invaluable insight and help in developing this article, as well as his formative mentorship. Mr. Hearsey would also like to thank Dr. Jim Pass, Thomas Gangale, the AIAA Astrosociology Working Group, the faculty in the Department of Justice, Law & Society at The American University, Dr. Edwin Greenlee, Esq., Gail Hearsey, and Tiffany Hearsey for their support in his academic and professional development. Additionally, Mr. Hearsey thanks Suzanne Roosen for her patience and emotional support, as well as her help in formatting this article.

References

1. “National Aeronautics and Space Act of 1958,” Public Law #85-568, 72 Stat., 426.
2. “National Aeronautics and Space Administration Authorization Act of 1985,” Pub. L. No. 98-361, 98 Stat. 422 (codified as amended at 42 U.S.C. § 2451 (2000)).
3. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, opened for signature Jan. 27, 1967, entered into Oct. 10, 1967, 18 UST 2410, 610 UNTS 205.
4. Cheng, Bin, “United Nations Resolutions on Outer Space: “Instant” International Customary Law?,” *Indian Journal of International Law*, 5 *Indian J. Int’l L.* 23 (1965).
5. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, open for signature Apr. 22, 1968, entered into force Dec. 3, 1968, 672 UNTS 119.

6. Convention on International Liability for Damage Caused by Space Objects, open for signature Nov. 29, 1971, entered into force Sept. 1, 1972, 961 UNTS 1878.
7. Convention on Registration of Objects Launched into Outer Space, open for signature Nov. 12, 1974, entered into force Sept. 15, 1976, 1023 UNTS 15.
8. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, open for signature Dec. 18, 1979, entered into force July 11, 1984, 1363 UNTS 3.
9. "Commercial Space Act of 1998," Pub. L. No. 105-303 (1998).
10. "Arms Export Control Act," 22 USC § 2778 (2002).
11. "International Traffic in Arms Regulations," 22 CFR §§ 120-30 (2003).
12. "Export Administration Act," 50 USC § 2401, appendix (1994).
13. "Export Administration Regulations," 15 CFR §§ 730-74 (2004).
14. Sattler, Rosanna, "Transporting A Legal System for Property Rights from the Earth to the Stars," *Chicago Journal of International Law*, 6 *Chi. J. int'l L.* 23 (2005).
15. "Commercialization of Space: Commercial Space Launch Amendments Act of 2004," *Harvard Journal of Law & Technology*, 17 *Harv. J. Law & Tech.* 2 (2004).
16. "Commercial Space Launch Amendments Act of 2004," 49 USC §70101, 118 Stat. 3974, P. L. 108–492 (2004).
17. "Tax Reform Act of 1986," Pub. L. No. 99-514, 100 Stat. 2085 (1986).
18. Andrews III, William Lee, "A Mighty Stone for David's Sling: The International Space Company," *Regent Journal of International Law*, 1 *Regent J. Int'l L.* 5 (2003).
19. "Federal Tort Claims Act," 28 USC §§ 1346(b), 2671-2680 (1946).
20. "Alien Tort Claims Act," 28 U.S.C. §1350 (1789).
21. Murnane, Andrew W., Daniel Inkelas, "Liability Issues Associated with the Space Shuttle Columbia Disaster," CRS Report for Congress, Order Code RS21426, February 12, 2003.
22. "Space Liability and Immunity Act," VA-HB3184, enacted July 1, 2007.
23. "Zero-G, Zero-Tax," VA-SB286, effective January 1, 2009.
24. "Informed Consent For Spaceflight Act," FL-HB 737, effective October 1, 2008.
25. "Zero Gravity, Zero Tax Act of 2001," HR 2504, 107th Cong. (proposed 2001).
26. Thomas, Jonathan, "Privatization of Space Ventures: proposing A Proven Regulatory Theory for Future Extraterrestrial Appropriation," *The Foundation for International Law and Management*, 1 *Int'l L. & Mgmt. Rev.* 191 (2005).
27. United Nations Convention on the Law of the Sea, open for signature Dec. 10, 1982, entered into force Nov. 16, 1994, 1833 U.N.T.S. 397.
28. The Antarctic Treaty, open for signature Oct. 1, 1959, entered into force June, 23, 1961, 402 U.N.T.S. 71.
29. Scott, *Hague Court Reports* 2d 83 (1932), (Perm. Ct. Arb. 1928), 2 U.N. Rep. Intl. Arb. Awards 829.
30. Gangale, Thomas, and Marilyn Dudley-Rowley, "To Build Bifrost: Developing Space Property Rights and Infrastructure," *American Institute of Aeronautics and Astronautics* (2005).
31. U.S. Const. art. VI, cl. 2.