September 2008

Outer Space, Inc.: Transmitting Business, Ethics, and Policy
Across the Universe

Gabriele Wohl
West Virginia University College of Law

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OUTER SPACE, INC.: TRANSMITTING BUSINESS, ETHICS, AND POLICY “ACROSS THE UNIVERSE”

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* On February 4, 2008, the National Aeronautics and Space Administration transmitted The Beatles song “Across the Universe” via satellite into deep space, in honor of NASA’s 50th anniversary and The Beatles’s 40th anniversary of recording the song. Marc Kaufman, Beatles Song Has Ticket to Ride, WASH. POST, Feb. 4, 2008, at A12.
I. INTRODUCTION

A. Conceptualizing Without Disenchanting

There is an undeniable element of the fantastic in any outer space-themed production, be it a science fiction novel, television series, documentary, or law review note. As creative beings, we are constantly stretching our imaginations and struggling to construct bridges between our capabilities and our ideas. Every day outer space becomes a more compelling and tangible medium for architects of ideas to work with, presenting us with opportunities to create the technology and policies that will increase our capabilities and proximity to what were, yesterday, blueprints in our imagination. As science and law advance, outer space issues will likely gain exposure and credibility, but hopefully space will never lose its essence of the extraordinary—of the fantastic—that motivates nine-year-olds and aerospace engineers alike. Rather, hopefully, people other than nine-year-olds and aerospace engineers, such as politicians, entrepreneurs, and environmentalists, will each find a place in this emerging medium and contribute to the development of what could be a very effective and productive extension of our earthly capabilities.

The private outer space industry, in contrast to the public sector, is not sponsored by the government, but rather originates from business owners and investors who are either interested in outer space or looking to profit from what promises to be a lucrative venture—be it in launching commercial telecommunications satellites, tourism, medical and crystals research, or mining minerals on the moon. Private space enterprises are few and relatively unnoticed by the general public, but they are the colonists of a rapidly expanding $251 billion global industry.¹ NASA Administrator Michael Griffin calls the space industry "an emerging economy, but a robust one even so," and warns that only the leading space-faring countries will be able to take full advantage of technological innovation that drives competition and economic growth in the space industry.²


There are a number of ways state and federal governments could be doing more to encourage and capitalize on the outer space industry, some of which are discussed later, but the focus of this Note is to reveal some of the major legal obstacles currently constraining the space industry and to suggest possibilities for clearing the path going forward. Specifically, the international community needs to clarify what rights are included in outer space activities. These rights should include rights of access and rights to share resources and the benefits of technology. In a 1963 address at the Georgia Institute of Technology, Chief Justice Earl Warren warned that when "law has not kept abreast of science," the necessary legal progression must avoid inhibiting the development of science.\(^3\) International and domestic space law keeping pace with commercial space development is essential to maximizing the success and potential of the future of peaceful space exploration.\(^4\)

**B. The Trajectory**

After summarizing the history of the space race in Part II, Part III of this Note discusses the apropos, albeit limited, legal precedent for outer space law, including some of the legal terms commonly associated with outer space. The body of law governing Antarctica, the deep seabed, and airspace provides a useful model for outer space, as well as a foreshadowing of conflicts that may occur surrounding space issues. Part IV outlines the progression of the international and United States attitude toward space exploration and the reflecting and reactive policies. Specifically, this Note examines the origins of the five United Nations outer space treaties\(^5\) and NASA,\(^6\) likely the most influential enactments stemming from the international community and the American government, respectively. Part IV also discusses the derivative effect of the space race on state governments by looking specifically at recent legislation in California and Virginia. Next, in Part V, this Note describes the current state of the space industry, including government and private activity and international cooperation,

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and how all of this activity fits (or does not fit) into the current laws. Part V identifies some of the deficiencies of the current space law regime in light of questions regarding equity and the interpretation of existing treaties, property rights in the satellite regime, the environment, and liability. In Part VI, this Note offers several solutions. There are international policies and regulations that should be implemented or adjusted and legal conflicts that should be immediately resolved to guarantee the continuation of space development in line with the principles of equity, safety, peace, and cooperation. Finally, Part VII looks at ways that the United States and individual state governments, specifically West Virginia, can gain awareness of this fast growing economy and institute legislative measures to ensure the realization of some of the potential economic and technological benefits of the space industry.

II. THE SPACE RACE

On October 4, 1957, the universe became slightly smaller when the Soviet Union successfully launched the first earth orbiting artificial satellite, Sputnik. To the Soviets, this was a reasonable triumph in leader Nikita Kruchev’s strongly supported space program, but to the United States, this event was a pivotal and threatening moment in the Cold War that shook the confidence of the entire country. Lyndon Johnson, the Senate Majority Leader at the time, reflected, “Now, somehow, in some new way, the sky seemed almost alien. I also remember the profound shock of realizing that it might be possible for another nation to achieve technological superiority over this great country of ours.” President Dwight D. Eisenhower responded by making space exploration a priority. The United States government was determined to never again be left lagging behind another country’s technological prowess. In the months following Sputnik’s launch, Eisenhower established a civilian space agency, NASA, and instituted intensive hands-on science and math programs in public schools. The space race had begun.

When President Eisenhower signed legislation creating NASA, the agency had four objectives: 1) exploration and discovery; 2) national defense; 3) prestige and confidence in U.S. scientific, technological, industrial, and military

7 John Noble Wilford, With Fear and Wonder in Its Wake, Sputnik Lifted Us Into the Future, NY TIMES, Sept. 25, 2007, at F2 (“People could now see their kind as spacefarers. Their enhanced mobility might someday prove as liberating as the first upright steps of hominid ancestors long ago.”).

8 Id. (“The Soviet press published a standard two-column report of the event, with a minimum of gloating. But Newspapers in the West, particularly the United States, filled pages with news and analysis.”). See also NATHAN C. GOLDMAN, AMERICAN SPACE LAW, INTERNATIONAL AND DOMESTIC 4 (1988) (“Soviet success in orbiting the world’s first satellite meant that the Soviets could likewise suborbit a nuclear bomb.”).

9 STINE, supra note 1, at 5

systems; and 4) knowledge and understanding about earth, the solar system, and the universe. Congress recently reauthorized NASA for 2008-2009, and a congressional report noted that the current NASA research and scientific objectives are the same, but there is a new emphasis on NASA cooperating with the private sector of outer space technology development.

Funding for NASA peaked to about four percent of the federal budget in the 1960s during development of the lunar landing program and has decreased steadily since then, along with public interest in national space programs. However, despite the shrinking attention from the government and public, the space industry has lifted off dramatically worldwide and is currently responsible for $251 billion in revenue. Previous investments in space sciences have led to the discovery of advanced medical technologies like pacemakers and defibrillators along with satellite weather tracking; remote sensing; and a greater understanding of the earth's atmosphere, astronomy, and physics. As discussed more specifically in Part V, this industry is constantly stretching the limits of science and finding new ways to make space commercially profitable.

III. THE ORIGINS OF OUTER SPACE LAW

A. Res Communis and Common Heritage of Mankind

There are three terms relevant to discussing the legal status of outer space: res communis, "common heritage of mankind," and "province of mankind." Res Nullis is the legal term to describe "unattributed territory." Res Nullis is the legal term to describe "unattributed territory."
Communis, on the other hand, refers to territory that is common to the international community. There are two opposing interpretations of the doctrine of res communis: that something is common to all, and that something is open to all. The first interpretation implies that there can be no appropriation of a res communis area because everyone owns it equally, while the second restricts the definition to say that res communis areas only entitle everyone to equal access, not ownership. That is to say, no one party can restrict another from navigating or exploiting the area. The res communis doctrine has been applied by scholars, lawmakers, and commentators to the high seas, the deep sea-bed, and Antarctica, as well as Outer Space and celestial bodies.

Once the prospect of exploiting minerals from designated res communis areas became plausible, like in the deep seabed or in Antarctica, the international community responded with a new doctrine: the “common heritage of mankind.” This concept “prohibits states from proclaiming sovereignty over any part of the [area], and requires that states use it for peaceful purposes, sharing its management and the benefits of its exploitation.” Interpretations of specific aspects of the common heritage of mankind vary, especially the degree of duty states owe to share exploited resources. These differing interpretations present legal questions in the law governing Antarctica, the deep seabed, and outer space. One more important phrase in determining the legal status of outer space is the “province of mankind.” This terminology appears in treaties governing outer space, but does not fit neatly into either res communis or the common heritage principles. The reconciliation of the three concepts will be discussed further in Part V.

B. Antarctica

The development of law governing Antarctica is analogous to that of outer space because both were inspired by scientific advancements. Before there were international agreements and common principles of law governing Antarctica, several countries claimed sovereignty over sometimes overlapping

18 Id.
20 Id.
21 Id. at 119. See also Jon M. Van Dyke, Sharing Ocean Resources—In a Time of Scarcity and Selfishness, in Law of the Sea: The Common Heritage and Emerging Challenges 3, 35 (Harry N. Scheiber, ed., 2000).
23 Guntrip, supra note 22, at 1-5.
parcels of the 5,405,000 square mile ice-covered continent. Due to the inaccessibility of Antarctica, physical confrontation between the countries was minimal. In the 1950s, political cooperation followed scientific collaboration in the form of a convention hosting the countries already working together in Antarctic scientific research expeditions. This convention resulted in the Antarctic Treaty, which states that Antarctica shall be used for peaceful purposes only, and that no new claims to sovereignty will be recognized, exemplifying the doctrine of res communis.

C. Maritime Law

When "use" of the oceans was confined to navigation, it seemed as though "use" would never deplete this resource, and the idea of "freedom of the high seas" prevailed. The realization that fish were of limited numbers, and that the seabed contained valuable minerals, sparked international debate and a need to define every country's claims and duties to the oceans in legal terms. Accordingly, conventions were drafted to control waste dumping, overfishing, and dispute resolution among members.

In 1994, the United Nations Convention on the Law of the Sea (Law of the Sea Convention) was put into force and was seen by the international community as a promising accomplishment in both the fields of maritime and international law. The convention created the International Seabed Authority ("ISA") to regulate the exploitation of ocean resources, furthering the controversial principle that the seabed is the common heritage of mankind. The Law of the Sea Convention also provides means for dispute settlement, including the International Tribunal for the Law of the Sea, the International Court of Justice, an arbitral tribunal, and special arbitral tribunals relating to specific issues such as fisheries and environmental protection. Such a detailed outline of dispute

25 Grier C. Radin, From Ice to Ether: The Adoption of a Regime to Govern Resource Exploitation in Outer Space, 7 NW. J. INT'L. L. & BUS. 727, 730 (1986). Radin explains, "Prior to [1957], portions of the Antarctic Continent had been claimed by Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom. These claims, although held in abeyance pursuant to the terms of the Antarctic Treaty, continue today.” Id. at 730 n.19.


27 Van Dyke, supra note 21, at 3.

28 See generally id. at 4-36.

29 Id. at 6-22.


32 Id. at 35.
resolution may have seemed excessive at the time of the Law of the Sea Convention, but these means for resolving disputes are used increasingly as new issues regarding the sea arise. As discussed further in Part V, this anticipatory action serves as a good example for the development of space law.

D. Air Law

Another body of law important to the development of outer space law is aviation, or air space, law. An early and widely accepted doctrine in the law of air space was that of unregulated freedom of the air; however, this doctrine was replaced around World War I as aircraft were used for military purposes. States shifted from freedom to absolute sovereignty over the air space directly above their natural territory. This change benefited states not only in terms of defense, but also commercially since they could now control trade through regulating territorial airspace and landings.

Unlike Antarctica and the high seas, which have officially remained free of appropriation, air space is subject to the jurisdiction of the land directly below it, as negotiated in agreements and conventions. Specifically, the 1944 Convention on International Civil Aviation stated, “Every state has complete and exclusive sovereignty over the air space above its territory.” Although different, outer space law and air space law are inevitably merged for two reasons: one, it is disputed where air space ends and outer space begins, and two, to be subject to outer space law, an object necessarily travels through air space. This accounts for the relationship between U.S. space law and the Federal Aviation Administration (“FAA”), discussed in Part V of this Note.

33 See Van Dyke, supra note 21, at 14; Barnes, supra note 30 at 1-2.
35 There is no fine line at which airspace ends and outer space begins, and the distance is not universally agreed upon. Most aircraft do not fly above an altitude of 53-62 miles, and the lowest satellites orbit around 70 miles above the earth. See REYNOLDS, supra note 24, at 11-12 (citing W.McDougall, The Emerging Customary Law of Space, 58 NW. U. L. REV. 618 (1963)). For several theories on the proper demarcation of outer space, see I. H. PH. DIEDERIKS-VERSCHOOR, AN INTRODUCTION TO SPACE LAW 18-19 (2d ed. 1999).
36 See REYNOLDS, supra note 24, at 39.
38 Sucharitkul, supra note 34, at 431-32.
40 Sucharitkul, supra note 34, at 438.
E. Foreseeing Conflict

Scholars and journalists predict that future encounters in space will mirror past and current conflict over territories without historical sovereignty like the deep sea, Antarctica, and air space. However, for predicting the course of outer space law, it may be worthwhile to note that the status of historically "freedom of use" areas have tended to change once "economic, military, or other advantages" provide incentive for national appropriation.

For example, with polar ice caps melting and increased accessibility to the arctic, there is increased opportunity to take advantage of deep sea resources in that area, sparking the beginning of territory claims and what some call the "Cold Rush." Several countries have begun to take a territorial interest in the global commons of Antarctica for those reasons. Ad hoc courts with voluntary jurisdiction have proven most successful in settling international disputes between nations. If Antarctic appropriation becomes an issue in an international court, developed and developing countries alike will likely want to negotiate access, ownership, and apportionment of resources. Hopefully, the decisions made about Antarctica will be mindful of the anticipation of similar conflicts in outer space and will provide acceptable precedent that answers jurisdictional and property questions.

Additionally, it is unclear whether tortious conduct in outer space will be covered under any of the outerspace treaties when the conflict occurs between private individuals. United States courts have confronted the question of private law in territories not traditionally defined as states in what could eventually be precedent for outer space conflicts.

IV. THE LAUNCH OF SPACE POLICY

The three areas of law discussed above are the most analogous to outer space law, in that the sea, Antarctica, and air space began as unknown territories

42 REYNOLDS, supra note 24, at 42.
43 Morgan, supra note 41, at 46. Morgan writes, "It could get crowded up [in space], and the rules for lunar landgrabs will likely be patterned after what is happening now in the far north." Id.
44 Id.
45 JANIS, supra note 17, at 129.
46 See supra note 5.
and a legal framework developed around them as access and use evolved. After the launch of Sputnik, the United Nations was able to look to principles in those legal frameworks in creating the current outer space treaties. However, it is clear from the context and the purposes of the treaties that the nature of outer space presented many new legal challenges.

A. Five International Treaties

Like most individuals and organizations, the U.N. was unsure of what this new era of human space exploration would bring, especially in terms of international conflict. However, with the world's two most powerful countries locked in the Cold War in the 1950s, the U.N. did not waste much time in preparing for the worst. To many, the launch of Sputnik meant that the U.S.S.R. now had the capability to launch a nuclear weapon into space. The U.N.'s General Assembly passed a resolution one month after Sputnik was launched to ensure that all outer space activity be for peaceful purposes only. In 1959, the ad hoc Committee on Peaceful Uses of Outer Space ("COPUOS") was established by the General Assembly. Through this Committee, multiple treaties based on general international principles were advanced. The drafting of these treaties occurred before any of the eventual treaty signatories fully appreciated what was at stake and the potential of space exploration.

The five main treaties drafted, which constitute the body of international space law, are the Treaty on Principles Governing the Activities in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies ("Outer Space Treaty"), the Agreement on the Rescue of Astronauts, Return of Astronauts, and Return of Objects Launched into Outer Space ("Rescue Agreement"), the Convention on International Liability for Damages Caused by Space Objects ("Liability Convention"), the Convention on Registration of Objects Launched into Outer Space ("Registration Convention"), and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies ("Moon Treaty").

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48 STINE, supra note 1, at 5.
49 GOLDMAN, supra note 8, at 29.
51 GOLDMAN, supra note 8, at 29, 30; REYNOLDS, supra note 24, at 68.
52 Outer Space Treaty, supra note 5.
53 Rescue Agreement, supra note 5.
54 Liability Convention, supra note 5.
55 Registration Convention, supra note 5.
56 Moon Treaty, supra note 5.
1. Outer Space Treaty

The Outer Space Treaty is the most adhered-to of the five treaties. Before the Outer Space Treaty was ratified, President Eisenhower was a vocal proponent in the preservation of peace in space and proposed to the U.N. in 1960 that only peaceful uses of outer space be permitted. The Outer Space Treaty has offered a stable framework for international space law since its inception in 1967. It provides for the peaceful use of outer space, prohibits sovereignty in space by claiming the exploration and use of it the “province of mankind,” and was a precursor to later space law. The Outer Space Treaty also designates jurisdiction over space objects to be proper in the state of registry.

Article II of the Outer Space Treaty states in its entirety, “Outer 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.” This provision adds a layer of complexity when applied with outer space law’s adjacent neighbor, airspace law, which is subject to sovereignty. The ban on sovereignty is a “legal barrier” and should be closely examined alongside every space activity to ensure adherence to the treaty.

The Outer Space Treaty used as precedent for its “province of mankind” provision the res communis doctrine, which, as discussed above, does not specifically dictate the sharing of resources or benefits that lay behind the “common heritage” principle, but does speak to the administration of property rights as a general principle of law. One communications and space law scholar wrote before the Outer Space Treaty was ratified,

One of the basic doctrines to be established now upon which the law of space must be built is that any natural object in space is not subject to any earthly jurisdiction or sovereignty. No single nation may justifiably assert a paramount claim to any other heavenly body or portion of outer space. Thus, as far as space is concerned, we must promulgate the principle of res communis—the property of all.

57 REYNOLDS, supra note 24, at 62.
58 HALEY, supra note 3, at 12. President Eisenhower’s position was later adopted by both President Kennedy and Premier Khruschev of the Soviet Union. Id. at 13.
59 Outer Space Treaty, supra note 5, art. I; REYNOLDS, supra note 24, at 62. Outer space law and the militarization of outer space are subjects that are inevitably merged due to a requirement of “peaceful use,” the reality of reconnaissance satellites, and a history of space weaponization programs; however, the relationship between military and space presents a variety of issues deserving of its own lengthy discussion. See Major Robert A. Ramey, Armed Conflict on the Final Frontier: The Law of War in Space, 48 A.F. L. REV. 1 (2000).
60 Outer Space Treaty, supra note 5, art. VIII. See also GOLDMAN, supra note 8, at 119.
61 Outer Space Treaty, supra note 5, art. II.
62 HALEY, supra note 3, at 11.
In addition to describing this doctrine as a basic, or general principle, this quote demonstrates the more liberal of the two res communis interpretations: that all states are entitled to equal ownership, not just equal access.

2. Rescue Agreement

Article V of the Outer Space Treaty states,

States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space and shall render to them all possible assistance in the event of accident, distress, or emergency landing on the territory of another State Party or on the high seas. . . . States Parties to the Treaty shall immediately inform the other States Parties to the Treaty or the Secretary-General of the United Nations of any phenomena they discover in outer space, . . . which could constitute a danger to the life or health of astronauts.63

The Rescue Agreement expands upon these principles and details the obligations and necessary steps of member states to inform other members and the secretary general of the U.N. of any dangers or the discovery of any space object, or part thereof.64 This agreement does not explain what constitutes a “danger” sufficient to warrant notification and remedial action.

3. Liability Convention

Adopted in 1972 to expand on the existing liability provision in the Outer Space Treaty, the Liability Convention addresses liability for damages caused by space objects by explaining that the “launching state shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraft in flight.”65 There are three ways a state can qualify as the ‘launching state’: (1) if it procures the launching, (2) if it performs the launching, and (3) if its territory was used for the launching.66 The Liability Convention also provides that when two or more states jointly launch objects into space, they are jointly and severally liable for damage caused by that object.67 The registration provisions do not apply to liability conflicts between a launching state and nationals of that state, and the described means for present-
ing a claim are not very specific. The means are “through diplomatic channels,” “through the Secretary-General of the United Nations,” or through a “claims commission.” Unlike maritime law, the Liability Convention does not include the International Court of Justice in its procedures.

One deficiency in the Liability Convention became apparent when satellite companies discovered the cost-effectiveness of launching satellites from a platform situated on the high seas. A problem with only delineating the responsibility for damage solely among states is that there are an increasing number of private companies participating in the space industry. This raises a question:

According to Article VI of the [Outer] Space Treaty the launching state remains responsible for the activities of private companies, so the question arises if, in addition to this type of responsibility, the state where the company has been established will also be responsible for the activities of a private company.

Other questions about liability focus on the cooperation among states in carrying out space activities. Cooperation is an important tenet in space law, but could be discouraged if small countries that have been contracted to work on a minor part of a spacecraft are subject to liability for damage that the craft causes.

4. Regulation Convention

The Registration Convention, adopted in 1975 to regulate space objects, requires states to keep detailed records of all objects launched into space and to make this information available to the U.N. Secretary General. The Secretary General then must keep a registry of all states’ registration data, and “there shall be full and open access to the information in this Registrar.” The Registration Convention serves two functions: “(1) a well-ordered, complete and informative registry would minimize the likelihood and even the suspicion of weapons of mass destruction being furtively put into orbit; (2) it is not possible to identify a spacecraft that has caused damage without an international system of registration.” States may be reluctant to follow the disclosure requirements of the

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68 See id.
69 Id. at arts. VII, IX-XX.
70 See DIEDERIKS-VERSCHOOR, supra note 35, at 43.
71 Id. at 38-39.
72 Id. at 38.
73 Id.
74 Registration Convention, supra note 5, art. II.
75 Id. at art. III.
76 DIEDERIKS-VERSCHOOR, supra note 35, at 47.
Registration Convention, and its provisions do not explain the relationship between the state of registry and the liability of that state.\textsuperscript{77}

5. Moon Treaty

The Moon Treaty is the most controversial (and perhaps the most progressive) of the five space treaties, and it has not been ratified by the U.S. or the U.S.S.R., two major spacefaring countries, possibly due to the lack of clarity in resource administration that is mentioned in the treaty.\textsuperscript{78} The Moon Treaty was the conclusion of important hearings and discussions about how to regulate activity on the moon and by what international standards. This treaty affirms the Outer Space Treaty in that the moon shall not be subject to national appropriation, but the Moon Treaty goes further to outline the rights of states to resources obtained from the moon and other celestial bodies.\textsuperscript{79} The Article setting forth the resource provisions is an interesting departure from, or extreme furtherance of, the basic principles underlying prior outer space law, and it is worth quoting at length:

States Parties have the right to exploration and use of the Moon without discrimination of any kind, on the basis of equality and in accordance with international law and the terms of this Agreement.

States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploration is about to become feasible.

\ldots

The Main Purposes of the international regime to be established shall include:

(a) The orderly and safe development of the natural resources of the Moon;

(b) The rational management of those resources;

(c) The expansion of opportunities in the use of those resources;

\textsuperscript{77} Id. at 47-48.

\textsuperscript{78} See id. at 53.

\textsuperscript{79} Moon Treaty, supra note 5, art. 11.
(d) An equitable sharing by all States Parties in the benefits derived from those resources, whereby 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, shall be given special consideration.\textsuperscript{80}

The Moon Treaty also contains a provision requiring parties to prevent harm to the environment on the moon.\textsuperscript{81} The provisions in the Moon Treaty are a much more radical approach to the benefits of outer space, and as of January 1, 2007, only 13 countries have ratified the Moon Treaty.\textsuperscript{82}

B. U.S. Law and Policy

After Sputnik, the United States was determined to never again be left behind in the technological dust. Both the U.S. and U.S.S.R. launched several more satellites, but it was not until 1969 when Neil Armstrong planted the American flag on the face of the moon during the Apollo mission that the United States was assured of its superiority in space sciences and development.\textsuperscript{83} The Apollo moon landing was a unique victory because, while it was led by the Americans, all of humanity felt the impact of breaking through a boundary that had been in place since the beginning of human exploration.\textsuperscript{84} From then on, the United States’ space program included numerous satellite launches, shuttle missions, and international cooperatives.

By 1985, NASA had its own Office of Commercial Space Programs and was making money by launching satellites into space for private satellite companies that were entering the telecommunications industry and needed their equipment to be placed into orbit.\textsuperscript{85} President Reagan took an aggressive stance on privatizing and encouraging commercial space activity.\textsuperscript{86} In 1984, President Reagan declared in a radio address:

\begin{quotation}
For twenty-five years, we approached space with a certain amount of derring-do. It was the last frontier, and we would be its first pioneers. Space seemed like a vast black desert, but now we’re ready to make the desert bloom. I’m talking about
\end{quotation}

\textsuperscript{80} Id. at art. 11, §§ 4, 5, 7 (emphasis added).
\textsuperscript{81} Id. at art. 7.
\textsuperscript{84} Id.
\textsuperscript{85} Goldman, supra note 8, at 138.
\textsuperscript{86} Id. at 170
opening space up to business, to private enterprise; opening space up to commerce and experimentation and development. Why? To improve the quality of life on earth. 87

Reagan went on in that address to recognize some of the industry potentials of outer space, including drug manufacturing and crystal growing. 88

Following Reagan's lead, Congress passed the Commercial Space Launch Act in 1984 to both regulate and encourage the private space industry. 89 The Commercial Space Launch Act developed licensing requirements for private launches, to be administered by the Department of Transportation's Office of Commercial Space Transportation. 90

Then, in 1988, another event changed the course of American space activity: the world watched the Space Shuttle Challenger explode about one minute after take-off. 91 The real dangers of space travel became apparent, mitigating the excitement of adventure and technological superiority. President Reagan decided then that, for the most part, NASA would no longer accept commercial payloads for private companies, and he barred nearly all commercial satellites from the shuttle. 92 With that, the Office of Commercial Space Programs closed and ceased launching commercial satellites, leaving 44 launch contracts with private satellite companies unfulfilled and creating an immediate need for competition in commercial satellite launching services. 93 Reagan, however, stood by his commitment to supporting the private space industry. 84

C. State Level Space Policy

Several states in the past five years have realized the profit potential of hosting private commercial space companies. In 2003, California passed the Space Enterprise Development Act, legislation that seeks to encourage and promote space industry within the state. 95 It states in part:

88 Id.
90 Id. at § 70104; 14 C.F.R. §§ 404.11, 411-415.15.
93 See, e.g., Hughes Comm. Galaxy, Inc. v. United States, 998 F.2d 953, 956 (Fed. Cir. 1993); Am. Satellite Co. v. United States, 998 F.2d 950, 951 (Fed. Cir. 1992). See also GOLDMAN, supra note 8, at 8.
94 Cannon, supra note 91.
Subject to the availability of funds appropriated for that purpose, the Business, Transportation and Housing Agency shall implement a space enterprise development program to foster activities that increase the competitiveness of space enterprise in California, including, but not limited to, the commercial use of space, space vehicle launches, space launch infrastructure, manufacturing, applied research, technology development, economic diversification, and business development.  

Additionally, Virginia’s senate recently passed a bill that exempts from state taxation income generated from private space flight and training performed in state.  

[The bill] grants an income tax exemption for income resulting from the sale of launch services to space flight participants or launch services intended to provide individuals the training or experience of a launch, without performing an actual launch. The bill also grants an income tax exemption for any gain recognized as a result of resupply services contracts for delivering payload entered into with the Commercial Orbital Transportation Services division of the National Aeronautics and Space Administration or other space flight entity.

It is too early to say how much business these initiatives will attract, but in a multi-billion dollar industry without terrestrial limitations, a tax incentive could mean huge savings for a company looking to get started. States without the resources and funds to offer tax exemptions can realize space industry potential and act on it in other ways, as discussed in Part VII.

V. LIGHT-YEARS FROM WHERE WE STARTED, BUT A LONG WAY TO GO

Space law is a small subject. The main international treaties, discussed earlier, represent the outer boundaries of the field, and the U.S.’s federal regulations and emerging state government legislation are a subsection. Most books written on the subject are outdated, there are only four space law programs at law schools in North America, and most of those in the legal profession have never come across space law. This is because until recently, space has been a

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96 Id.
98 Id.
99 The law schools that offer space law programs are Nebraska College of Law, University of Mississippi School of Law, George Washington University, and McGill University Institute of Air and Space Law.
relatively slow-growing industry, and the laws already in place have seemed to encompass most new developments. However, given the speed at which the private commercial sector is advancing and the impending regularity of sending civilians into space, the current international laws will soon, if not already, be outdated. The development of outer space is a significant opportunity to learn from the past mistakes of other forms of development. When technology moves at a faster pace than the law, legal issues are resolved in haste, and in some cases the resolutions create even larger gaps. Jurisdiction, privacy, intellectual property, and moral issues are all presenting legal questions to fields such as cyberspace and genetic engineering, two examples of areas in which the law is currently trying to catch up to technology, often resulting in split holdings among the circuit courts or inequitable outcomes. Some small gaps in space law such as jurisdiction, property rights, resource distribution, and environmental protection might very well become gaping holes if they are not bridged before the laws are needed.

A. Current Government Activity

Currently, five countries have nationally funded space programs that are actively supporting manned and unmanned explorative missions to outer space: the U.S., India, Japan, Russia, and China. However, thirty-eight other countries have space agencies that deal with satellites, remote sensing, or other space-related technology. For example, NASA will work on software that controls the environment of the International Space Station, but it can contract some of the research and development to Portugal’s Space Agency, which cannot independently support missions to space, but can partner with other countries in their missions and benefit from developments created therein.

Of the five actively launching space agencies, China has most recently made headlines with its rapidly advancing space programs. China plans to

101 STINE, supra note 1, at 6.
cooperate with Russia in launching a satellite to orbit Mars by 2009, and to launch its own permanent lunar base by 2020. China's activities are probably a factor in the Bush administration's revitalization of the U.S. space program and commitment to send another manned space shuttle to the moon. This brief reawakening was met with lukewarm response and questionable follow-through. Without the immediacy of a Cold War enemy threatening our country on the world stage, the public and the government seem to have grown apathetic to what seems like spending a lot of money to repeat feats that were accomplished forty years ago.

NASA's 2005 Authorization Act included plans for human and robotic programs to explore the solar system, human presence on the moon by 2020, the development of technologies, and promoting international cooperation. International cooperation may be the most important goal, because a communist country being the first to make a significant technological leap, such as a permanent human presence on the moon or manned missions to Mars, may lead to another "Sputnik moment," with the corresponding panic and escalation in geopolitical tension. However, without proper funding and support, NASA can do little alone to accomplish its goals of sustaining the U.S.'s wavering position in the global stage of space innovation.

Aside from technological superiority, space program advances have clear economic and business implications as well. NASA Administrator Mi-

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105 STINE, supra note 1, at 7.
106 See Press Release, President Bush Announces New Vision for Space Exploration Program (Jan. 14, 2004), available at http://www.whitehouse.gov/news/releases/2004/01/20040114-1.html. Goals of Bush's renewed space initiative include returning the Space Shuttle to flight, sending a robotic orbiter and lander on the moon, sending a manned mission to the moon, and promoting international and commercial participation in space exploration. Id. While NASA has yet to confirm dates for these activities, they are engaged in testing new moon rovers and related technology. See generally NASA, http://www.nasa.gov.
107 See Dennis Overbye, One Giant Leap, Followed by Decades of Baby Steps, N.Y. TIMES, Sept. 25, 2007, at F7 ("I can think of many much worse ways than space exploration to put my tax dollars to work, but the space dream has been dead for me since the early 1980s . . . ."); Joel Achenbach, Here's Looking at You, Universe, WASH. POST, May, 13, 2007 at B01 ("[i]t remains to be seen whether the public really wants to pay for astronauts to land on the moon [again]."); Rupert Cornwell, Is NASA's Trillion-Dollar Space Mission Worth the Money?: The big question, THE INDEPENDENT, Dec. 6, 2006, at 34.
109 See STINE, supra note 1, at 4 (A "Sputnik moment" is "a rapid national response that quickly mobilizes major policy change as opposed to a response of inaction or incremental policy change."). See also Guy Gugliotta, New Challengers Emerge, Threatening to Take the Lead, NY TIMES, Sept. 25, 2007, at F11.
110 Marc Kaufman, Two Bills Aim for the Skies: Measures Focus on U.S. Ability to Go to Space Station, WASH. Post, Sept. 27, 2008, at A2. After 2010, when the International Space Station will be mostly complete, the space shuttle will be grounded and NASA will have no spacecraft to send astronauts into space. Id. Congress is considering whether to allow NASA to purchase space technology from Russia and other space powers, which will keep the space program afloat, but necessarily tie our government to "'unfriendly' countries with nuclear programs." Id.

Id.

Id.


Outer Space Treaty, supra note 5, at art. II.

that "[t]he activities of non-governmental entities in outer space . . . shall require authorization and continuing supervision by the appropriate State Party to the Treaty." That seems to say any non-governmental or private space activity must proceed only with state authorization and regulation, so that it is a kind of subsidiary of the state and is subject to all relevant treaty provisions to which the state is subject.

The Moon Treaty has termed space as the "common heritage of mankind." Also, it suggests the establishment of an international regime to equitably manage exploitation of space resources, a concept the Outer Space Treaty avoids. As discussed above, the Moon Treaty transforms the understood "freedom of use" into "an obligation to share the benefits of the use of this freedom." This change was predictably much less popular among the free enterprise supporting space powers.

An important point to be gleaned from the Moon Treaty is that its use of the phrase "common heritage" seems to disclaim any implication of the phrase in the Outer Space Treaty, which uses only the term, "province of mankind," applying only to the "exploration and use" of space as opposed to physical territory. Despite the fact that "common heritage" is used in one, relatively unpopular treaty, one can legitimately argue that it is a general principle that space is the common heritage of mankind and subject to the applicable limitations. That outer space's resources should be subject to equitable distribution was an idea espoused by scholars and policy makers before the Outer Space Treaty was ratified. Indeed, space law scholar and International Court of Justice judge Manfred Lachs, in an article about the intersection of law and technology, commented that the "common heritage of mankind" is a legal institution, which is
bolstered by its inclusion in the 1982 Law of the Sea Convention. He further states, "No more is the concept of exclusive rights of individual states to be applicable to areas deemed part of the common heritage." The lack of an adequate legal definition of either phrase is a significant problem in space law because it prevents all actors from knowing their rights and obligations under the space treaties.

C. International Cooperation: The International Telecommunications Union and the International Space Station

One of the most important and progressive battlegrounds for developing countries asserting rights to outer space resources is also the most utilized and established international organization governing outer space activity: the International Telecommunications Union ("ITU"). Recall that the space industry is more than a $250 billion industry. The ITU regulates the commercial sector of satellites and telecommunications, which contributes to over half of the global revenues generated from space. The ITU is a United Nations Agency set up in 1865 to standardize international telecommunications. Today, it is responsible for allocating orbit plots to nations and private companies for hosting satellites, and it actively confronts the principle of equitable access to space resources. For example, Intelsat is the world's largest telecommunications service, providing services like broadband and high definition television with 53 satellites in orbit, and all are registered and authorized by the ITU. Interestingly, and possibly to bypass the "no national appropriation" clause of the Outer Space Treaty, the World Administrative Radio Conference, which registers radio frequencies with the ITU, states that an entity has no "permanent priority" over its slot registration. The slot registration is equivalent to an orbital plot or "parking space" for a satellite.

In 1982, the ITU declared the geostationary orbit ("GSO") to be a limited resource that should be divided equally and equitably among all coun-

125 Id.
126 GOLDMAN, supra note 8, at 33.
127 See SPACE REPORT, supra note 1.
128 GOLDMAN, supra note 8, at 33; see also STINE, supra note 1.
129 Thompson, supra note 123, at 283.
130 See Chun Hung Lin, The International Telecommunication Union and the Republic of China (Taiwan): Prospect of Taiwan's Participation, 10 ANN. SURV. INT'L & COMP. L. 133, 136-37 (2004) (This article also contains a comprehensive breakdown of the structure and functions of the ITU.).
132 GOLDMAN, supra note 8 at 34. See also Milton L. Smith, Current Development: The Space WARC Concludes, 83 A.J.I.L. 596 (1989).
tries. The GSO is an orbit that circles the earth’s equator approximately 35,786 kilometers above the surface. The GSO is ideal for satellites because objects launched into the GSO remain stationary above a single point on the equator. As a result, “geostationary satellites can communicate with approximately one third of the planet, an entire country, or if in conjunction with a satellite network, the entire globe.” To avoid crowding, satellites that are no longer in service are either propelled out of orbit by their last bit of fuel, or just allowed to drift out of orbit once the fuel that keeps them in place has expired. Both situations create unused satellite pieces floating in space, referred to as “space debris.” Space debris is a serious environmental concern and will be discussed further below.

The ITU’s allocation of satellite plots raises interesting questions of how space is divided into property and what rights the sponsor has to its plots. Are the ITU and its members violating the Outer Space Treaty’s “no national appropriation” clause? Are they violating principles of space being the province of mankind and accessible to all by assigning plots of space and thus limiting accessibility? Part VI discusses these issues in terms of treaty interpretation and the ITU’s debatable adherence to treaty provisions.

Recent actions concerning accessibility to the GSO have made questions about the ITU’s compliance with the Outer Space Treaty more difficult to answer. In 1988, the small pacific island monarchy of Tonga applied, as a country, to the ITU for sixteen satellite plots. Tonga followed the internationally agreed-upon process squarely and two years later the ITU granted Tonga six plots. Tonga, with its population of under 120,000, had no actual satellite capabilities of its own and proceeded to open the market, making deals with several telecommunications companies worldwide to rent some of its coveted plots for a relatively decent fee. In the telecommunications industry, Tonga’s

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133 1973 ITU Convention, art. 33; WASSERBERGH, supra note 121, at 32.
134 Thompson, supra note 123, at 283.
135 Id.
136 Id.
137 Adriand Copiz, Scarcity in Space: The International Regulation of Satellites, 10 COMMLAW CONSPECTUS 207, 211 (2002).
140 Id.
142 Thompson, supra note 123 at 281-82 (Tonga auctioned slots to Unicom, Intelsat, Rimsat and Panamsat for $2 million per year.).
actions are called "warehousing" the spectrum resource.\textsuperscript{143} The space-faring community was taken a"ack that the process it designed was being used against it for a commercial profit, and now more than ever encroaching on the Outer Space Treaty limits of non-appropriation.\textsuperscript{144} The more influential members of the ITU are currently trying to figure out a way to prevent actions like Tonga's,\textsuperscript{145} but Tonga is a model, and quite possibly a prognosticator, for developing countries finding other ways to forge access to the "universally accessible" outer space.\textsuperscript{146} This issue will become more complicated as it becomes easier to pay private nongovernmental companies to provide the access without necessitating a comprehensive national space program.

The International Space Station (ISS) serves as a model of the anticipated continued and increased human presence in space. The ISS stays in a low earth orbit at about 240 miles above earth.\textsuperscript{147} Its assembly began in 1998 by a cooperation of countries aiming to "enhance the scientific, technological, and commercial use of outer space" and it will reenter into the Pacific Ocean once the hardware ages to a point where it becomes unsafe to continue to operate, probably within the next ten years.\textsuperscript{148} Despite the unresolved legal issues the Space Station presents, the ISS is an optimistic foundation for continued cooperation between countries in space exploration, use, and discovery. Michael Griffin stated in a lecture on November 16, 2006, "I believe that the most important legacy of the ISS endeavor will one day be seen to have been the partnership itself."\textsuperscript{149} Hopefully, the ISS will serve as a successful model for future cooperation among countries in space activity.

Countries that utilize the station work in partnerships, but it is unclear which countries' laws apply to the research and development activities onboard the station. For instance, the Agreement Concerning Cooperation on the Civil International Space Station suggests that when something is invented on the ISS, the country that built the module in which the invention was made has ju-

\textsuperscript{143} \textit{Id.} at 282.


\textsuperscript{145} See ITU Newslog, Feb. 4, 2008, available at http://www.itu.int/ITU-T/newslog/default,date,2008-02-04.aspx (A global symposium will be held on Oct. 20, 2008. "It will see leading figures in the telecom/ICT field, both from government and the industry, give their vision of the future, and suggest ways of increasing the involvement of developing countries . . . .")

\textsuperscript{146} See Wilson, \textit{supra} note 138, at 4 ("The Isle of Man is even trying to blast into the space industry, which might seem improbable for an island of 80,000 people.").

\textsuperscript{147} Manzione, \textit{supra} note 144, at 511.


\textsuperscript{149} Griffin, \textit{supra} note 148.
risdiction over the patent process.\textsuperscript{150} This suggestion gets complicated when more than one country has contributed to the module, or when an invention is made outside of the station, for example, on the surface of the moon.\textsuperscript{151}

One area of space law that deserves attention is jurisdiction. For example, criminal jurisdiction on the International Space Station has not completely been agreed upon. If a private company is contracted by a partnership of government space agencies to develop a product for use on the ISS, and the company exhibits criminal negligence, what country has jurisdiction over the company?\textsuperscript{152} The "nationality" of a space entity for jurisdictional purposes is not clearly determinable; it may be where the entity is incorporated, where the principle place of business is located, or the territory from which the space activity is launched.\textsuperscript{153} The complexities multiply when nations work in partnerships and space agencies cooperate, as they should be encouraged to do in order to maximize innovation.\textsuperscript{154}

These issues and others will become very relevant, if not on the ISS, then when countries begin to implement lunar colonies, as China and the U.S. plan to do.\textsuperscript{155} It is important to answer the jurisdiction questions before they arise to prepare a consistent and practical legal framework for resolving conflicts relating to space activity, especially with so many private commercial enterprises entering the industry.


\textsuperscript{151} GOLDMAN, supra note 8, at 117 ("The importance of whose law applies becomes imminent because the United States holds that first to invent an item has the right to patent it; most of the world follows the first-to-register rule." (footnote omitted)); Hertzfeld, supra note 4, at 89.

\textsuperscript{152} See WASSENBERGH, supra note 121, at 23. The Outer Space treaty does not explicitly provide for activity by nongovernmental entities and intergovernmental organizations. Id.

\textsuperscript{153} Id. See also Hans P. Sinha, Criminal Jurisdiction on the International Space Station, 30 J. SPACE L. 1, 85 (2004).


Adding to the ambiguity of the legal status of [intergovernmental organizations] is the language of the Outer Space Treaty, which states that 'practical questions arising in connection with activities carried on by international intergovernmental organizations . . . shall be resolved by . . . States Parties . . . either with the appropriate international organization or with one or more States members of that international organization, which are parties to this Treaty.'

D. Commercial Enterprises

Opportunities for making a profit in space have existed as long as there has been a need to launch satellites. However, opportunities are diversifying as researchers are finding that certain crystals grow better in zero gravity environments; that the moon is rich with helium-3, a valuable mineral; that there are good prospects for extracting energy from orbiting solar panels; and that demands for space tourism are gaining popularity.156 These innovations combined with private initiatives present many new legal questions.157

1. NASA's Role in an Increasingly Commercial Space

While NASA's commercial payload launching business is now limited, its relationship with private space enterprises is substantial. In addition to contracting work to other nations' space agencies, NASA hires commercial companies to develop technology that it can use.158 NASA, acting like a risk-free venture capital fund or investor, pays for companies to develop technology to meet its needs.159 The company keeps the intellectual property rights to its technology and the government retains a broad scope of rights to the technology without paying for a license.160 The intuitive consequence of a growing commercial space industry is a decreasing role for NASA; however, as private companies develop launch vehicles, satellites, cameras, and sensors, NASA is able to use technology already in place for its missions and can focus its funds and objectives to those dedicated to the core missions of outer space discovery and development.161

156 GOLDMAN, supra note 8, at 113; Robert C. Bird, Procedural Challenges to Environmental Regulation of Space Debris, 40 AM. BUS. L.J. 635, 642 (2003); Ezra J. Reinstein, Owning Outer Space, 20 NW. J. INT'L. L. & BUS. 59, 60 (1999); REYNOLDS, supra note 24 at 20 ("One of the major United States companies looking into the future of solar energy is Boeing Aerospace, whose aim is to bring the concept closer to engineering reality.").
157 GOLDMAN, supra note 8 at 143.
158 See Commercialization of Space, Commercial Space Launch Amendments Act of 2004, 17 HARV. J. L. & TECH. 619, 623 (2004) ("NASA's industrial partners — most notably Lockheed Martin and Boeing — have multi-billion dollar contracts with the agency and wield tremendous influence over the agency's actions.").
159 Id.
2. Tourism

Perhaps the most promising, and quickly progressing space activity is tourism.\(^{162}\) On September 13, 2007, Google launched the Google Lunar X-Prize, the antecedent to the Ansari Prize, offering a reward of $30 million to the first team to develop a robotic explorer on the moon.\(^{163}\) The Ansari Prize had originally awarded $10 million to the team that first came up with a working, reusable, low-cost spacecraft.\(^{164}\) SpaceShipOne, a craft developed by Scaled Composites and associated with Richard Branson of Virgin Galactic won the Ansari Prize,\(^{165}\) but several other contenders created functional spacecraft and are still developing space tourism programs.\(^{166}\)

The Google X-Prize foundation, aside from accelerating the private space race, is an interesting commentary on global development of technology because it is an example of the private sector addressing development needs before the government can. However, this event is not unique; the U.S. has seen the private sphere surpass government development in several areas of technology that have changed the world.\(^{167}\) It is natural that those with the highest possibility of return (the private sector participating in the X-Prize) would be more efficient and effective sources of space development, especially since the government arm of space activity cannot take a large part in commercial endeavors. NASA is unprepared to take on the administration of the growing commercial industry.

As a government agency, NASA is poorly suited to manage and promote innovative commercial opportunities in space. Though

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\(^{167}\) See Ansari X-Prize: A Brief History and Background, NASA, http://history.nasa.gov/x-prize.htm. In 1927, Charles Lindbergh “spurred tremendous growth in the aviation industry” when he became the first pilot to fly non-stop from New York to Paris, winning the privately funded Orteig Prize, on which the X-Prize Foundation is based. Id. See also John Schwartz, New Horizons Beckon, Inspiring Vision if Not Certainty, N.Y. TIMES, Sept. 25, 2007, at F8 (discussing a similar progression of personal computing and the internet where the government financed early technologies, but ultimately commercial enterprises created the successful modern infrastructure).
NASA's subject matter is perhaps more lofty than that of the typical government agency, it is nonetheless a federal administrative agency and therefore susceptible to many of the problems faced by government bureaucracies.\textsuperscript{168}

This quote exemplifies the unconcealed layers of government bureaucracy that make private development faster and more efficient than government efforts.

As the participants of the Ansari Prize must have decided, the possible financial return on space tourism outweighs its legal risks and obstructions, such as liability and complying with multiple agencies' regulations. At $150,000 to several million dollars per customer, companies offering seats on near-orbit or space flights are worthwhile investments.\textsuperscript{169} The next twenty years will see that price tag drop dramatically into a range within reason to even upper-middle class space fanatics, as well as hotels and varieties of tour packages, thanks to vigorous engineering and innovation funded by private financiers who spot an irresistible challenge to cash-in early on a promising industry.\textsuperscript{170}

Right now, there is no cohesive U.S. governmental regulatory authority for space activity. Launch activity must be licensed and registered with the Department of Transportation; the flight crew and air space travel must be cleared by the Federal Aviation Administration; and the Federal Communications Commission regulates satellites in orbit and negotiates international space policy.\textsuperscript{171} Additionally, the Department of State handles registration of satellite and satellite part exports under the International Traffic in Arms Regulation (ITAR).\textsuperscript{172} A reaction to the possible sharing of secret information between American and Chinese satellite companies, ITAR is a particularly prohibitive regulation on the exportation of American technology that has resulted in re-

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\textsuperscript{168} Commercialization of Space, Commercial Space Launch Amendments Act of 2004, supra note 158 at 623.

\textsuperscript{169} UNITED NATIONS OFFICE OF OUTER SPACE AFFAIRS, HIGHLIGHTS IN SPACE 2005 8-10 (2006).

\textsuperscript{170} See id.; Starship Enterprise: The Next Generation, supra note 165, at 66; Kim Hart, Riches to Rides; Local Firm Launches Wealthy Thrill-Seekers Into Space, WASH. POST, Apr. 16, 2007, at D01 ("Robert Bigelow, founder of Budget Suites hotel chain, is developing inflatable space stations . . . ."); Jacqui Goddard, From Cyberspace to Outer Space: Entrepreneurs Give NASA a Run for Their Money, THE TIMES, Mar. 22, 2007, at 35 (Bigelow currently has a model of his private space hotel orbiting earth containing cockroaches for passengers. He intends to have a model completed for human guests by 2010. Other entrepreneurs in the space industry include Amazon.com founder Jeff Bezos, author of video games Doom and Quake John Carmak, and founder of an IT firm Jim Benson); Michael Hastings & Allan Madrid, The New Space Race, NEWSWEEK, Sept. 18, 2006 at 0; Nicola Clark, Thousands Signing on as Early Space Tourists; Investors Join Commercial Space Race, THE INT'L HERALD TRIB., Sept. 17, 2007, at 1.


\textsuperscript{172} 22 C.F.R. §§ 120-130 (2006).
duced international business and dependence on American companies, and increased satellite technology in foreign companies.\footnote{Earthbound, The Economist, Aug. 23, 2008, at 66-67 ("[I]n 2007 a survey of around 200 space companies by the Air Force Research Laboratory cited export controls as the highest barrier to foreign markets.").}

### E. Environmental Concerns

Currently, the probability of a collision between space debris and spacecraft or operating satellites in space is low.\footnote{See Bird, supra note 156, at 640.} However, the risk continues to rise, and the damage to space objects as a result of a collision would be detrimental, as space debris can travel as fast as 35,000 kilometers per hour, and a piece the size of a paint chip "could puncture a standard space suit."\footnote{See id. "According to the United States Space Command catalogue, over a span of forty years, spacecraft have deposited nearly 10,000 traceable objects of measurable size into earth's orbit." Id. at 637.} Space debris entering the earth's atmosphere usually burns up before it causes any harm, however there have been instances of damage on the earth's surface from falling space objects. In 1979, America's abandoned space station, Skylab, fell into earth, "raining debris across the Australian Outback."\footnote{Jeffrey Kluger, Spacecraft Falling! Get Set to Duck?, TIME.COM, Jan. 28, 2008, http://www.time.com/time/health/article/0,8599,1707541,00.html.} In 2006, a Russian satellite fell into the atmosphere and nearly hit a passenger plane.\footnote{Id.} In February 2008, the U.S. Navy spent about $30 million to shoot down a derelict spy satellite filled with hazardous gas that was spiraling toward earth.\footnote{Don Lemon, Pentagon Defends Decision to Shoot Down Satellite, CNN NEWSROOM, Feb. 21, 2008; Marc Kaufman and Josh White, Spy Satellite's Downing Shows a New U.S. Weapon Capability, WASH. POST, Feb. 22, 2008, at A3.}

Aside from collision damage, damage to the outer space environment must be considered.\footnote{DIEDERIKS-VERSCHOOR, supra note 35, at 131.} The U.S. has contributed more than its fair share of space debris since the 1950s, however when China launched a missile exploding one of its own satellites in early 2007, the resulting debris immediately accounted for 28% of all space debris.\footnote{Disharmony in the Spheres, THE ECONOMIST, Jan. 19, 2008, at 25-26.} It is unclear whether this type of damage falls under the Liability Convention or how much (if any) responsibility nations have to not produce space debris or to provide for its eradication.

### VI. FUELING THE ASCENT

The current pace of technology is such that innovation is swiftly moving ahead of the law. The current space law regime was created carefully and over
time, however the international community may not have that luxury when private space activity increases and suddenly new legal questions need answers. Laws made in haste frequently do not anticipate all accompanying problems and must be altered as the field grows. Even when the law is crafted as thoughtfully as possible, it is impossible to anticipate issues that will arise forty years from now. For example, the Outer Space Treaty was designed to anticipate and encourage further exploration of outer space. However, it leaves out several explanations of terms and responsibility that are becoming more relevant and will undoubtedly become imminent with the development of technology. "The legal system for outer space is today also closely linked with human rights: the freedom to seek, receive and impart information 'regardless of frontiers, through any medium[,]"' and forthcoming space policies need to reflect these considerations.¹⁸¹ It is essential that international and domestic space law advance with the principles of cooperation and equity remaining at the height of importance.

A. Cooperation

Like the Law of the Sea Convention, the U.N. should implement preemptive means for dispute settlement for conflicts in outer space. Great strides in human development have been made through international cooperation. The World Health Organization is an example of effective cooperation that has distributed pharmaceutical supplies and immunized third world citizens, eliminating smallpox and controlling many other fatal diseases.¹⁸² The Universal Postal Union, the International Union of Railways, the International Civil Aviation Organization, and the ITU are further demonstrations of enhancing the benefits of a technological development worldwide through international cooperation.¹⁸³ Policies need to be put in place now by both the U.N. and the U.S. government to ensure peaceful resolutions of international conflict in space. One scholar has suggested using alternative dispute resolution (ADR) to resolve space conflicts such as space-related torts, intellectual property, or negligence actions, to minimize the enmity of litigation and encourage adherence to legal decisions.¹⁸⁴ Applying ADR, such as arbitration, to conflicts between private individuals will encourage cooperation and provide a quicker, more efficient and less expensive way to resolve disputes.¹⁸⁵ Such preemptive policy ideas deserve international consideration.

¹⁸¹ Manfred Lachs, *Views From the Bench: Thoughts on Science, Technology and World Law*, 86 AM. J. INT'L. L. 673, 689.
¹⁸² Id. at 681.
¹⁸³ Id. at 684.
¹⁸⁵ Id. at 466-70.
B. Equity

Major spacefaring countries must agree to two things before the private space industry continues to expand: a formal definition of property rights in space that encompasses the orbit spectrum resource, land on the moon, and any resources obtained from space; and a delineation of responsibilities to share resources and/or benefits, be they scientific or other, with non-spacefaring countries. More specifically, there is a need for a law on appropriation of space that accounts for current activity. The rights to satellite plots need to be defined and described. The treaties and international agreements need to provide a discourse on accessibility for developing countries. If the extent of “the province of mankind” is that space is truly accessible to all, then international agreements cannot ignore the fact that developing countries cannot afford access, nor can they penalize countries like Tonga for creating access commercially. If many other small or developing countries follow Tonga’s example, the ITU will be overloaded with registration requests and will have to develop a systematic gatekeeping function to determine the legitimacy and viability of each request. If many countries without satellite capabilities hold rights to satellite plots to trade with other countries, the ITU regime will be undermined in favor of an open market that neither abides by the international space treaties nor distributes the geostationary orbit resource equitably.

Along the same lines as equal access, the international community must commit to an agreement of a definition of “the common interest of mankind” that applies to governments and private enterprises alike before space resources begin to be exploited to a wider commercial degree. This requires that interested parties determine a just and equitable distribution of resources obtained to non-space faring and developing countries. This could be translated to a distribution of monetary or tangible resources, or a sharing of technology and certain scientific discoveries. The proposed agreement, possibly in the form of a protocol that stems from the current space treaties, should define access rights and should also provide for specific property rights of private companies to the territory on which their activity is based in space. Property rights in space do not have to be completely inclusive or exclusive—“all or nothing.” National Center for Remote Sensing, Air, and Space Law Director and law professor Joanne Gabrynowicz has noted that there are several options for delineating property rights, “[T]errestrial law has scores of mechanisms that allow development without fee simple ownership of land: ports of authority; condominiums; cooperatives; separating land rights from resource rights. These are all available models that could succeed [in space] with the political will to do so.”

186 See supra notes 139-46 and accompanying text.

Agreeing to equitable property rights and resource distribution in space would be in furtherance of the 1996 U.N. General Assembly Resolution, the Declaration on International Cooperation on the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries, which states in part:

All States, particularly those with relevant space capabilities and with programmes for the exploration and use of outer space, should contribute to promoting and fostering international cooperation on an equitable and mutually acceptable basis. In this context, particular attention should be given to the benefit and the interests of developing countries and countries with incipient space programmes stemming from such international cooperation conducted with countries with more advanced space capabilities.

The proposed agreement, or protocol, would accomplish several goals internationally and within nations. First, a commitment to equitable distribution of resources would conform to the Outer Space Treaty and clarify the definition of a principle applicable in a large area of international law. Also, if private commercial companies wishing to devote capital to exploitation of outer space resources know exactly how to comply with the “common interest” provision of the Outer Space Treaty, they may proceed in research and development with confidence and full understanding of their international obligations and without the uncertainty of how their property and assets may be divided later. Indeed, for the expansion and success of the space economy, “private entities and investors . . . will need to see predictable, transparent and flexible international and domestic legal frameworks within which they may operate their businesses and protect their investments.”

This must be done by way of clarifying vague language in existing treaties and providing a definite regulatory scheme for conducting exploitive business in outer space.

If a new space law agreement were to define and require a distribution of resources, one might argue that private research and development would stall if the commercial space industry were forced to contribute a definitive percent-
age of wealth or technology. However, if the profit of private enterprises were to depend on capitalizing on space ventures even after complying with principles of international equity, technology would prevail and much greater advances would be made in terms of cheaper fuel, reusable vehicles, and efficiency. Deciding what exactly is owed to developing or non-spacefaring countries does not necessarily mean making private space companies hand over a percentage of their profits to countries that cannot afford to be involved in space activities. Profit-generating private companies should be given the choice of fulfilling their defined international obligation by sharing technology, as mentioned above, or by contracting partnerships with developing countries, or even through contributions to developing space programs. If these requirements are in place before private industry expands further, future commercial space activity will benefit the common interest of humankind, and the emerging technology will conform to a more diverse market. This establishment of the “common heritage” will not stall the development of technology. Indeed, what does stall progress is the lack of clarity in space explorers’ property rights and distribution obligations under current international law.

C. Liability and Responsibility

In terms of liability, there needs to be a fairer and more inclusive international agreement on liability for damage, greater domestic protections, and more incentives for private enterprises to develop space industry technology. Currently, under the Liability Convention, the launching country is absolutely liable for damage caused by the space activity. The Outer Space Treaty provides that the nation that authorizes or licenses the activity or registers the space object has jurisdiction over the object and is responsible for the activity. Liability for damage by space objects differs from responsibility in that, “the launching State is responsible for launching but not internationally responsible for the conduct of the space object(s) launched by it, when in outer space, unless it concerns a ‘national activity’ of the launching State.” The liability structure should be reformatted to require proportional assignment of liability and authorization, and to take into account privately contracted companies that may

191 See, e.g., Reinstein, supra note 156, at 68 (If the Outer Space Treaty is interpreted to require wealth redistribution, “[s]uch a system would likely devastate the development of outer space.”).


193 Liability Convention, supra note 5, at art. II; WASSERBERGH, supra note 121 at 25-29.

194 Outer Space Treaty, supra note 5, at art. VI.

195 WASSERBERGH, supra note 121, at 30.
have little to do with the launching state, or even the state in which they are incorporated, but contribute to a damaging space object.\footnote{See id. at 29.}

\textbf{D. Environmental Protection}

The risks of outer space technology include physical damage to territory not bordering the responsible state, much like the risks of nuclear energy, in that a meltdown creates detrimental environment problems miles from where the accident originated.\footnote{Lachs, supra note 181, at 693-694.} There is a “need for adequate protection against transborder pollution, whatever its source.”\footnote{Id.} The Stockholm Declaration of 1972\footnote{Report of the United Nations Conference on the Human Environment at 3, U.N. Doc. A/Conf. 48/14, reprinted in 11 I.L.M 1416 (1972).} charges national governments with bearing “the greatest burden for large-scale environmental policy and action within their jurisdiction.”\footnote{Id. at 3.} The space industry, as an “emerging economy,” is an ideal place to implement environmental regulations from its inception and set international standards in preserving outer space. The Liability Convention casts a wide net of responsibility over countries responsible for damage to space objects, but international and domestic space law need to make environmental considerations a norm in creating new policy.

Before space debris seriously endangers space activity, the space law regime should take two steps.\footnote{See Bird supra note 156 at 635-40 ("Space Debris is a significant hazard facing the expansion of space activities. Space debris is no mere floating junk—a two-inch fragment can travel faster than ten kilometers a second and strike with the force of a steel safe dropped from a ten-story window.").} First, the U.S. should implement space object regulations that prevent creation of space debris, and require government and private launch initiatives to provide for means of removing defunct space objects from orbit.\footnote{See id.} Second, the international community should agree to countries, in addition to being liable for damage caused by their space objects, being responsible for the removal of defunct objects or fragments of broken objects even if they have not caused any damage. The COPUOS has considered debris removal programs such as using earth-bound sensors and lasers to “nudge” debris into the earth’s atmosphere causing it to incinerate, attaching “tethers,” or using small satellites to de-orbit debris into the earth’s atmosphere.\footnote{Id. at 644}
The U.S. should initiate a single interagency regulatory organization to govern all space activity. This agency would be responsible for promoting outer space environmental policy, issuing the proper licenses for private space activity, keeping track of all objects and spacecraft launched from the U.S., processing ITAR clearance, and cooperating with the international space organizations. Currently, as explained earlier in this Note, space objects must be registered with the Department of State, NASA must regulate certain space activities, the Department of Transportation must issue launching and reentry licenses, the FAA must issue clearance licenses and guidelines for flight crews, and the FCC must negotiate international policy.\footnote{See Commercial Space Launch Act, 49 U.S.C. § 70101(b)(3); Human Space Flight Requirements for Crew and Flight Participation, 70 Fed. Reg. 77, 262 (Dec. 29, 2005); Goldman, supra note 8, at 32, 159 (FCC); 168 (FAA).} A single interagency organization that deals with domestic and international regulatory and policy issues in space activity would minimize the bureaucracy involved in getting launch organizations off the ground; limit the forced and resource-consuming obligations in existing agencies; encourage and make it easier for smaller companies to become active in the space industry, and would result in clearer, more cohesive domestic and international space policy.\footnote{See Goldman, supra note 8, at 132, ("NASA is an R & D agency that has been thrust into the roles of operations and regulations.").}

Federal and state governments in the U.S. should enhance space policy to promote the private commercial space industry and lead the world in space technology. Barriers to the industry like export and insurance regulations need to be adjusted. The restrictions of ITAR should be narrowed to apply only to critical technology affecting national security, and the current government attempts to lower insurance burdens can be strengthened.

For example, the Liability Convention can hold launching states liable for damage caused by private companies; hence, states require companies to purchase liability insurance before they will license a launching vehicle.\footnote{Liability Convention, supra note 5; Wasserbergh, supra note 121, at 24. ("[T]he launching State . . . will often subrogate the claiming State to (re)claim the compensation for damages from the private enterprise, for whose activities the launching State is liable.".)} Section 70112 of Title 49 of the U.S. Code requires companies in the commercial space industry to purchase insurance for coverage up to $500 million.\footnote{49 U.S.C. § 70112(a)(3)(a)(i) (2006).} The statute states that the government will indemnify companies up to $1.5 billion over the insurance coverage.\footnote{49 U.S.C. § 70113(a)(1)(b) (2006).} This offer by the government was designed to lower some of the hurdles to the space industry and promote entrepreneurial behavior, but it would be more effective if the government lowered the initial coverage amount or contributed to the insurance payments because the high cost
of insurance excludes a large innovative class of entrepreneurs from private development of space tourism, industry, or satellite launching. If private companies did not have to bear the entirety of the insurance or risk of space activity, more companies would enter the industry and create partnerships and the results would manifest in job creation and the business economy. Specifically, while a small landlocked state like West Virginia may not have the facilities to launch a spacecraft, like Virginia or Florida, an increase in research partnerships in private industry space development could enhance West Virginia’s ability to benefit and compete in the space industry.

On November 19, 2007, West Virginia Governor Joe Manchin III addressed an entrepreneurship policy forum in Charleston, West Virginia and confirmed his commitment to cultivating and advancing business in West Virginia. Thanks to nearly half a century of government spending appropriations championed by West Virginia Senator Robert C. Byrd, West Virginia hosts several job-creating projects funded by federal agencies including the U.S. Navy, the FBI, and NASA.

One such project is the NASA facility in Fairmont, West Virginia, which primarily runs tests on software to be used in NASA operations. It is unsurprisingly one of the only recognizable outer space technology institutions in West Virginia. In fact, the federally funded NASA space grant consortia provided in every state are probably close to the only publicly recognizable space technology institutions in most states in the country.

In West Virginia, the NASA foundation has a landlord-tenant relationship with West Virginia University and occasionally employs computer science interns from the University. If the state government offered commercial com-

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209 Wasserbergh, supra note 121, at 30.
213 Although less visible, several businesses with space technology branches exist in West Virginia. Thanks largely to the efforts of Congressman Alan Mollohan and Senator Robert C. Byrd, West Virginia is home to the I-79 Technology Park, which hosts offices of major aerospace companies like Lockheed Martin, Northrop Grumman, and Pratt & Whitney, who all have significant connections to outer space innovation and technology.
panies a similar partnership with the university in terms of facility and research, that would not only be a tremendous business investment for the state, but also a cutting edge research branch for the university.

West Virginia University recently partnered with the Federal Bureau of Investigation to become the national leader in FBI biometrics research. West Virginia lawmakers should use that as an example to pursue an expanded relationship with NASA. NASA already sponsors a grant for students to study outer space in West Virginia. The West Virginia Legislature and Governor should also set up a research grant in which they contribute funds specifically for research in outer space development and innovations, to attract more graduate students who will perform research in this area.

Further, legislation similar to Virginia’s or California’s that provide tax incentives and encouragement to the space industry would make these graduate students inclined to remain in West Virginia to start research and development firms relating to space technology. These legislative acts are not only in line with West Virginia’s business attracting policies, but if done soon enough will carve out a unique niche for the state that will build connection between West Virginia and a cutting-edge industry. If the state is open to it, West Virginia will be linked in association with essential facilities and brainpower to house a successful space enterprise. Without launch facilities, West Virginia and other non-coastal states may not be the sites of direct launch activity, but creating policies that attract researchers and promote private space business with incentives is a practical way to take part in this emerging global economy.

VIII. CONCLUSION

The actual age of space activity began fifty years ago and has progressed dramatically since. The possibilities of exploiting space resources are more numerous and real than they have ever been. There is still an element of the fantastic to space exploration, as there has been with any exploration of a previously undiscovered frontier. Space activity innovations should be met with excitement and encouragement, but also with extreme caution, as the capacity for conflict is high and the stakes are even higher. The world cannot afford to wait until there is an irresolvable dispute in space that results in the destruction, or even prorogation of useful space technology.

In the North Sea Cases, one of the most successful resolutions of an international conflict in modern history, the International Court of Justice was asked to resolve a territory dispute between Denmark, Germany and the Nether-


217 See NASA West Virginia Space Grant Consortium website, supra note 214.

218 North Sea Continental Shelf Cases, 1969 I.C.J. 3 (Feb. 20).
lands. In the opinion, Judge Lachs advised, "[T]he great acceleration of social and economic change, combined with that of science and technology, have confronted law with a serious challenge: one it must meet, lest it lag even farther behind events than it has been wont to do."

If steps are taken now to prepare for future legal questions and the following enforcement, then alliances and partnerships between countries will ensure that the resources in space may be used in the most profitable, fair, and efficient way possible.

Gabriele Wohl**

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219 Id.

220 Id. at 230.

** Editor-in-Chief, Volume 111, WEST VIRGINIA LAW REVIEW. J.D. Candidate, West Virginia University College of Law, 2009; Bachelor of Arts in Political Science, Wellesley College, 2004. I sincerely thank West Virginia College of Law Professor andre douglas pond cummings and National Center for Remote Sensing, Air, and Space Law Director Joanne Irene Gabrynowicz for their insightful comments and guidance. I also thank Dan Lattanzi for his support and patience; Matt Lockhart for administrative support and deadline-management; and Ryan Simonton, Andrea Johnson, Joseph Cramer and Kala Ours for technical editing. Finally, for their constant encouragement and enthusiasm, I thank my parents David Wohl and Diana Bowman, my stepparents Sherry Simmers and Mike Howard, my brother Isaac Wohl, and my good friend Danya Goodman who is as bright and inspiring as the sky itself.