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Space Tourism Law: Lessons From Aviation, Antarctica, And The International Space Station

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SPACE TOURISM LAW: LESSONS FROM AVIATION,
ANTARCTICA, AND THE INTERNATIONAL SPACE STATION

by

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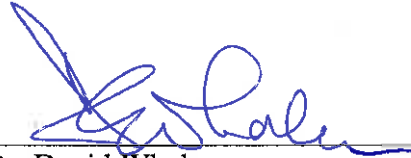
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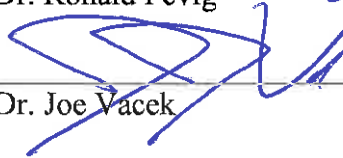
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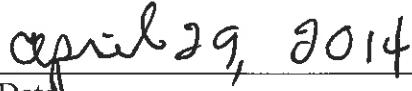


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April 25, 2014

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ABSTRACT

Space tourism has economic, social, and educational benefits, however, unresolved legal issues remain that need to be addressed on state and international levels in order for space tourism to succeed and for these benefits to be realized. Space treaties do not address and federal laws have impeded space tourism efforts. Aviation industry regulations, Antarctic treaties, and International Space Station agreements serve as models to guide the space tourism. In the future, however, the space tourism industry will create its own legal regime based on the technical expertise of its practitioners and the social mores of its participants.

I. INTRODUCTION

Space Tourism

The concept of citizens being able to “tour the heavens” sometime not too far into the 21st century is one that is exciting to millions and may well entice tens of thousands to try. But whether the tourism is in an orbiting hotel, a reusable launch vehicle [RLV] or something more modest such as a ride in balloon above 100,000 feet, one thing is clear, there will be government regulation of these activities. Why and to what extent regulation will be imposed will to a large degree depend on the policy and legal framework for such regulation and the degree and specificity of guidelines that flow from it. While marketeers and manufacturers are pursuing customers and hardware designs, a concomitant effort to ensure that Space Tourism projects do not inadvertently proceed into a regulatory box canyon is essential.

Richard W. Scott,
Policy/Legal Framework for
Space Tourism Regulation
Journal of Space Law, 2000

The total number of international business and leisure tourists is expected to reach 1.8 billion by 2030. In 2012, more than one billion tourists crossed international borders, with more than half reaching their destinations by air (United Nations International Civil Aviation Organization, 2013). Air travel, once reserved primarily for the wealthy, and considered adventurous and risky, is now routine. In the future, many of these travelers will be space tourists, who have chosen to participate in activities that may combine space flight and visits to space hotels or lunar sites, air transportation and travel among international destinations, and Antarctic cruises.

Space tourism has been defined as “any commercial activity offering customers direct or indirect experience with space travel” and a space tourist as “someone who tours or travels into, to, or through space or to a celestial body for pleasure and/or recreation” (Masson-Zwaan and Freeland, 2010). Space tourism will provide opportunities for new and existing corporations to offer unique terrestrial experiences, such as flight training, virtual reality facilities, and space theme parks (Pitts, 2011), and others that cannot be attained on our planet (Goehlich et al., 2013).

Only a few hundred humans have traveled into space. Most were astronauts and cosmonauts in government sanctioned space programs. In 2001, however, Dennis Tito became the first paying space tourist, after he reportedly paid \$20 million to train in Russia for his flight to the International Space Station (ISS) (Spennemann, 2004). Tito was followed by Mark Shuttleworth, Greg Olsen, Anousheh Ansari, Richard Garriott and Charles Simonyi, who also traveled to the ISS, via the Russian Space Agency (RSA) flights (Cater, 2010).

Space tourism operators currently face some of the same risks and regulatory uncertainty as early air carriers, as well as additional challenges. This thesis will review the regulatory and legal environment, discuss how it has evolved, and recommend changes that would promote the growth of the space tourism industry, which reflect that of the aviation industry.

Why Current International Regulations Won't Work

As space tourism costs decrease, the number of space tourists will increase. The international community will need to prepare for future social, environmental, economic, technological, and political situations that will arise as the space tourism industry

expands, and space operators and space flight participants develop their own legal codes for visiting, living, and working in outer space.

Space is no longer a program dominated exclusively by state entities and political rivals in a competition to “get there first” in order to demonstrate national superiority. While governments have concocted obtuse regulations in an attempt to squelch the exchange of technology, private enterprise and ingenious entrepreneurs have found legal means to overcome these restrictions. Many legal issues remain, however, which will best be resolved by space entrepreneurs, rather than the United Nations, NASA, or other space agencies.

Aviation, Antarctica, and the ISS

International space treaties, created during the Cold War and the evolution of the U.S. and Soviet space programs, did not foresee space tourism opportunities; these treaties cannot address unique contractual issues that will arise between the space operator and space tourist, appropriate space-related tourism activities that merit protection and preservation mechanisms, and industry self-regulation in the domains of safety, training, and medicine. Aviation industry regulations, Antarctic treaties and tourism policies, and ISS agreements provide the best guide for addressing these issues.

Suborbital space tourism has often been compared to air transport, which during its early barnstorming days, was undertaken by aviation pioneers, pilots and engineers, who understood aerodynamics and risk. Early aviation was a dangerous activity; space tourism, at least in its early days, will also be risky. This risk will be compounded by transporting inexperienced passengers, with days rather than decades of space flight training. Most passengers will undertake suborbital up-and-down flights, a sophisticated

and expensive form of bungee-jumping (von der Dunk, 2007-2008), but with many more moving parts and explosive propellants. Over its 100 year history, the aviation industry developed rules and regulations that defined the legal relationships and responsibilities of air carriers and passengers; some of these can be used as models to establish the legal relationships between space tourism operators and space tourists.

Antarctica and space are remote environments. Each has been the subject of a series of treaties, sovereignty and jurisdictional issues (Rankin, 2002-2003, Ehrenfreund et al., 2012) designed to maintain international peace, collaborative scientific research relationships, and protected environments (Bastmeijer and van Hengel, 2009), however, Antarctic regulations provide far more guidance to the space tourism industry than space treaties. Evidence indicates that both Antarctica and space harbor mineral resources which may be economically exploitable in the foreseeable future. Lessons learned from the legal efforts to protect and sustain Antarctica's resources can be applied to the laws governing space tourism.

During the 1970s, space journeys turned into long duration stays on orbiting space stations including *Skylab*, *Mir*, and finally, the ISS. The ISS is an example of space cooperation in planning, construction, and implementation, the result of decades of intergovernmental scientific, technical and legal agreements, many of which are related to crew behavior and responsibility. The ISS has been the home of international crews and space tourists, has expanded our knowledge of human ability to work long-term in space, and is currently the best platform from which to advance knowledge of safety, training, and medical issues involved in working in a low gravity environment.

II. JURISDICTION, FORUM SELECTION, AND LIABILITY

Several independent sovereign nations may be entitled to exercise jurisdiction in a given fact situation. As might be expected, this legal situation has led to a great deal of confusion. As a result, there have been efforts to limit the discretion left to states by international law with respect to the exercise of jurisdiction in cases of this sort. These efforts have been made through international conferences and bilateral treaties. For the most part, they have had little effect.

Chester Ward, U.S. Navy Rear Admiral
11th Annual Meeting of the American Rocket Society, 1956 (Doyle, 2002)

There are no international courts with the power to create general international common law, so international law arises through agreements among states. International law can be “public,” defining the relationships among states, or “private,” governing the international relationships between international governments and private citizens or corporations (Sykes, 2007). Space law utilizes both, and space tourism operators must understand the basic legal concepts of jurisdiction, forum selection, and liability applied to their industry.

Jurisdiction

The first 50 years of the space age focused on state and international space activities. Only during the last decade has legislation been enacted which recognizes private commercial space activities, including space tourism. As van Asten (2011) stated, one of the challenges to

a legal framework in outer space modelled on the legal framework as on earth, with scattered jurisdictions based on territoriality and nationality, might not be fit for the conditions in outer space. First of all this might be the case because of the magnitude of space, and the problems relating to controlling potential territories and nationalities. Second, should the same scattering of territorial jurisdictions as we see on earth occur in outer space it will again lead to a serious constraint on jurisdictional efficiency. In short, “new areas of human activity” will create problems.

Jurisdiction, as applied to space tourism, does not reside in a single body of law.

Space law encompasses tort law when applied to consent and liability; contract law in regard to informed consent, launch arrangements and manufacturing; international law in the application of treaties and bilateral agreements; and, civil procedure and conflict of law in regards to jurisdictional issues (Walker, 2007). Space tourism law, as a product of aviation, Antarctic, ISS, and other international laws and treaties, is an interesting balance among these jurisdictional frameworks.

Space law jurisdiction is imperfect, and in some cases, unenforceable. If a space object lacks a launching state, is launched from a state that is not a signatory to the Outer Space Treaty, is launched by a private entity from a private facility located in international waters or on Antarctica, or by a state that has not enacted domestic legislation to restrict its space operators, there may be no violations of international law (Blount, 2007). States would need to rely on diplomatic, political, or economic pressure and innovative solutions to encourage non-cooperative states to exercise jurisdiction over their citizens engaged in the space tourism industry.

Forum Selection

Forum selection clauses or jurisdiction agreements are contractual provisions stipulating that claims arising from a contract or in relation thereto can be presented

before a particular court. Companies use forum selection clauses to limit the risk and the cost of litigation before multiple courts, which may be in different states, and to secure litigation in a favorable legal environment, where the law will probably satisfy their legal positions in case of a contractual dispute. Given that the space tourism industry is young and uses largely experimental technology, it is expected that operators of suborbital space tourism vehicles will use such clauses in their contracts with spaceflight participants (Chatzipanagiotis, 2011).

Liability

The two liability doctrines most relevant to the space tourism industry are fault-based liability or negligence, and strict liability. Negligence doctrine requires that the injured party prove that the defendant in a tort lawsuit is legally responsible for the harm because it failed to meet a legally-defined standard of care owed to the victim, and that its failure was the main or proximate cause of the injury for which the injured party seeks compensation. A space tourism operator may be found liable if it is convincingly shown that it behaved inadequately or erroneously when it designed, tested, made or used its spacecraft and its associated equipment or failed to adequately train its crew, and that this failure was the cause of the claimant's injury (Baram, 2007).

Strict liability requires proving that a company sold a product or process which was unusually or unreasonably dangerous, and that this defective condition was the main or proximate cause of the harm, to purchasers, users, bystanders, or rescuers. Strict liability eliminates the need to prove that a company behaved inadequately or erroneously, and may apply even if the injured party was not the purchaser of the

product. As with negligence, persons with compensable injuries may include bystanders and rescuers in addition to purchasers and users (Baram, 2007).

III. A BRIEF HISTORY OF SPACE LAW

Never before in the history of mankind has the necessity arisen so quickly to state legal parameters in connection with a vast new area of social change. The legal problems presented by the advent of space flight have been climacteric and technology has far outstripped the formulation of legal rules. The gap has widened to the point that the peace of the world is dependent upon our ability to contain the remarkable and precipitous advance of the science and technology of space flight within an effective system of laws.

Andrew Haley
*The Law of Space – Scientific and Technical
Considerations, 1958*

Space law is highly specialized, complex, and unique in its scope and character, when compared to other fields of law. Space law consists of international relations, public international law, private international law, international trade law, communications law, and intellectual property law. Space-related goals and abilities of states varies significantly; some address both public and private interests, while others have been created exclusively by governments with little, if any, input from other interests (Jakhu, 2009).

Various state regulatory models also complicate space law (Jakhu, 2009). The *U.N. Space Law Database* lists space laws and bilateral agreements from Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, France, Germany, Japan, Kazakhstan, Netherlands, Norway, Republic of Korea, Russian Federation, South Africa,

Spain, Sweden, Ukraine, United Kingdom (U.K.), and the U.S. (United Nations Office for Outer Space Affairs, November 1, 2013).

The Early Years

The origins of modern space law began in 1910, with the writings of Belgian lawyer, Emile Laude, who referred to it as “aerial law.” In 1919, Paris was the site of the *International Conference on Aerial Navigation*. At that conference, participants agreed that each state had sovereignty over its airspace (Dula, 1985).

At an air law conference held in Moscow in December, 1926, V.A. Zarzar, a member of the Soviet Aviation Ministry, presented a paper, *Public International Air Law*, on interplanetary flight, which was possibly influenced by the work of Konstantin Ziolkovsky. Zarzar claimed that the use of space by non-Communist countries was imperialistic and provided four reasons justifying state control of flights over state territory: prevention of military reconnaissance; protection from contraband falling on territory that could damage life or property; prevention of hostile action, such as bombing; and protection from unannounced entry into and landings by uninvited aircraft (Doyle, 2002).

In Arthur C. Clarke’s 1946 paper, *The Challenge of the Spaceship*, the author noted that, given advances in technology, humans had no choice but to live peacefully, and avoid using space for destructive purposes. In this paper he also warned that the U.S. could engage in “interplanetary imperialism” in a quest to be the first to reach the Moon. He suggested that the only way to prevent hostile extraterrestrial conflicts were political agreements based on the expertise of organizations involved in space-related issues (Clarke, 1999).

In 1949, British engineer R. A. Smith sent a letter to the *Journal of the British Interplanetary Society* in which he warned against firing missiles at the Moon, pointing out to

the American government and all other governments, that the Moon is not their property, and will not become so by right of bombardment. It is the common heritage of man, possibly, if otherwise untainted, and although there is little we can do at the present to prevent the Americans or others from abusing their present position of technical advantage, they would be stupid to overlook the possibility that militaristic exhibitionism normally evokes unpleasant reactions—ultimately (Doyle, 2002).

The phrase “the common heritage of man” would become the subject of debate over the following decades (Doyle, 2002).

The International Astronautical Federation (IAF), established in 1951, is currently the world’s leading space advocacy organization, with more than 270 members, all key space agencies, companies, societies, associations and institutes of 62 countries. Since its inception, the IAF has played a vital role in the development of space law. It created the first international forum for space lawyers to work in conjunction with space experts (International Astronautical Federation, 2013). American lawyer John Cobb Cooper (1951), International Institute of Air Law, McGill University, also raised the issue of the definition of the upper atmospheric limit of state sovereignty, and the first space flight symposium was held at the Hayden Planetarium, exactly six years before the launch of Sputnik (Doyle, 2002).

Pre-Sputnik

In January, 1956, C. Wilfred Jenks, of the International Labor Organization of Geneva, and Institute of International Law (ILL), published *International Law and Activities of Space*. Jenks suggested that future space flight would require international

cooperation for communication, space flight crew, space rescue regulations, and space commerce. Foreseeing legal issues related to the settlement of the Moon, Jenks also stated that

One can conceive of the United Nations governing extra-mundane settlements, directly or by some special agency created for the purpose. The ideal arrangement would indeed appear to be that sovereignty over unoccupied territory in the moon or other planets or satellites should be regarded as vested exclusively in the United Nations (Doyle, 2002).

Jenks also proposed a list of law topics that would need to be applied to space and that would require attention from society members: jurisdictional issues, personal status, property rights, contract law, tort law, and criminal law (Doyle, 2002).

In April, during the 50th anniversary of the American Society for International Law, Cooper presented *Legal Problems of Upper Space*, remarked that the law had lagged behind technological progress, and that scientists have benefited mankind as a whole in a field where lawyers might have failed (Cooper, 1956). He compared air law of the 1900s to space law of the 1950s, noted that neither the Paris Convention of 1919 nor the Warsaw Convention of 1944 dealt with craft beyond the atmosphere, observed that there was no basis on which to extend international customary law to high altitudes, and concluded that airspace over the seas was “for free use by all” (Doyle, 2002).

P.K. Roy, Director of the Legal Bureau of the International Civil Aviation Organization (ICAO), called into question the definition of airspace, which at that time, was considered to extend to an altitude of about 1,500 miles. Roy believed that

Airspace does not present itself as a very useful criterion for fixing the altitude of state sovereignty any more than the force of gravity helps, because their affects are extensive and they are not precisely delineated (Doyle, 2002).

He also stated that, because of Earth's rotation, the actual space over a state was constantly changing. While this is obvious, its implications had not really been explored by others in the space law field (Doyle, 2002).

International Law Professor Quincy Wright raised questions of international liability for damage as the result of space flight activities, specifically those related to injury to those not directly involved, and to whom such liability would be attributed if states had taken all necessary precautions. He also warned that states should not enact any laws related to space flight which they would be incapable of enforcing (Doyle, 2002). While he was referring specifically to satellite missions and human orbital flights, this point will also prove relevant when humans explore the Moon and beyond, since enforcement at a distance is difficult.

Sputnik

The first and most obvious achievement of the space age was the launch of Sputnik 1 on October 4, 1957. The U.S.S.R prepared an interesting defense in case of objections to the overflight of its little satellite: no violation had occurred, because in reality, Sputnik did not pass over other countries, rather, they passed below it as the Earth rotated; the outer atmosphere, like the open seas, belongs to no one; and that freedom of circulation above 15 or 18 miles should be permitted by international law (Quigg, 1958). After the launch of Sputnik 1, there were no significant protests claiming that the satellite had encroached on sovereign territory. Through their inaction and silence, states acknowledged that the legal character of outer space differed from that of the air space beneath it, and that states had the right to engage in activities in outer space without obtaining prior permission of any other state (Freeland, 2010).

But Sputnik's flight

had a 'Pearl Harbor' effect on American public opinion, creating an illusion of a technological gap and provided the impetus for increased spending for aerospace endeavors, technical and scientific educational programs, and the chartering of new federal agencies to manage air and space research and development (Garber and Launius, 2013).

Even after the first satellite launches by the world's superpowers, the question of airspace versus outer space was still not fully resolved. In 1958, McDougal and Lipson wrote about the interpretations of "airspace" held by legal scholars at the time. A few interpreted its meaning, according to the Chicago Convention, such that sovereignty applying to airspace also was extended to outer space. Their argument was based on French and Spanish versions of previous conventions which, when translated into English, referenced "atmospheric space" rather than "airspace." The counterarguments, appropriately used by other legal scholars, were that at the time those conventions were drafted, no outer space activities existed and there was no need for a definition that distinguished "airspace" from "outer space," and, that vehicles designed to operate in airspace were not capable of doing so in outer space (McDougal and Lipson, 1958).

The Origins of Space Treaties

The International Law Association (ILA) was founded in 1873 for

the study, clarification and development of international law, both public and private, and the furtherance of international understanding and respect for international law (International Law Association, 2013).

Its Space Law Committee (SLC), established in 1958, works closely with other committees to study public and private international law in related to outer space. It cooperates with the International Law Commission (ILC), and the Permanent Court of Arbitration to draft dispute settlement procedures for international space law, as well as

with the governments of industrialized and developing states. The ILA SLC participates in U.N. Committee on the Peaceful Uses of Outer Space (COPUOS) meetings to promote space law education (United Nations General Assembly Committee on the Peaceful Uses of Outer Space Legal Subcommittee, 2010).

On December 12, 1959, the U.N. General Assembly established COPUOS, per Resolution 1472 (XIV), *International Co-operation on the Peaceful Uses*. Its purpose is to review the scope of international cooperation in peaceful uses of outer space, to create related programs to be carried out by the U.N., to encourage continued research and the dissemination of information on outer space matters, and to study legal problems arising from the exploration of outer space. It had 24 members when it was established, but currently has 74 (United Nations Office for Outer Space Affairs, March 28, 2013).

More than 50 years ago, during the 1960 *Second Colloquium on the Law of Outer Space*, the IAF Permanent Legal Committee became the International Institute of Space Law (IISL) (Billings, 2006). This new organization divided itself into several working groups tasked with

- studying questions related to the definitions of airspace and outer space, state jurisdiction in these areas, and the legal status of outer space;
- determining the legal status of rockets, space vehicles, and other man-made instruments designed to return to Earth;
- dealing with the status of celestial bodies other than Earth and researching sovereignty-related issues;
- identifying laws and treaties requiring change and legal space-related questions that had not yet been addressed;
- researching flight regulations, including vehicle registration, preflight inspection, flight traffic rules, notices to airmen, collision avoidance, search and rescue, emergency landings, emigration and immigration, disease prevention, and information dissemination;
- enforcing existing regulations through the ICJ and arbitration;
- planning, allocation and use of the electromagnetic spectrum and the role of the International Telecommunication Union;

- investigating personal rights in space and the potential legal issues of property ownership;
- determining the issues related to injury and a legal regime for insurance;
- deciding whether a treaty modeled on the 1959 Antarctic Treaty was suitable as basis on which to limit the use of outer space to peaceful purposes; and
- defining uses for space artifacts, navigation services, spaceship armaments and nuclear weapons control (Doyle, 2002).

These issues, raised by IISL members, had considerable influence on the work of COPUOS and the 1967 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (Outer Space Treaty) (Doyle, 2002).

In 1961, the U. N. General Assembly, requested that COPUOS

- maintain close contact with governmental and non-governmental organizations concerned with outer space matters;
- provide for the exchange of such information relating to outer space activities as Governments may supply on a voluntary basis, supplementing, but not duplicating, existing technical and scientific exchanges; and
- assist in the study of measures for the promotion of international cooperation in outer space activities (United Nations Office for Outer Space Affairs, 2014).

IV. UNITED NATIONS SPACE TREATIES AND LEGAL PRINCIPLES

Explorations in space will necessitate drastic modification in today's legal principles governing man's relations with man. Science is rapidly outdistancing law in the field of space exploration and travel, and legal scholars must act forthwith if we are to avoid perpetuating the inadequacies of the international law of today in the space law of tomorrow.

Andrew G. Haley
Basic Concepts of Space Law, 1956

Treaties, conventions, agreements, protocols, and exchanges of notes have the same meaning under international law. Since its creation in 1959, COPUOS has created a substantial body of space law in the form of treaties and declarations, but the organization is slow, tedious, and deliberate, and has not addressed space tourism issues. Treaties have a serious weakness; drafting, adoption, and entry into force can take years, decades, or never occur. Those that rely on scientific evidence, technological innovation, or political realities, require negotiators to obtain and assimilate new and uncertain information and may prove to be out-of-date and unenforceable because the circumstances that prompted their creation no longer exist (Viikari, 2005).

U.N. space treaties were created during the Cold War era, when the U.S. and the U.S.S.R. were the dominant space powers. Work on U.N. space resolutions began in 1957, the year of Sputnik, and over three decades, between 1966 and 1996 the U.N. adopted five major space treaties and five major space declarations. When they were

finalized, there was no consideration that humans would engage in widespread commercial space tourism activities (Freeland, 2010).

Outer Space Basic Principles Declaration, 1962

One of the first documents submitted to the COPUOS Legal Subcommittee was a 1962 draft of *Declaration of the Basic Principles Governing the Activities of States Pertaining to the Exploration and Use of Outer Space* (Outer Space Basic Principles Declaration), proposed by the U.S.S.R. This document derived from the controversial ideological issue between the U.S. and the U.S.S.R. concerning the role of private enterprise in outer space. The Soviet view was that only states were entitled to free use and access to outer space in order to prevent chaos caused by private enterprise; the American assessment of space argued that private participation should be encouraged and that space should be as open as the seas (Chatterjee, 2011).

The initial draft was modified and adopted on December 13, 1963, as the first of the five U.N. space declarations, by the General Assembly as *The Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*. It affirmed that “the exploration and use of outer space shall be carried out for the benefit and in the interest of all mankind,” that “outer space and celestial bodies are free for exploration and use by all States on a basis of equality and in accordance with international law,” and that “celestial bodies were not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means” (United Nations Office for Outer Space Affairs, 1963). It made states responsible for space activities by both governmental and non-governmental entities, and required states to

authorize space activities and it established cooperation and mutual assistance as basic tenets of space exploration. Article 8 established liability:

Each State which launches or procures the launching of an object into outer space, and each State from whose territory or facility an object is launched, is internationally liable for damage to a foreign State or to its natural or juridical persons by such object or its component parts on the earth, in air space, or in outer space (United Nations Office for Outer Space Affairs, 1963).

Article 9 described the status of astronauts:

States 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 a foreign State or on the high seas. Astronauts who make such a landing shall be safely and promptly returned to the State of registry of their space vehicle (United Nations Office for Outer Space Affairs, 1963).

Outer Space Treaty, 1966

On December 19, 1966, the U.N. General Assembly agreed to the first of the five space treaties: *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). This is one of the most important and most analyzed space legal documents in existence. To date, there are 102 parties and 26 signatories to the treaty (United Nations Office for Outer Space Affairs, March 28, 2013). Articles I and II provided guiding principles for nearly all future space treaties and declarations:

Article I. The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.

Article II. 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 (United Nations Office for Outer Space Affairs, January 27, 1967).

When states were the only entities capable of space flight, Article II would have been sufficient, however, space tourism operators will soon be placing space hotels in orbit or on the Moon. Article II addresses only national appropriation, and makes no mention of private or individual appropriation of space or celestial bodies.

Article VIII states:

A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return (United Nations Office for Outer Space Affairs, January 27, 1967).

Article VIII does not prevent space tourists from interacting with spacecraft, articles left in space or on the lunar surface, and seems to encourage their return, rather than leaving them where they are located. It also fails to specify a time period under which the articles would need to be returned to their owners (Spennemann, 2004).

Article XII states:

All stations, installations, equipment and space vehicles on the Moon and other celestial bodies shall be open to representatives of other States Parties to the Treaty on a basis of reciprocity. Such representatives shall give reasonable advance notice of a projected visit, in order that appropriate consultations may be held and that maximum precautions may be taken to assure safety and to avoid interference with normal operations in the facility to be visited (United Nations Office for Outer Space Affairs, January 27, 1967).

“Advance notice” of a visit may be a courteous gesture, but carries little weight if the “facility to be visited” is non-functional or uninhabited (Spennemann, 2004), leaving it open to exploitation by space tourists.

For many years the Outer Space Treaty was the only statute governing space exploration by non-state entities. If activities are conducted by non-governmental entities, Article VI requires that the appropriate state must authorize and continuously supervise such activities, but beyond that, the Outer Space Treaty does not define the scope of that supervisory responsibility (Meyer, 2010). Consequently, the granting state becomes legally responsible for the actions of the non-governmental party (Abeyratne, 1998).

This became relevant in 1982, when Space Services, Inc. (SSI) decided to conduct the first commercial space launch. SSI contacted and obtained clearance from several U.S. government agencies, including the State Department, North American Aerospace Defense Command, the U.S. Navy, the Bureau of Alcohol, Tobacco and Firearms, the U.S. Coast Guard, and others. SSI’s decision to contact these organizations was based only on its own opinions, rather than any accepted definitions of responsible state parties, absent in the treaty. Five months later, SSI’s Conestoga I was launched into sub-orbit over the Gulf of Mexico (Scott, 2000).

Article VII established international liability:

Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies (United Nations Office for Outer Space Affairs, January

27, 1967).

As Beckman (1999) observed, this article, and the rest of the treaty, failed to address state liability for its own citizens. This issue would remain unresolved for the next five years.

Several articles acknowledged that space activities would require joint, international participation, cooperation, and protection of the Earth itself, but provided little guidance on how to enforce international cooperation. Article XIII states:

The provisions of this Treaty shall apply to the activities of States Parties to the Treaty in the exploration and use of outer space, including the Moon and other celestial bodies, whether such activities are carried on by a single State Party to the Treaty or jointly with other States, including cases where they are carried on within the framework of international intergovernmental organizations (United Nations Office for Outer Space Affairs, January 27, 1967).

Article V addresses space personnel:

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. When astronauts make such a landing, they shall be safely and promptly returned to the State of registry of their space vehicle. In carrying on activities in outer space and on celestial bodies, the astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties (United Nations Office for Outer Space Affairs, January 27, 1967).

But the 1967 definition of “astronaut” was unambiguous and specific; the advent of orbital and suborbital space tourism flights will require a broader definition of “astronaut.”

Space tourism operators invest millions of dollars in unique spacecraft technology. If a spacecraft were to land off-course, operators would want the spacecraft, its passengers, and its crew returned safely. Loss of a spacecraft and subsequent replacement would be extremely expensive both financially and from a marketing

standpoint. Landing in hostile territory would be far worse, since there is an opportunity for technology theft and resale and reverse engineering. A state that is not a party to the Outer Space Treaty or the Rescue Agreement, both of which require the return of spacecraft, might also consider impounding the spacecraft and holding its crew and passengers as hostages (Freeland, 2005-2006). Third party liability is also of international concern.

Rescue Agreement, 1967

The U.N.'s second space treaty, the *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, General Assembly Resolution 2345 (XXII)* (Rescue Agreement) was proposed on December 19, 1967. There are 92 parties and 24 signatories to the treaty. The Rescue Agreement, “prompted by sentiments of humanity” (United Nations Office for Outer Space Affairs, December 19, 1967) supersedes the Outer Space Treaty.

The changes between the Outer Space Treaty and the Rescue Agreement which are the most relevant to space tourism are the use of the terms “personnel,” “space object,” and “spacecraft,” and the omission of the phrase “envoys of all mankind” from the Rescue Agreement, rather than the use of the terms “astronaut” and “space vehicle” as used in the Outer Space Treaty (Zhao, 2009). Outer Space Treaty language could have resulted in a narrow interpretation of what constitutes space-related personnel, potentially excluding space tourists on orbital or suborbital commercial space flights, however, the lack of any distinction between private and public space flight in the Rescue Agreement supports a broad interpretation, requiring states to rescue non-governmental personnel

and return them, along with private spacecraft, to the state of the launching authority (Sundahl, 2009).

The broader geographic coverage of the Rescue Agreement eliminates the gap that was left by the Outer Space Treaty with respect to landing on celestial bodies or in Antarctica and over the seas (Sundahl, 2009). Article 3 states:

If information is received or it is discovered that the personnel of a spacecraft have alighted on the high seas or in any other place not under the jurisdiction of any State, those Contracting Parties which are in a position to do so shall, if necessary, . . . extend assistance in search and rescue operations for such personnel to assure their speedy rescue (United Nations Office for Outer Space Affairs, December 19, 1967).

Article 4 continues:

If, owing to accident, distress, emergency or unintended landing, the personnel of a spacecraft land in territory under the jurisdiction of a Contracting Party or have been found on the high seas or in any other place not under the jurisdiction of any State, they shall be safely and promptly returned to representatives of the launching authority (United Nations Office for Outer Space Affairs, December 19, 1967).

Sundahl (2009) proposed that the use of the word “alighted” in Article 3, however, makes the duty to rescue contingent on the landing of the spacecraft, excluding any duty to rescue personnel stranded in orbit or elsewhere in outer space. Since most space tourists will be in orbit, this interpretation would prove problematic for stranded space tourists and crews. There is also no agreement on the term “personnel.” French, Spanish, Russian, and Chinese translations of the Rescue Agreement translate “personnel” to “crew,” but the Italian interpretation includes “everyone on board” (Sundahl, 2009), leaving the language open to state interpretation.

The primary motivation for most space tourists will be personal enjoyment. They will not qualify as “envoys of mankind in outer space” (United Nations Office for Outer

Space Affairs, December 19, 1967). Complicating the issue even further is the likelihood that some space tourists will be engaged in activities, such as photography, educational activities, or scientific experiments that could certainly benefit humanity. In case of an accident, it seems unlikely that rescuers will interrogate passengers about the purpose of their trip and save only those with press passes, teaching credentials, or university IDs, but the smart space tourist should know what the probability of rescue is before launching.

In 2007, Sheikh Muszaphar Shukor launched with *Expedition 16* and landed with *Expedition 15* after a 10 day stay on the ISS. Shukor, an orthopedic surgeon, was the first Malaysian in space when he was selected as one of two astronauts to be trained at Star City in Russia and the first astronaut in Malaysia's Angkasawan program (Muslim500, 2013). Even though he spent a year training to go into space, NASA refused to classify him as either an astronaut or cosmonaut, but rather as a "spaceflight participant" (Failat, 2012). If NASA and the RSA do not have clear definitions on what constitutes a participant versus an astronaut, rescuers could simply ignore titles with no consequences.

Article 31 of the Vienna Convention, however, requires that

A treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose" (United Nations Conference on the Law of Treaties, 1969).

The principle and purpose of the Rescue Agreement was "the humanitarian desire to protect the life of those aboard a spacecraft...prompted by sentiments of humanity" (Sundahl, 2009). Rescue efforts that fail to attempt to rescue everyone on board, unless there are compelling reasons not to do so, lead to absurd, but potentially legal, situations.

Liability Convention, 1971

On November 29, 1971 the *Convention on International Liability for Damage Caused by Space Objects, General Assembly Resolution 2777 (XXVI)* (Liability Convention), was proposed as the third of the U.N. space treaties. There are 89 parties and 22 signatories to this treaty (United Nations Office for Outer Space Affairs, March 28, 2013). Enforcement of this treaty proved to be particularly difficult, as demonstrated by more than a year of bureaucratic diplomacy between the governments of Canada and the U.S.S.R.

Article I(c) of the Liability Convention defines “launching state” as:

- (i) A State which launches or procures the launching of a space object;
- (ii) A state from whose territory or facility a space object is launched (United Nations Office for Outer Space Affairs, 1971).

and Article 1(d) defines a “space object” as including “component parts of a space object as well as its launch vehicle and parts thereof” (United Nations Office for Outer Space Affairs, 1971). This implies that any part of a space object or spacecraft itself is the legal responsibility of the launching state, as defined in Article 1(c).

On January 24, 1978, a Soviet nuclear powered satellite, Cosmos 954, which supposedly contained 100 pounds of uranium 235 deorbited, disintegrating into thousands of pieces over and in a large area of Canada (Embassy of Canada, 1979). Two weeks later, the Canadian government submitted a request for compensation of \$6,041,174.70 to the Soviet government. The negotiations continued for several years, and having rejected the original payment request, the U.S.S.R. paid Canada only \$3 million (Beckman, 1999).

Clearly, the Liability Convention failed to provide a timely resolution for a situation that involved two state governments. For the space tourism industry, the implications are even more problematic, where flights may involve both non-state and state entities, and injuries on the ground and in space. The convention holds launching states absolutely liable for damages, allows only states to make claims, provides no relief to space tourists, and prevents private causes of action. Article VII compounds these difficulties:

- The provisions of this Convention shall not apply to damage caused by a space object of a launching State to:
- (a) Nationals of that launching State;
 - (b) Foreign nationals during such time as they are participating in the operation of that space object from the time of its launching or at any stage thereafter until its descent, or during such time as they are in the immediate vicinity of a planned launching or recovery area as the result of an invitation by that launching State (United Nations Office for Outer Space Affairs, 1971).

Neither space tourists, nor those injured on the ground as a result of a mishap related to an orbital or suborbital flight would be protected by the Liability Convention (Zhao, 2004). The convention also includes no limit on liability amounts, which has motivated the U.S. states to enact laws that hold private space tourism companies responsible for damages (Reed, 2009-2010).

The Liability Convention addresses damages, but provides no guidance on differences between direct and indirect damages, or procedure for determining what should be done if damages are discovered long after a launch or landing incident. As Zhao (2004) stated

No statutory or jurisprudential guidance exists to help decide exact recoverable damages in the context of space tort. Moreover, the Convention offers flexible guidance on the standard of compensation: in

accordance with international law and the principles of justice and equity to restore the damaged party to the condition which would have existed if the damage had not occurred. Such guidance is difficult to follow in reality since some basic areas still remain blank: how should one compute the quantum of damages in individual cases? Which national law should be applied to determine recoverable damages?

Registration Convention, 1974

The November 12, 1974 *Convention on Registration of Objects Launched into Outer Space*, General Assembly Resolution 3235 (XXIX) (Registration Convention) is the fourth U.N. space treaty. There are 60 parties and 4 signatories to this treaty (United Nations Office for Outer Space Affairs, 1974). Calling upon the previous treaties, Article II specifies registration requirements for both single and multiple launching states:

1. When a space object is launched into Earth orbit or beyond, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain. Each launching State shall inform the Secretary-General of the United Nations of the establishment of such a registry.
2. Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object...(United Nations Office for Outer Space Affairs, 1974).

According to Zhao (2009), the Registration Convention provides a suitable framework in which space tourism operators can register vehicles for both orbital and suborbital flights, provided that bureaucratic requirements do not hinder the industry. The Registration Convention also permits the transfer of satellite ownership while a satellite is in orbit, provided that there is an agreement among launching states to transfer jurisdiction (Chatterjee, 2011), however, for short duration space tourist flights, this is likely not to occur, but on substantially longer flights, the transfer of spacecraft

ownership could occur, calling into question the responsibility for the safety and security of space tourism crews and participants.

Moon Agreement, 1979

If the signatory and ratification status of the Moon Treaty is any guide, however, selfish interests of nation states will take precedence over the common good of humankind. Unless we act soon and decisively as a world community, we will need to revise Neil Armstrong's famous statement of 20 July 1969, "one small step for man, one giant leap for mankind" to read "one small step for a selfish individual, one giant loss for humankind."

Dirk Spennemann,
*The Ethics of Treading on
Neil Armstrong's Footprints*, 2004

Of all of the five U.N. space treaties, the December 5, 1979 *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* General Assembly Resolution 34/68 (Moon Agreement) is by far the most controversial. It took nearly a decade to negotiate, an additional five years to achieve the five ratifications necessary to enter into force, and it still has not received enough support from space-faring states, including the U.S., to have any real impact (Viikari, 2005). There are currently only 17 states which are parties to the treaty: Australia, Austria, Belgium, Chile, Kazakhstan, Lebanon, Lithuania, Mexico, Morocco, the Netherlands, Pakistan, Paraguay, Peru, the Philippines, Saudi Arabia, Turkey, and Uruguay (United Nations Office for Outer Space Affairs, March 28, 2013). None is a major space power (Ehrenfreund et al., 2012).

The premise of this agreement is that extraterrestrial resources are "the common heritage of mankind." It prohibits exploitation of celestial bodies' natural resources, and reflects some of the principles found in the Outer Space Treaty. Together, these two treaties seem to promote a legal regime that prevents commercialization of outer space,

however, both treaties do permit private ownership, provided that “internal interests are given their due consideration” (Meyer, 2010). But there are two exceptions. First, celestial bodies in the solar system other than Earth and the Moon are no longer subject to Moon Agreement restrictions if contrary “specific legal norms enter into force with respect to any of these celestial bodies” (United Nations Office for Outer Space Affairs, 1979). Second, if an international regime is created by which

- (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;
- (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 (United Nations Office for Outer Space Affairs, 1979),

then exploitation of the natural resources of celestial bodies may proceed (Meyer, 2010).

Neither public nor private entities, however, can exploit space until a means for international resource sharing has been established (Cooper, 2003).

While the Moon Agreement admits “equitable sharing,” it does not define “equitable,” but defers that determination to international consensus. As Meyer (2010) proposed, common sense should dictate that the majority of the profits should go to the parties which invested time and funding, and assumed the risk for the development of space resources. The question that arises for space tourism concerns whether or not space itself and the Moon are exploitable natural resources since they can be enjoyed by space tourists. If so, then it could be argued that the profits derived from private space tourism ventures would need to be shared with the “international regime,” including “developing countries” which may not have contributed anything to the space tourism

industry. “International regimes” capable of agreeing on wealth distribution derived from space tourism activities will suffer even worse diplomatic, bureaucratic, and political problems than other treaties and agreements since they will be dealing with actual, rather than future, scenarios (Oduntan, 2005).

Article 6(2) of the Moon Agreement obligates states:

In carrying out scientific investigations and in furtherance of the provisions of this Agreement, the States Parties shall have the right to collect on and remove from the Moon samples of its mineral and other substances. Such samples shall remain at the disposal of those States Parties which caused them to be collected and may be used by them for scientific purposes (United Nations Office for Outer Space Affairs, 1979).

Scientific investigations, or activities claimed to be for scientific purposes which are actually primarily tourism-related, have the potential to disrupt the lunar and space environment. Article 7(1) requires that:

In exploring and using the Moon, States Parties shall take measures to prevent the disruption of the existing balance of its environment, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise. States Parties shall also take measures to avoid harmfully affecting the environment of the Earth through the introduction of extraterrestrial matter or otherwise (United Nations Office for Outer Space Affairs, 1979).

Given that there are few signatories to the Moon Agreement, it will be necessary to establish clear guiding principles to regulate tourism activities and preserve the lunar environment (Freeland, 2005-2006).

Article 10 was a noble effort to resolve some of the ambiguity of the Rescue Agreement:

1. States Parties shall adopt all practicable measures to safeguard the life and health of persons on the Moon. For this purpose they shall regard

any person on the Moon as an astronaut within the meaning of article V of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies and as part of the personnel of a spacecraft within the meaning of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.

2. States Parties shall offer shelter in their stations, installations, vehicles and other facilities to persons in distress on the Moon (United Nations Office for Outer Space Affairs, 1979).

The lack of support from space-faring states which have the capability of actually sending humans to the Moon, however, presently renders this article moot.

Article 18 provides for treaty review to encourage states to modify the agreement based on changes in technology and other laws:

Ten years after the entry into force of this Agreement, the question of the review of the Agreement shall be included in the provisional agenda of the General Assembly of the United Nations in order to consider, in the light of past application of the Agreement, whether it requires revision (United Nations Office for Outer Space Affairs, 1979).

While there was a cursory review by the states parties in 2008, little effort has been put into considering agreement modifications (Mukherjee, 2011).

Space Debris Mitigation Guidelines, 2007

Principles of improved registration and debris mitigation efforts must work together to provide a safe environment for space flight participants and crews. On December 22, 2007, the U.N. COPUOS adopted an updated version of the *Space Debris Mitigation Guidelines of the United Nations Committee for the Peaceful Uses of Outer Space*. This document was modified several times over the last decade to address increasingly crowded conditions in space, was published in 2010, and called for state action to prevent orbital collisions especially in LEO, because of

The implementation of space debris mitigation measures is recommended since some space debris has the potential to damage spacecraft, leading to loss of mission, or loss of life in the case of manned spacecraft. For manned flight orbits, space debris mitigation measures are highly relevant due to crew safety implications (United Nations Office for Outer Space Affairs, 2010).

These guidelines are well intentioned, but voluntary, remaining virtually unenforceable.

U.N. COPUOS works primarily on consensus, which worked well in the past, but during the last two decades, its decision-making processes have been criticized for allowing a small minority to exercise veto power. COPUOS has failed to draft a space treaty since the adoption of the 1979 Moon Agreement. Instead, COPUOS has proposed non-binding resolutions and guidelines (Jakhu and Nyampong, 2010).

U.N. deliberations on the concept of “launching state” illustrate the lengthy process that must be undertaken to reach international agreements, not on an entire treaty or regulation, but simply on terminology that would be used to clarify the interpretation of existing or future treaties. In April, 2004 the COPUOS Legal Subcommittee reached an agreement on a draft concept of the “launching state” that began in 2002, and continued into 2003 (United Nations Office for Outer Space Affairs, 2004).

V. FEDERAL AND U.S. SPACE LAWS

Our approach to foreign policy must reflect the world as it is, not as it used to be. It does not make sense to adapt a 19th century concert of powers, or a 20th century balance of power strategy. We cannot go back to Cold War containment, or to unilateralism. Today we must acknowledge two inescapable facts that define our world. First, no nation can meet the world's challenges alone. The issues are too complex.

Hilary Clinton, Secretary of State,
Council on Foreign Relations Address,
July 15, 2009

United States Regulations

Over the last 50 years the U.S. has enacted legislation that will directly or indirectly affect the space tourism industry. Several laws enacted during the last decade have tended to support space tourism, however, the current U.S. Congress does not act quickly, and is easily distracted by the personal agendas of its more vocal and self-righteous members, as was demonstrated during the October, 2013 government shutdown. If and when spaceport operations require federally funded employees, government shutdowns that occur while tourists are in space or on the lunar surface, would be particularly problematic. U.S. legislation that prevents Congressional pay furloughs for those employees will be necessary to ensure the safe return of space tourists.

Foreign Sovereign Immunities Act, 1976

The 1976 *Foreign Sovereign Immunities Act* (FSIA) deals with law suits by U.S. citizens against foreign governments brought in U.S. federal courts. A foreign state is immune from the U.S. jurisdiction, and unless a specified exception applies, the court lacks subject matter jurisdiction over the claim. This means that a U.S. citizen is barred from suing a foreign government in a U.S. court for injuries suffered from the foreign government's activities, in outer space for example, unless an exception to the FSIA can be satisfied. There are seven possible exceptions, four of which are conceivably applicable to tort based injuries related to space travel:

- (1) any case in which the foreign state has either expressly or impliedly waived its sovereign immunity;
- (2) in any case in which the action is based upon a commercial activity outside of the U.S. where the act causes a “direct effect” in the U.S.;
- (3) in a case in which money damages are sought for personal injury or death, or damage to or loss of property, occurring within the U.S. and caused by the tortious act or omission of a foreign state or employee;
- (4) in any case in which a foreign state has brought an action in a court within the U.S., or in a case in which a foreign state intervenes (Beckman, 1999).

This means that even though a state may have signed a treaty, it has not waived its rights under FSIA, including those related to space activities. The Supreme Court has ruled that FSIA would allow for damage recovery as a result of negligent foreign acts within the territorial air space of the U.S., but not beyond it, even if the alleged tort had “effects” within the U.S. The “commercial activity” exception allows a suit against a foreign state when the cause of action of the suit is based upon a state’s “commercial activity” within the U.S. by the foreign state, or upon an act outside the territory of the U.S. in connection with a commercial activity of the foreign state elsewhere and that causes a direct effect

within the U.S. (Beckman, 1999). One exception to foreign sovereign immunity occurs when the foreign government is involved in a commercial enterprise in the U.S. (Rankin, 2002-2003).

Adding to the confusion, and relevant to space tourism, is the situation where a corporation is indirectly owned by one or more foreign states or is in part controlled by one or more foreign government officials who may or may not be acting in an official governmental capacity (Vollmer and Bederman, 2001). Space tourists, unaware that the craft on which they are about to take their suborbital journey is owned by a foreign state, will likely have no knowledge of the potential impacts of FSIA on their ability to sue in the case of an accident (Rankin, 2002-2003).

Arms Export Control Act and ITAR, 1976

In 1976 Congress also *passed the Arms Export Control Act, 22 U.S.C. 2778*, an exercise in frustration and overreaction, creating a dazzling maze of legal confusion:

In carrying out functions under this section with respect to the export of defense articles and defense services, including defense articles and defense services exported or imported pursuant to a treaty referred to in subsection (j)(1)(C)(i), the President is authorized to exercise the same powers concerning violations and enforcement which are conferred upon departments, agencies and officials by subsections (c), (d), (e), and (g) of section 11 of the Export Administration Act of 1979 [50 App. 50 U.S.C. 2410(c), (d), (e), and (g)], and by subsections (a) and (c) of section 12 of such Act [50 App. U.S.C. 2411 (a) and (c)], subject to the same terms and conditions as are applicable to such powers under such Act [50 App. U.S.C. 2401 et seq.], except that section 11(c)(2)(B) of such Act shall not apply, and instead, as prescribed in regulations issued under this section... (Legal Information Institute, November 10, 2013).

Subchapter III continues:

- (2) Decisions on issuing export licenses under this section shall take into account whether the export of an article would contribute to an arms race, aid in the development of weapons of mass destruction, support international terrorism,

increase the possibility of outbreak or escalation of conflict, or prejudice the development of bilateral or multilateral arms control or nonproliferation agreements or other arrangements (Legal Information Institute, November 10, 2013).

The U.S. Government requires all manufacturers, exporters, and brokers of defense articles, defense services or related technical data to be International Traffic in Arms Regulations (ITAR) compliant, however, the ITAR lacks a definition of what it actually means for a corporation to be “ITAR certified” (International Import-Export Institute, 2013). The ITAR covers space systems and associated equipment such as ground stations, electronics, optical components, and technical data (Choi and Niculescu, 2006), which means that it likely will affect space tourism operators, who will depend on using several of these systems to facilitate space tourism safety.

The ITAR has expensive consequences for the space tourism industry. In Russia, for more than a year, two security guards and two American federal government monitors watched a piece of equipment, “a glorified metal table designed to keep Bigelow Aerospace's Genesis I space habitat from getting dirty on the floor” (Koebler, 2013). Under the ITAR, the table was included on the *United States Munitions List* (USML), meaning that it could have potentially served military purposes. According to federal definitions, it was highly dangerous if it fell into the wrong hands. Mike Gold, Director of Bigelow Aerospace’s Washington, D.C. operations, described the purpose of the program in which this “dangerous” metal table was being used:

Kosmotras takes Russian SS-18s and turns them into commercial space launchers (called the Dnepr). It is literally a ‘swords-into-plowshares’ program. Transforming a weapon of war into a tool for peaceful commerce, and working with former Cold War opponents is what space exploration is all about, and is part of what made the Genesis campaigns

so special. We weren't just building better technology, but building a better, more peaceful future (University of Mississippi Law School, 2008).

The ITAR restrictions have had unintended, but not necessarily unforeseen consequences. Not only had the ITAR not deterred the Chinese space program, it provided the Chinese with new opportunities and challenges. At the *Third Annual Space Exploration Conference* in Denver, Jin (2008) reported that there was an obvious lack of trust between the U.S. and China manifested through the application of the ITAR. He noted the “Positive effects of close door policy: government investment, a great pool of young scientists and engineers, and working harder” and “Great potential, optimistic with patience: earth science, climate research, data sharing on various scientific missions, and robotic exploration of several kinds” as part of the Chinese space program.

The ITAR also prohibits non-U.S. citizens from viewing the inside of a spacecraft with technology or equipment developed in the U.S. Space flight operators are required to train space flight participants to respond to emergency situations. Doing so is impossible without allowing operators to familiarize space tourists with spacecraft safety features, exposing spacecraft components, and possibly technical data through visual inspection, hands on training, and responses to questions asked by space tourists during safety training. If a foreign space flight participant was denied requested information deemed protected under the ITAR, it could be argued that the lack of information prevented informed consent, leading to lawsuits against the space tourism operator. The operator would then be liable for not securing required export licenses to fulfill its duty of informed consent. If the operator discloses information to a foreign space flight participant without a proper export license, then the operator could be held liable for

violating the ITAR restrictions (Blount, 2010). Even if the foreign tourist receives compulsory safety training and is allowed to board the spacecraft, the ITAR requires that monitors be present during any meetings that might involve technology transfer, implying that the monitor would also need to be present during the flight itself, increasing operator expenses and reducing income, as the result of having to use a seat that cannot be sold to a space tourist (Blount, 2010).

Based on the ITAR, Blue Origin, the Personal Spaceflight Federation, and the New Mexico Office for Space Commercialization noted that the ITAR requirements would prevent space tourism operators from providing flight experiences to foreign participants. Blue Origin suggested that the FAA establish the same disclosure standards for U.S. citizens and foreign nationals, to only “general systems descriptions” which would then conform with “Technical Data” as defined in the ITAR 22 CFR 120.10(a)(5). The FAA finally agreed (Blount, 2010).

In 2007, Bigelow Aerospace filed the first legal challenge to the ITAR rules, disputing claims that foreign space tourists were involved in a transfer of technology. In 2009, Mike Gold, Bigelow’s attorney, indicated that the government’s decision was “everything we could want,” but the ruling rejects passengers from Sudan, Iran, North Korea and China, who will not be allowed to fly or train on suborbital passenger flights, or visit Bigelow's space station (The Economist, 2009).

Marc Holzapfel, legal counsel for Virgin Galactic, described the ruling as a “major development,” freeing the space tourism industry from the “complicated, expensive and dilatory export-approval process” (The Economist, 2009). Tim Hughes, chief counsel of SpaceX, agreed, stating that the approval represented a “common-sense

approach” and bodes well for similar requests made by companies such as his own to carry foreign astronauts hoping to work on missions to the ISS (The Economist, 2009).

Finally, in August, 2009, with the support of Secretary of State Hillary Clinton, Defense Secretary Robert Gates, National Security Advisor General James Jones, and Ellen Tauscher Undersecretary of State for Arms Control and International Security, the White House announced an official ITAR review. During the first eight months of the Obama administration, the average license application process time was cut from 43 days to two weeks (Klamper, 2009). This announcement occurred 33 years after ITAR’s inception. Decade-long legal deliberations are clearly not acceptable in promotion of the space tourism industry.

Commercial Space Law Amendments Act, 2004

The *Commercial Space Law Amendments Act, Public Law 108–492 (CSLAA)*, was passed by Congress on December 23, 2004. It was the first legislation to specifically define human space flight as a commercial activity; to streamline the regulatory process and remove launch barriers; to balance safety and innovation; and to lessen liability requirements for space flight operators (Bromberg, 2005). The act included several new amendments specifically addressing space tourism:

- (10) the goal of safely opening space to the American people and their private commercial, scientific, and cultural enterprises should guide Federal space investments, policies, and regulations;
- (11) private industry has begun to develop commercial launch vehicles capable of carrying human beings into space and greater private investment in these efforts will stimulate the Nation’s commercial space transportation industry as a whole;
- (12) space transportation is inherently risky, and the future of the commercial human space flight industry will depend on its ability to continually improve its safety performance;

- (13) a critical area of responsibility for the Department of Transportation is to regulate the operations and safety of the emerging commercial human space flight industry;
- (14) the public interest is served by creating a clear legal, regulatory, and safety regime for commercial human space flight; and
- (15) the regulatory standards governing human space flight must evolve as the industry matures so that regulations neither stifle technology development nor expose crew or space flight participants to avoidable risks as the public comes to expect greater safety for crew and space flight participants from the industry (United States Congress, 2004).

It also defined the differences between “crew,”

any employee of a licensee or transferee, or of a contractor or subcontractor of a licensee or transferee, who performs activities in the course of that employment directly relating to the launch, reentry, or other operation of or in a launch vehicle or reentry vehicle that carries human beings (United States Congress, 2004)

and “space flight participant,” “an individual, who is not crew, carried within a launch vehicle or reentry vehicle” (United States Congress, 2004). Crews are required to meet safety training standards, and license holders must notify their crews and space tourists, in writing, that the U.S. has not certified the launch vehicle. In return space flight participants must sign informed consent agreements (United States Congress, 2004).

The 2004 CSLAA requires entities that launch space vehicles to purchase \$500 million in third-party liability insurance, but does not mandate that space tourism operators insure space flight participants, who would need to purchase their own insurance (van Oijhuizen Galhego Rosa, 2012). The huge cost of insurance for space tourism, if purchased by commercial operators, would be passed on to space tourists and result in high ticket prices that would exceed what most potential tourists would be willing to pay (Zhao, 2009).

To facilitate private space travel, new amendments directed the Secretary of Transportation to require only one permit “to conduct activities involving crew or space flight participants, including launch and reentry” (United States Congress, 2004) and allow for the issuance of experimental permits, based on historical experimental aircraft programs (Bromberg, 2005). The act also required the Secretary of Transportation to undertake a study to assess the liability risk sharing regime in the U.S. and in other states involved in commercial space transportation and includes additional language related to reciprocal waivers to reduce tort liability risks and insurance premiums for launch operators.

FAA and Commercial Space Activities, 2005

In April, 2005, *SpaceShipOne* designer Burt Rutan testified before House Subcommittee on Space and Aeronautics about FAA oversight:

It resulted in cost-overruns. It increased the risk for my test pilots. It did not reduce the risk to the non-involved public. It destroyed our safety policy of always question the product, never defend it...The regulatory process imposed by AST was grossly misapplied for our research tests. And worse yet, is likely to be misapplied for the regulation of future commercial spaceliners (David, 2005).

FAA Associate Administrator Patricia Grace Smith, responded to Rutan's testimony, stating that the agency

is extremely proud of our safety record and we intend to maintain this level of public safety as we work with developers of suborbital reusable launch vehicles. The space tourism sector represents a promising new market that will generate economic benefits for our nation but only if it is considered a safe and reliable form of transportation. We are striving to support and promote the development of this new industry by offering a regulatory environment that fosters innovation and creativity (David, 2005).

The FAA's implication is that it is in a better position to evaluate the safety of space tourism vehicles than the designer, and that giving Rutan, or others in the field, discretion to determine the safety of their vehicles would give them too much oversight. That logic, however, makes no sense. It is in the best interest of the space tourism industry to undertake whatever means are necessary to design, build, test, and fly the safest vehicles possible to ensure the success of the new industry. The space tourism market will expand only if passengers have confidence in the safety of the vehicles. Vehicle designers, rather than the FAA or any other governmental agency, are in a better position to make that determination (Walker, 2007).

Draft Guidelines for Crewed Commercial Suborbital RLV Operations, 2005

On February 11, 2005, the Federal Aviation Administration (FAA) issued the *Draft Guidelines for Commercial Suborbital Reusable Launch Vehicle (RLV) Operations with Flight Crew* (Crewed RLV Flight Guidelines Draft). The guidelines require appropriate medical training, flight certification, and nominal and emergency scenario flight training for RLV flight crews. Guidelines also reiterate the CSLAA requirements for notifying RLV flight crews that the U.S. has not certified the launch and require that RLV crew members file reciprocal waiver of claims with the DOT/FAA (Federal Aviation Administration, February 11, 2005a).

Draft Guidelines for Passengered Commercial Suborbital RLV Operations, 2005

On the same date that it issued the Crewed RLV Flight Guidelines, the FAA issued the *Draft Guidelines for Commercial Suborbital Reusable Launch Vehicle (RLV) Operations with Space Flight Participants* (Passenger RLV Flight Guidelines Draft).

The major differences between these two documents are the risk disclosures, that must notify the space tourist, in plain language, of the hazards of space flight, and

describe to each space flight participant the safety record of all launch or reentry vehicles that have carried one or more persons on board, including both U.S. government and private sector vehicles. The safety record should not be limited to only the vehicles of a particular RLV operator (Federal Aviation Administration, February 11, 2005b).

Space tourism operators must also train passengers on what to do in emergencies, answer participants' questions, and institute safety protocols to prevent tourists from interfering with crew responsibilities or jeopardizing the safety of the crew and other passengers. Guidelines include the same notifications as those to RLV crews, that the U.S. has not certified the launch. Space flight passengers must also file reciprocal waiver of claims with the DOT/FAA (Federal Aviation Administration, February 11, 2005b).

FAA Requirements for Crew and Space Flight Participants, 2006

The 1976 ITAR had negative consequences for the U.S. commercial space flight industry, and its ramifications for the space tourism industry could have had equally adverse effects. The 2006 Federal Aviation Administration *Human Spaceflight Requirements for Crew and Spaceflight Participants* (Human Spaceflight Requirements) rectified some of the potential negative effects, and at the same time, addressed the Passenger RLV Flight Guidelines, which specified that space flight operators were mandated to respond to space tourists' questions related to flight safety and system operations, at least at a system level (Federal Aviation Administration, 2006).

Protecting and Preserving Lunar Artifacts, 2011

On July 20, 2011 NASA issued *Recommendations to Space-Faring Entities: How to Protect and Preserve the Historic and Scientific Value of U.S. Government Lunar Artifacts* (Lunar Artifacts Preservation). In this document

NASA recognizes the steadily increasing technical capabilities of space-faring commercial entities and nations throughout the world and further recognizes that many are on the verge of landing spacecraft on the surface of the moon... NASA has assembled this document that contains the collected technical knowledge of its personnel – with advice from external experts and potential space-faring entities – and provides interim recommendations for lunar vehicle design and mission planning teams (National Aeronautics and Space Administration, 2011).

NASA asserts U.S. Government ownership of

- A. Apollo lunar surface landing and roving hardware;
- B. Unmanned lunar surface landing sites (e.g., Surveyor sites);
- C. Impact sites (e.g., Ranger, S-IVB, LCROSS, lunar module [LM] ascent stage);
- D. USG experiments left on the lunar surface, tools, equipment, miscellaneous EVA hardware; and
- E. Specific indicators of U.S. human, human-robotic lunar presence, including footprints, rover tracks, etc., although not all anthropogenic indicators are protected as identified in the recommendations (National Aeronautics and Space Administration, 2011)

based on the *National Aeronautics and Administration Act*, the 2010 NASA

Authorization Act, the *United States Constitution*, and the Outer Space Treaty:

parties to the treaty retain jurisdiction and control over objects launched into outer space that are listed on their registries, while they are in outer space and that ownership of objects launched into outer space is not affected by their presence in outer space or by their return to Earth (United Nations Office for Outer Space Affairs, 2011).

The document includes detailed technical and specific geological recommendations for descent and landing, use of natural boundaries, and collision and contamination

avoidance for commercial space operators. It makes special mention of the Apollo 11 and 17 sites:

Apollo 11 was a pivotal event in human exploration and technology history. Apollo 11 marked the first human flight to the lunar surface; Apollo 17 represented the last within the Apollo Program. Project Apollo in general, and the flight of Apollo 11 in particular, should be viewed as a watershed in human history and humanity...The site of that first landing requires preservation; only one misstep could forever damage this priceless human treasure (National Aeronautics and Space Administration, 2011).

In a departure from the previous, exclusively U.S.-centered approach, Appendix C listed specific items, including Soviet Lunas 9 and 13, and Lunokhod I and II, delivered by Lunas 17 and 21 respectively. Lunokhod 1 traveled more than 10 kilometers, surviving 11 lunar day-night cycles. Lunokhod 2 traveled 37 kilometers, surviving four months. While one of the Lunokhod rovers remains Russian property, the other has been sold to a private individual. NASA, however, has no authority over Russian property (National Aeronautics and Space Administration, 2011).

U.S National Space Transportation Policy, 2013

In November, 2013, the Office of the President of the United States released the *National Space Transportation Policy*. Among its goals are: enabling the capabilities to support human space transportation activities to and beyond LEO, including services to and from the ISS; developing a deep-space-capable transportation system; facilitating U.S. commercial industry access to available public data and lessons learned related to human spaceflight; and pursuing policy, regulatory, and other measures to foster the development of U.S. commercial spaceflight capabilities serving the emerging

nongovernmental human spaceflight market (Office of the President of the United States, 2013).

The policy affirms a commitment to the commercial space flight industry by directing the Secretary of Transportation to ensure that the regulatory environment for licensing commercial space transportation activities is timely and responsive. It also addresses current market and industry developments; supports continuation of the current liability risk-sharing regime for U.S. commercial space transportation activities, including provisions for the conditional payment of excess third-party claims by the U.S. government; and advocates for the international adoption of U.S. safety regulations, standards, and licensing measures to enhance global interoperability and safety of international commercial space transportation activities (Office of the President of the United States, 2013). While the policy is a step in the right direction, it fails to consider the technical expertise of members of the space tourism industry and their role in the development of space-related regulations. Like government policies of the past, it places the U.S. government in control and at the center of commercial space.

Space Launch Liability Indemnification Extension Act, 2013

On December 2, 2013, Congress approved the *Space Launch Liability Indemnification Extension Act, HR 3547* by a vote of 376 to 5. The bipartisan bill extends, for one year, commercial space transportation risk-sharing and liability regime established by the CSLAA. The bill extends CSLAA provisions which cover third-party liability for licensed commercial space launches. The bipartisan bill was introduced by Texas Republican and Committee Chair Lamar Smith, Ranking Member and Texas Democrat Eddie Bernice Johnson, Space Subcommittee Chairman and Mississippi

Republican Steven Palazzo, and Space Subcommittee Ranking Member and Maryland Democrat Donna Edwards (Spaceref.com, 2013). This is only one example of the legislation that will need to be enacted to enable private space tourism operators to serve the international community.

U.S. State Space-Related Legislation

The U.N. and state governments have been unable to create laws that can address the unique nature of space tourism. The 10th Amendment of the U.S. Constitution states: “The powers not delegated to the United States by the Constitution, nor prohibited by it to the states, are reserved to the states respectively, or to the people” (Legal Information Institute, November 17, 2013). Consequently, six states, all of which have played major roles in U.S. space efforts, have enacted space flight regulations aimed at addressing liability and informed consent via a waiver, to encourage space entrepreneurs to engage in space-related enterprises in their states.

Virginia Space Liability and Immunity Act, 2007

In 2007, Virginia became the first U.S. state to pass legislation aimed at facilitating the growth of the space tourism industry with the *Space Liability and Immunity Act* (Federal Aviation Administration, 2009). Virginia’s law states:

...a spaceflight entity is not liable for a participant injury resulting from the risks of spaceflight activities, provided that the participant has been informed of the risks of spaceflight activities as required by federal law pursuant to federal law and this article, and the participant has given his informed consent that he is voluntarily participating in spaceflight activities after having been informed of the risks of those activities as required by federal law and this article (Legislative Information System of Virginia, 2007).

New Mexico Space Flight Informed Consent Act, 2010

New Mexico's space tourism efforts began in the early 1990s, with the Southwest Space Task Force (SSTF). In June, 1994, the New Mexico State Legislature established the Office for Space Commercialization. In 2003, SSTF members convinced Economic Development Cabinet Secretary Rick Homans, that New Mexico was an ideal location for a spaceport. Former Governor Bill Richardson and the New Mexico State Legislature agreed to support financing the new spaceport starting in 2005 (Spaceport America, 2013).

On March 1, 2010, the New Mexico State Legislature passed the *Spaceflight Informed Consent Act* (Legislature of the State of New Mexico, 2010), with language similar to that of Virginia's. Section 4 provides a warning, which if not signed by the participant, prevents the space tourism operator from invoking liability immunity:

I understand and acknowledge that under New Mexico law, there is no liability for injury or death sustained by a participant in a space flight activity provided by a space flight entity if the injury or death results from the inherent risks of the space flight activity. Injuries caused by the inherent risks of the space flight activities may include, among others, death, bodily injury, emotional injury or property damage. I assume all risks for participating in this space flight activity (Legislature of the State of New Mexico, 2010).

On April 12, 2013, New Mexico Governor Susana Martinez signed an updated version of the 2010 bill that

provides coverage to both operators and their supply chain during the critical early years of the industry's development. The enhancement, which costs taxpayers nothing, still allows legal options for spaceflight participants in cases of willful, wanton or reckless disregard, while creating an environment that enables New Mexico to more successfully recruit and retain commercial space tenants and customers for human spaceflight operations at Spaceport America (Messier, 2013).

New Mexico has already reaped significant financial benefits from the space tourism industry:

Spaceport America has already created over 1,100 construction jobs in New Mexico and the continuing economic impact is already delivering on its promise to the people of New Mexico...Spaceport America is now generating consistent revenues for the State of New Mexico following the commencement of rent on the 20-year lease of the spaceport's main terminal hangar facility, signed with Virgin Galactic in 2008. The NMSA continues to work closely with leading aerospace firms such as Virgin Galactic, Lockheed Martin, Moog-FTS, and UP Aerospace and their customers NASA and the Department of Defense to develop commercial spaceflight at the new facility (Messier, 2013).

Other U.S. State Space Laws

Passed in 2011, the Florida *Spaceflight Informed Consent Act, Title XXV, Chapter 331, Facilities and Commerce*, is nearly identical to the Virginia and New Mexico legislation (Florida Senate, 2011). On March 15, 2011 the Texas Senate passed S.B. 115, the *Texas Space Liability Act* (Blount, 2011), with language nearly identical to that of the other states. Texas offers the broadest protection, and limits liability under all mission phases, including preparation of the launch vehicle, the launch, the time between launch and re-entry, preparation for re-entry and actual re-entry, landing, and post-landing recovery (Yates, 2012).

On April 19, 2012, Colorado enacted *Concerning Limited Liability for Spaceflight Activities* (Colorado State Senate, 2012). Colorado followed the lead of the other states, but added an additional exception to limited liability: when the spaceflight operator had actual knowledge of, or reasonably should have known of, a dangerous condition on the land or in the facilities or equipment used (Yates, 2012).

The 2012 California *Space Flight Liability and Immunity Act, A. B. 2243*

(California Legislative Information, 2012) is also similar to the other state laws. The passage was praised by CSF President Michael Lopez-Alegria:

With the space shuttle Endeavour's arrival in California closing the door on one era, this bill is opening the door to another. Commercial companies will soon begin to open up access to space for the public and preserve America's leadership in spaceflight. This bill will provide the required liability protections needed for the companies in this developing sector to operate in an efficient and effective manner, while acknowledging that spaceflight is not a risk-free activity (Commercial Spaceflight Federation, 2012).

VI. INTERNATIONAL SPACE-RELATED AGREEMENTS

There are no international courts with the power to create general international common law, so international law arises through agreements among states. International law can be “public,” defining the relationships among states, or “private,” governing the international relationships between international governments and private citizens or corporations (Sykes, 2007). Space law often entails the application of both.

Manned Space Flight Draft Convention, 1991

In 1988, the Institute of Air and Space Law of Cologne University in Germany, represented by Professor Karl-Heinz Böckstiegel, the Institute of State and Law of the Academy of Sciences of the U.S.S.R., represented by Professor Vadlen Vereshchetin, and the Research and Study of Space Law and Policy Center of the University of Mississippi Law School (USA) represented by Professor Stephen Gorove, initiated a research project to create the *Draft for a Convention on Manned Space Flight*. Recalling the aims of the Outer Space Treaty, the Rescue Agreement, the Liability Convention, and the Registration Convention, Article IV of this proposal, *Rights and Obligations of Persons on Manned Space Flight*, specified the responsibilities of the commander and crew to a level of detail that had not been done in any previous space-related treaties, declarations, or laws, and which can and should be utilized in future space tourism-related regulations:

1. The preparation of the manned space flight, determination of composition and functions of the crew and participation of other persons as well as their rights and obligations fall within the

competence of the State exercising jurisdiction and control. The same applies to an international manned space flight, unless the States participating in the flight agree otherwise.

2. The commander of the manned space object shall (1) provide for the safety and wellbeing of all persons on board, and (2) provide for the protection of the space flight elements and any payload carried or serviced by the manned space object. The commander shall have sole authority throughout the flight to use any reasonable and necessary means to achieve this end.
3. The authority of the commander extends to all persons participating in the space flight, irrespective of their nationality. It also extends to all manned space flight elements and payloads (Böckstiegel et al., 1991).

The writers of the draft had anticipated that it would serve as the basis for international discussions, and they planned to publish the draft in state and international journals. At its session in Dresden in October 1990, the Board of Directors of the IISL communicated the draft to the COPUOS Legal Sub-Committee. Despite these efforts, and the draft's attention to registration, jurisdiction and control, safety, mutual assistance, liability, intellectual property, and dispute resolution, the draft was never adopted (Böckstiegel et al., 1991).

United States and Russian Federation Agreement, 1992

The June 17, 1992 *Russian Federation Agreement between the United States of America and the Russian Federation Concerning Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes* (Russian Federation Agreement) established that the two governments

Expressing their satisfaction with cooperative accomplishments in the fields of astronomy and astrophysics, earth sciences, space biology and medicine, solar system exploration and solar terrestrial physics, as well as their desire to continue and enhance cooperation in these and other fields (Japan Aerospace Exploration Agency, 1992)

would cooperate to increase the “potential for commercial applications of space technologies for the general benefit” (Japan Aerospace Exploration Agency, 1992). Article I of the agreement allowed for “the possibility of working together in other areas,” and Article II provided that “The Parties may designate additional implementing agencies as they deem necessary to facilitate the conduct of specific cooperative activities in the fields enumerated in Article 1 of this Agreement” (Japan Aerospace Exploration Agency, 1992).

While this agreement did not foresee cooperation between the two states in the space tourism industry it did not preclude such an arrangement, and may serve as a basis for future agreements where the two states have political, economic, environmental, or technical needs to cooperate as partners with commercial or international entities in the space tourism industry.

Russian Space Activity Law, 1993

On August 20, 1993, the Russian House of Soviets enacted the *Law of the Russian Federation “About Space Activity,” Decree No. 5663-1* (Russian Space Activity Law) (United Nations Office for Outer Space Affairs, 1993). Both civilian and military space activities are regulated by this law, which was amended in November 1996. The law consists of seven sections which consider general issues related to space, organization of space activities in the Russian Federation, economics, space infrastructure, space safety, international cooperation, and liability (United Nations Office for Outer Space Affairs, 1993).

The Russian Space Activity Law mentions principles of international law as a binding source of law governing space activities of and in the Russian Federation.

Article 23 includes specific space accident investigation procedures; Article 24 defines search-and-rescue authority; and Article 25 mandates insurance for space activities.

Article 30 addresses liability:

1. Liability for damages inflicted by space objects of the Russian Federation within the territory of the Russian Federation or outside the jurisdiction of any state except outer space shall arise regardless of the fault of the inflictor thereof.
2. If in any place, except from the Earth's surface, damage has been inflicted on a space object of the Russian Federation or on property onboard such an object by another space object, the liability of the organization and citizen owners of another space object shall emerge with their being at fault and in proportion to their fault.
3. Damage inflicted to a person or property of a citizen, as well as damage inflicted on a property of an organization by a space object of the Russian Federation while performing space activity on a territory of the Russian Federation or outside its territory, shall be compensated by the organization or citizen that insured their liability for damage in a size and order foreseen by the Civil Codex of the Russian Federation (United Nations Office for Outer Space Affairs, 1993).

Since September, 2006, the *Proposed Special Technical Regulation on Space Technology Safety* (Special TR) has been under discussion, and for the first time in Russian history, a space safety document has been prepared and publicly discussed. The draft consists of six chapters and 20 articles that address many of the same issues as the Russian Space Activity Law, but goes further in its definition of dangers associated with space activity:

- risk to cosmonauts, personnel from cosmodromes and other ground infrastructures, local population of the Russian Federation where the cosmodromes are located, employees of the rocket and space industry, the population of Russia, and populations of other countries, environment, and property;
- damage to life and health, nature, property damage, and global catastrophes; and
- launch, payload and propellant accidents, spacecraft failures, crashes, and subsequent deaths due to malfunctions or human error (Zhdanovich, 2010).

RSA safety standards differ from those of ESA and NASA, and are part of the reliability and quality control programs that were part of the rules and regulations that were developed under Soviet control. Various state national standards such as the *System of Standards of Labour Safety, Systems of Hygienic Rules, and System of Environmental Protection Standards* regulate human health and safety-related issues for spacecraft crew and ground personnel (Zhdanovich, 2010). Should the U.S. and Russia cooperate in space tourism activities, safety regulations will need to be established that accommodate the standards of both states.

Brussels I, 2000

On December 22, 2000, the European Union (E.U.) adopted Council Regulation No. 44/2001 on *Jurisdiction and the Recognition and Enforcement of Judgments in Civil and Commercial Matters* (Brussels I). This document clarified the effect of jurisdictional clauses in contracts as they relate to citizens of the E.U.

To be applicable, Brussels I requires that the parties are domiciled in different E.U. member states or that one party is domiciled in an E.U. member state and the other party in a non-E.U. member state, at the time of the conclusion of a contract between them. For example, XCOR's principle place of business is California, however, if a space tourism contract is made through an agent in the Netherlands, XCOR is considered to reside in the Netherlands and the Dutch courts would have jurisdiction over a Dutch space tourist's claim against XCOR (Chatzipanagiotis, 2011).

The forum under which they agree to settle disputes must be clearly stated in writing in the contract (Chatzipanagiotis, 2011), which, according to Article 23(2), recognizing the nature of modern electronic communication includes "Any

communication by electronic means which provides a durable record of the agreement shall be equivalent to writing” (Council of the European Union, 2000). This was a new idea for the new century, and not evident in previous domestic or international treaties or declarations.

Article 15 addresses “special contracts” made between members of a trade or profession, and those who are not, such as a contract between a space tourism operator and a space tourist. Section 1 states:

- (c) in all other cases, the contract has been concluded with a person who pursues commercial or professional activities in the Member State of the consumer's domicile or, by any means, directs such activities to that Member State or to several States including that Member State, and the contract falls within the scope of such activities (Council of the European Union, 2000).

Section 3, however, states that

This Section shall not apply to a contract of transportation other than a contract which, for an inclusive price, provides for a combination of travel and accommodation (Council of the European Union, 2000).

For space tourism operators, this becomes particularly problematic if they include lodging for preflight training, extended orbital stays, or space hotel accommodations:

To protect their clients from the application of the special rules, legal councils of operators of suborbital vehicles would argue that contracts for suborbital flights as such are contracts of transport. Therefore, the forum-selection clauses included by operators in the respective contracts are not covered by the Regulation’s special provisions on consumers (Chatzipanagiotis, 2011).

To add to the confusion, it is not certain whether Brussels I will even apply to space tourism, which may be superseded by international agreements and space treaties, depending on which states are signatories at the time that a contract is made (Chatzipanagiotis, 2011).

VII. AVIATION INDUSTRY: OPERATOR AND PASSENGER AGREEMENTS

The prospects for both suborbital and orbital private human access to space give rise to some interesting and difficult legal questions. It also opens up an exciting opportunity to develop an adequate system of legal regulation to deal with these activities. The existing international legal regimes covering air and space activities are not well suited to large-scale commercial access to space, largely because they were developed at a time when such activities were not a principal consideration in the mind of the drafters. The lack of legal clarity represents a major challenge and must be addressed as soon as possible, to provide for appropriate standards and further encourage (not discourage) such activities.

Tanja Masson-Zwaan and Steven Freeland
Between Heaven and Earth: The Legal
Challenges of Human Space Travel
Acta Astronautica, 2010

On October 9, 1890, in Brie, France, on the lawn of the Château d'Armainvilliers, Clément Ader flew his bat-winged Éole prop plane, powered by an alcohol-burning steam engine, down a 200 meter runway. He was the first to achieve powered flight (Historic Wings, 2012). Thirteen years later, in 1903, the Wright Brothers flew at Kitty Hawk, opening the era of American flight transportation history. The response was a legal regime for regulating commercial air transportation (Zhao, 2009) and an aviation industry about to transform the world.

Warsaw Convention, 1929

The 1929 *Convention for the Unification of Certain Rules Relating to International Carriage by Air* (Warsaw Convention) was signed by 23 states. The Convention demonstrated international support for the commercial aviation industry,

defined passengers, baggage, and operations (Bromberg, 2005), provided an international regulatory structure for human and cargo transportation via air, and established liability limits, which could only be superseded due to willful misconduct of the air carrier (Reed, 2009-2010).

Article 17 states:

The carrier is liable for damage sustained in the event of the death or wounding of a passenger or any other bodily injury suffered by a passenger, if the accident which caused the damage so sustained took place on board the aircraft or in the course of any of the operations of embarking or disembarking (Warsaw Convention, 1929).

Articles 20 and 21 define situations under which the carrier is not responsible:

1. The carrier is not liable if he proves that he and his agents have taken all necessary measures to avoid the damage or that it was impossible for him or them to take such measures.
2. In the carriage of goods and luggage the carrier is not liable if he proves that the damage was occasioned by negligent pilotage or negligence in the handling of the aircraft or in navigation and that, in all other respects, he and his agents have taken all necessary measures to avoid the damage (Warsaw Convention, 1929)

and

If the carrier proves that the damage was caused by or contributed to by the negligence of the injured person the Court may, in accordance with the provisions of its own law, exonerate the carrier wholly or partly from his liability (Warsaw Convention, 1929).

This balanced liability structure was necessary since *en masse* air travel had just begun and air travel was still dangerous. Most airlines, with the exception of those in the U.S., were owned by their governments. The limitation of liability also served to protect both the airlines and their governments (Abeyratne, 1997).

The convention's limited-liability provisions had two positive effects: capital could be used to invest in technological improvements and to expand into new

international markets; and the airlines were able to obtain insurance (Bromberg, 2005). The regime proved to be vital to the development of the air transportation industry by shielding the new airline industry from expensive insurance premiums and unlimited liability for accidents (Zhao, 2009). The Warsaw Convention has successfully enabled companies to provide insurance services in the field of international air transportation and may prove to be a good model for the space tourism industry (Nase, 2012).

Chicago Convention, 1944

The 1944 *Convention on International Civil Aviation* (Chicago Convention) was signed by 52 states and established the U.N. ICAO, which has facilitated the development of international aviation for more than 60 years. Article 1 reaffirms that “The contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory” (Chicago Convention, 1944). Article 5 states:

Each contracting State agrees that all aircraft of the other contracting States, being aircraft not engaged in scheduled international air services shall have the right, subject to the observance of the terms of this Convention, to make flights into or in transit non-stop across its territory and to make stops for non-traffic purposes without the necessity of obtaining prior permission, and subject to the right of the State flown over to require landing (Chicago Convention, 1944).

Article 8 diverges from the situation that occurred 13 years later with the launch of Sputnik, and addresses pilotless aircraft:

No aircraft capable of being flown without a pilot shall be flown without a pilot over a territory of a contracting state without special authorization by that state and in accordance with the terms of such authorization. Each contracting state undertakes to insure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft (Chicago Convention, 1944).

Article 44 assigns responsibilities to the ICAO, primarily to develop the principles and techniques of international air navigation and to foster the planning and development

of international air transport. The ICAO Council has divided the airspace over the entire world into Flight Information Regions (FIRs) which also cover the seas (Marciacq et al., 2010). The ICAO may play a major role in the commercial space tourism industry.

Every commercial airline flight is dealt with by air traffic control, airport authorities, and pilots. The system functions because of universally accepted regulations, *Standards and Recommended Practices* (SARPs), created by the ICAO, covering safety, personnel licensing, aircraft operation, aerodromes, air traffic services, accident investigation, and the environment. Most SARPS refer to technical regulations, so the Air Navigation Commission's (ANC) 15 technical experts play a predominant role in the SARP development (Jakhu and Nyampong, 2010). Standards are defined as "any specification whose uniform application is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention;" a recommended practice is "any specification whose uniform application is recognized as desirable for the safety, regularity, or efficiency of international air navigation" (Chicago Convention, 1944).

The convention and its related SARPs include several articles and requirements to facilitate international flight. For example, SARPS require that

- any pilot who wishes to fly on an aircraft registered in a State other than the one that has issued the license, needs to obtain an authorization from the State of Registry;
- pilots and controllers shall use ICAO standardized phraseology in all situations for which it has been specified and resort to plain language... communications only when standardized phraseology cannot serve an intended transmission (United Nations International Civil Aviation Organization, 2014).

Amendment 164 to Annex 1 of the Chicago Convention strengthened language proficiency requirements for flight crew members and air traffic controllers:

“pilots on international flights shall demonstrate language proficiency in either English or the language used by the station on the ground. Controllers working on stations serving designated airports and routes used by international air services shall demonstrate language proficiency in English as well as in any other language(s) used by the station on the ground” (United Nations International Civil Aviation Organization, 2014).

Changes to the convention and its associated SARPs over the following decades reflected huge increases in the number of passengers, modernized airports, new destinations, and modified, international liability regimes (Zhao, 2009). Space tourism regulations will likely require similar modifications to meet increasing international space tourist demands.

Rome I, 1952

The 1952 *Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface* (Rome I), went beyond the 1929 Warsaw Convention, which had not addressed air carrier liability for those injured on the ground as a result of air transportation mishaps. Article 1(1) of Rome I stated:

1. Any person who suffers damage on the surface shall, upon proof only that the damage was caused by an aircraft in flight or by any person or thing falling therefrom, be entitled to compensation as provided by this Convention (United Nations International Civil Aviation Organization, 1952).

Article 2 defined “operator:”

1. The liability for compensation contemplated by Article 1 of this Convention shall attach to the operator of the aircraft.
2. (a) For the purposes of this Convention the term “operator” shall mean the person who was making use of the aircraft at the time the damage was caused, provided that if control of the navigation of the aircraft was retained by the person from whom the right to make use of the aircraft was derived, whether directly or indirectly, that person shall be considered the operator (United Nations International Civil Aviation Organization, 1952).

Article 14 of Rome I also reaffirmed, clarified, and limited liability:

If the total amount of the claims established exceeds the limit of liability applicable under the provisions of this Convention, the following rules shall apply, taking into account the provisions of paragraph 2 of Article 11:

- (a) If the claims are exclusively in respect of loss of life or personal injury or exclusively in respect of damage to property, such claims shall be reduced in proportion to their respective amounts.
- (b) If the claims are both in respect of loss of life or personal injury and in respect of damage to property, one half of the total sum distributable shall be appropriated preferentially to meet claims in respect of loss of life and personal injury and, if insufficient, shall be distributed proportionately between the claims concerned. The remainder of the total sum distributable shall be distributed proportionately among the claims in respect of damage to property and the portion not already covered of the claims in respect of loss of life and personal injury (United Nations International Civil Aviation Organization, 1952).

Liability issues would be revisited in several laws during the next 50 years with the dramatic rise in the number of airline passengers and the increase in the diversity of destinations around the world.

Intercarrier Agreement on Passenger Liability, 1995

The International Air Transportation Association (IATA), the trade association for the world's airlines, is headquartered in Montreal, as is the ICAO, and represents 240 airlines, 84% of world-wide air traffic (International Air Transportation Association, 2013). In October, 1995, IATA unanimously passed the *Intercarrier Agreement on Passenger Liability* (IAPL), which set the standard for international compliance and modernized private air law, subject to governmental approval. The initiative focused serious weaknesses of private international air law (Abeyratne, 1997). At less than a page in length, and consisting of eight concise articles, the document is by far the simplest international air-related agreement:

1. To take action to waive the limitation of liability on recoverable compensatory damages in Article 22 paragraph 1 of the Warsaw Convention as to claims for

death, wounding or other bodily injury of a passenger within the meaning of Article 17 of the Convention, so that recoverable compensatory damages may be determined and awarded by reference to the law of the domicile of the passenger.

2. To reserve all available defences pursuant to the provisions of the Convention; nevertheless, any carrier may waive any defence, including the waiver of any defence up to a specified monetary amount of recoverable compensatory damages, as circumstances may warrant.
3. To reserve their rights of recourse against any other person, including rights of contribution or indemnity, with respect to any sums paid by the carrier.
4. To encourage other airlines involved in the international carriage of passengers to apply the terms of this Agreement to such carriage.
5. To implement the provisions of this Agreement no later than 1 November 1996 or upon receipt of requisite government approvals, whichever is later.
6. That nothing in this Agreement shall affect the rights of the passenger or the claimant otherwise available under the Convention.
7. That this Agreement may be signed in any number of counterparts, all of which shall constitute one Agreement. Any carrier may become a party to this Agreement by signing a counterpart hereof and depositing it with the Director General of the International Air Transport Association (IATA).
8. That any carrier party hereto may withdraw from this Agreement by giving twelve (12) months' written notice of withdrawal to the Director General of IATA and to the other carriers parties to the Agreement (International Air Transportation Association, 1995).

The importance of this document is its demonstration of the willingness of industry representatives to find solutions that would benefit their customers (Abeyratne, 1997), and that this could be accomplished by addressing a long standing treaty, the Warsaw Convention, as well as by acknowledging more modern issues, resulting from the international and ubiquitous status of air travel. Documents of this clarity and simplicity may prove useful to the space tourism industry.

VIII. ANTARCTICA: PRESERVATION AND PROTECTION

If it had been practicable...at an earlier stage of Arctic and Antarctic exploration and development which it was also not in the political climate of the time, to devise and international regime for the polar regions such as was suggested by the United States in August 1948 with the support of the United Kingdom and New Zealand, a number of acute current [1955-56] controversies and problems would not have arisen. It would be entirely fitting that the control of activities in space should be regarded as a world responsibility...(Jenks, 1956).

Antarctica has the cleanest air in the world, and is the ideal terrestrial station at which to measure the effects of global pollution and carbon dioxide levels. It is also the darkest land on Earth, and an excellent setting for astronomical research. Subjected to winds up to 250 miles per hour and temperatures as low as -50° centigrade, Antarctica has the world's most delicate ecosystem, where a footprint in moss can last for decades (Greenpeace U.S.A., 2013). Scientists also study its extensive food chain to better understand the environmental impacts of and by humans.

On August 28, 1948, the U.S. Department of State released *Discussions Asked on Territorial Problems in Antarctica*, based on discussions with Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom. In this document the Department of State suggested that territorial problems in Antarctica could be resolved through the promotion of scientific research and internationalization. While not recognized at the time, these ideas were later applied to space law (Doyle, 2002).

Antarctica was once the domain of explorers such as Shackleton, Amundsen, and Scott. After the pole was reached in 1911, more explorations followed, and by the 1950s, several states had erected scientific research stations. In December, 1956, commercial tourism began with a LAN Chile DC-6 conducting an overflight tour. The first ship-based tours, out of Chile and Argentina, began in 1958, and by 1969, cruise ship visits became common (Spennemann, 2007).

Antarctic Treaty, 1959

On December 1, 1959, the governments of Argentina, Australia, Belgium, the French Republic, Japan, New Zealand, the Union of South Africa, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States, signed the *Antarctic Treaty*, outside the auspices of the U.N. This treaty entered into force on June 23, 1961. These states, per Article IX of the treaty, comprise the entity referred to as the Contracting Parties. Since 1959, thirty-eight other countries have acceded to the Treaty (Secretariat of the Antarctic Treaty, 1959).

Parties recognized

that it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord...Convinced that the establishment of a firm foundation for the continuation and development of such cooperation on the basis of freedom of scientific investigation in Antarctica as applied during the International Geophysical Year accords with the interests of science and the progress of all mankind (Secretariat of the Antarctic Treaty, 1959).

Article I of the treaty prohibits the use of military weapons, fortifications, maneuvers, or weapons but allows for the use of military personnel and equipment for scientific research; Articles II and III addresses the nature of the cooperative exchange of

scientific ideas and discoveries; and Article IV provided that claims made before treaty enforcement would continue to be acknowledged:

No acts or activities taking place while the present Treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or create any rights or create any rights of sovereignty in Antarctica. No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present Treaty is in force (Secretariat of the Antarctic Treaty, 1959).

This meant that existing territorial claims would be honored, but no new claims could be made by treaty signatories.

Territorial claims are based on a combination of two different legal principles: the principle of discovery and occupation and the principle of contiguity. Discovery alone is not considered sufficient for obtaining title under international law; legal scholars also consider effective occupation as an additional and necessary criterion on which to base resource ownership. The definition of effective occupation, however, is nebulous, especially in Antarctica, where harsh conditions prevent many of the overt activities of normal, temperate climates from occurring. Some claimant countries, including Chile and Argentina, have conducted Antarctic activities, including visits by heads of state, marriage ceremonies, and the issuance of postage stamps, in an attempt to demonstrate effective occupation (Westermeyer, 1982).

Sections 2 and 3 of Article VII of the treaty are of particular importance because they enabled treaty signatories to designate observers who

shall have complete freedom of access at any time to any or all areas of Antarctica...including all stations, installation and equipment within those areas, and all ships and aircraft at points of discharging or embarking cargoes or personnel in Antarctica, shall be open at all times to inspection by any observers...(Secretariat of the Antarctic Treaty, 1959).

Section 5 states that Contracting Parties “shall give them notice in advance of all expeditions to and within Antarctica” (Secretariat of the Antarctic Treaty, 1959).

Article VIII delegated responsibility for “members of the staffs accompanying any such persons,” stating that they

shall be subject only to the jurisdiction of the Contracting Party of which they are nationals in respect of all acts or omissions occurring while they are in Antarctica for the purpose of exercising their functions (Secretariat of the Antarctic Treaty, 1959).

Sections 1 and 2 of Article IX address dispute resolution procedures:

- 1) If any dispute arises between two or more of the Contracting Parties concerning the interpretation or application of the present Treaty, those Contracting Parties shall consult among themselves with a view to having the dispute resolved by negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement or other peaceful means of their own choice.
- 2) Any dispute of this character not so resolved shall, with the consent, in each case, of all parties to the dispute, be referred to the International Court of Justice for settlement; but failure to reach agreement on reference to the International Court shall not absolve parties to the dispute from the responsibility of continuing to seek to resolve it by any of the various peaceful means...(British Antarctic Survey, 1959).

The 1959 *Antarctic Treaty* has been supplemented by more than two hundred agreements, ratified via the ATCM process, and providing a flexible, incremental system that does not require modifications to the original treaty. The ATS is better prepared to tackle future challenges related to tourism far better than any existing space treaties. On September 22, 1960, President Eisenhower agreed, recommending that Antarctic Treaty principles be used as a model for an international agreement governing space (Simberg, 2012). This treaty established the principles of the legal regime of scientific exploration of Antarctica on the basis of experience gained during the International Geophysical Year (IGY) and later became an example for the regulation of space activities (Kopal, 2008),

specifically the Outer Space Treaty, and most of the operational features of the unratified Moon Treaty mutual inspection system (Peterson, 1997).

Antarctic Treaty System

Several Antarctic treaties followed as part of the *Antarctic Treaty System (ATS)*, each with the primary objective of conserving Antarctica's resources. On June 2, 1964 the *Agreed Measures for the Conservation of Antarctic Fauna and Flora* was drafted, however, there was little urgency in enforcing this treaty.

Prior to the 1970s there was little evidence that minerals existed in commercially exploitable quantities. There were four constraints that limited our knowledge of Antarctica's resources: Antarctica has been viewed by some states as a preserve outside the domain of commercial enterprise; the technology, needed to extract non-living resources from the Antarctic continent and its surrounding ocean, would need to operate under extremely harsh conditions and with potentially limited human interaction; and some resources would simply be unattainable for months at a time because ice would prevent equipment from reaching sites where resources were available or from shipping them to locations where they could be utilized (Westermeyer, 1982).

Additional Antarctic treaties and conventions, aimed at preserving Antarctica's living resources became part of the Antarctic Treaty System (ATS): the 1972 *Convention for the Conservation of Antarctic Seals* (British Antarctic Survey, 1972), the 1980 *Convention on the Conservation of Antarctic Marine Living Resources (CCAMRL)* (Antarctic Cooperative Research Center, 1980), and the 1982 *Agreed Measures for the Conservation of Antarctic Fauna and Flora*. (U.S Department of State, 2014).

Convention on the Regulation of Antarctic Mineral Resources, 1988

The *Convention on the Regulation of Antarctic Mineral Resources* (Mineral Resources Convention) was never ratified, but reflected the future Outer Space Treaty. Article 4 of the proposed treaty stated that no Antarctic mineral resource activity shall take place until it is judged that

technology and procedures are available to provide for safe operations and compliance...there exists the capacity to monitor key environmental parameters and ecosystem components so as to identify any adverse effects of such activity and to provide for the modification of operating procedures as may be necessary in the light of the results of monitoring or increased knowledge of the Antarctic environment or dependent or associated ecosystems; and there exists the capacity to respond effectively to accidents, particularly those with potential environmental effects. (Antarctic Cooperative Research Center, 1988).

According to Greenpeace, the 1989 the *Exxon Valdez* oil spill in Alaska severely undermined the oil company's argument that drilling in ecologically sensitive areas could be conducted in a safe environmentally friendly manner. Greenpeace offices worldwide lobbied their governments to take a responsible position on protecting the Antarctic, joining forces with other non-governmental organizations, eliciting support from Prince Sadruddin Aga Khan, Jacques Cousteau, and Ted Turner, leading to additional environmental protections for Antarctica (Greenpeace U.S.A., 2013). Greenpeace's tactics are frequently controversial, but the organization was clearly correct in its evaluation for the need of international protection of Antarctic resources.

Protocol on Environmental Protection, 1991

The 1991 *Protocol on Environmental Protection to the Antarctic Treaty* (Environmental Protection Protocol) prohibits any activity related to mineral resources except for scientific research. Annexes are aimed at mitigating specific environmental

problems: Annex I defines conditions for environmental evaluation, monitoring, circulation of information, and conditions warranting emergency status; Annex II provides additional protections for native flora and fauna as well as strict permitting requirements for species introduced for scientific investigations; and Annex III describes the procedures for the removal of waste, including radioactive materials, electrical batteries, liquid and solid fuels and drums, toxic heavy metals, materials that produced harmful emissions when incinerated, and sewage domestic liquid wastes (Secretariat of the Antarctic Treaty, 1991).

Annexes V and VI provide the most constructive lessons for space tourism law.

Annex V, Article 3, section 1 establishes that

Any area, including any marine area, may be designated as an Antarctic Specially Protected Area to protect outstanding environmental, scientific, historic, aesthetic or wilderness values, any combination of those values, or ongoing or planned scientific research (Secretariat of the Antarctic Treaty, 1991).

The other type of designation for site protection at a lower level, is described in Article 4 as the Antarctic Specially Managed Area, where no special visitation permits are required. The power to determine whether to designate a site for protection, and what level of protection is appropriate falls to the Committee on Environmental Protection (CEP), described in Article 6. This committee, established by the protocol, is comprised of one representative from each of the parties to the CEP (Walsh, 2012). Article 7 describes the process required to obtain a permit describing the activities that would be undertaken in a preserved area, and Article 8 stated that

Sites or monuments of recognised historic value which have been designated as Antarctic Specially Protected Areas or Antarctic Specially

Managed Areas, or which are located within such Areas, shall be listed as Historic Sites and Monuments (Secretariat of the Antarctic Treaty, 1991).

Annex VI addresses environmental emergencies, contingency plans, financial liability, limitations and exemptions to liability. Article 10 states that

A Party shall not be liable for the failure of an operator, other than its State operators, to take response action to the extent that that Party took appropriate measures within its competence, including the adoption of laws and regulations, administrative actions and enforcement measures, to ensure compliance with this Annex (Secretariat of the Antarctic Treaty, 1991).

Article 12 provides for the Secretariat of the Antarctic Treaty to administer a fund for the reimbursement of the reasonable and justified costs incurred by a Party or Parties in taking response action to mitigate environmental disasters. Section 3 addresses special circumstances where

the fact that the responsible operator was an operator of the Party seeking reimbursement; the identity of the responsible operator remaining unknown or not subject to the provisions of this Annex; the unforeseen failure of the relevant insurance company or financial institution; or an exemption in Article 8 applying, shall be duly taken into account by the Antarctic Treaty Consultative Meeting...(Secretariat of the Antarctic Treaty, 1991).

In the event of inaction or ineffective response to an emergency, this article also provides an arbitration system in the case where individual or joint liability in emergencies was disputed or in question. Annex VI was adopted but an actual agreement on liability was never achieved. The strict liability system established by this annex is not in force, and by 2011 has been ratified only by Spain, Peru, Poland and Sweden (Aneiros, 2011).

Antarctic Treaty Consultative Parties (ATCPs) have never claimed responsibility over Antarctic tourism. Their self-assumed responsibility for governance of Antarctica and its environment has lead the U.N. to agree that the ATS and its regulatory efforts

supported the principles and purposes of the U.N. charter and the interest of mankind (Molenaar, 2005). This is an important point because it implies that the U.N. will defer to the ATCPs to self-regulate legal disputes.

Dispute resolution is often determined by considering international policy, politics, and forum shopping, and it has also been argued that the ATCPs self-assumed responsibility for Antarctica has established it as legally obligated to resolve any Antarctic-related legal questions (Molenaar, 2005). The difficulty in applying this reasoning becomes most evident when ATCPs are unable to enforce ATS stipulations on non-ATCPs, effectively undermining the purpose and legitimacy of the treaties and the ATCPs:

The fundamental international law principle of *pacta tertiis* stipulates that States cannot be bound by rules of international law unless they have in one way or another consented to them. An important disadvantage of the agreement to disagree in the Antarctic Treaty is that it does not provide or assert a basis under general international law by which non-parties to the Treaty can be bound, with obvious implications for effectiveness of governance. If a form of joint sovereignty or condominium had been opted for instead, this would have offered such a basis (Molenaar, 2005).

It been argued that the ATS is an “objective regime,” which is capable of creating *erga omnes*, towards all rights and obligations, regulating the conduct of non-ATCPs, but this

theory of objective regimes belongs to the arena of international law, it relies to a significant extent on universal acceptance and this is also at the heart of the notion of (international) legitimacy... (Molenaar, 2005).

ATCPs, and the ATS have received international support for several decades; there has been little need to invoke the theory of objective regimes because ATCPs have strictly

observed the *pacta tertiis* principle, and non-ATCP states still have little direct involvement in Antarctic activities (Molenaar, 2005).

International Association of Antarctic Tourism Operators, 1991

The International Association of Antarctic Tourism Operators (IAATO) was founded in 1991 by seven tour operators, with the objective “to advocate, promote and practice safe and environmentally responsible travel to the Antarctic” (International Association of Antarctic Tour Operators, 2013). For more than 30 years, approximately 2,000 tourists visited Antarctica each year (Bastmeijer, 2003). By 1994, with the convenience of air and sea travel, visiting tourists outnumbered scientists for the first time; several thousand tourists a year now arrive via plane and cruise ships, for eclipse-viewing expeditions, skiing, snowboarding, mountain climbing, iceberg expeditions, kayaking, marathons, long distance swimming, scuba diving, helicopter flights, film projects, new product testing, and meteorite hunting. Many of these activities seem out of alignment with the limitations proposed by the ATS (Bastmeijer, 2003).

With more than 90 current members (Bowermaster, 2007), IAATO has been very successful in showing the value of its work to the ATCPs (Pérez-Salom, 2000-2001). IAATO bylaws abide by ATS articles on waste management and interference with Antarctica flora and fauna, value judgments on allowable tourist activities are not specifically addressed (Bastmeijer, 2003). By 2003, parties to the ATS had agreed to discourage risky activities and to distinguish among those deemed responsible and irresponsible tourist activities, at least in principle, but little formal action was taken (Bastmeijer, 2003). Activities such as skiing, mountain climbing, kayaking, and scuba

diving, can be done elsewhere with considerably less environmental impact and far less risk.

Declaration on Antarctic Tourism, 1998

In an effort to mitigate the potential damage caused by tourists, the World Trade Organization (WTO) *Declaration on Antarctic Tourism* was adopted on December 1, 1998, by the WTO Executive Council at its 59th meeting held at Ushuaia, Argentina. This document addressed the peculiarities of the Antarctic ecosystem, declaring that states were responsible for the Antarctic tourist activities of their nationals which were to be carried out in a manner that did not damage the Antarctic ecosystem (Pérez-Salom, 2000-2001).

Questions about tourists' use of Antarctica are equally applicable to the space environment: Should parts of Antarctica be permanently preserved from tourist activities? Should certain activities, especially those that can be more safely undertaken elsewhere, be banned? Should structural facilities, such as hotels, visitor centers, and platforms, be restricted? (Bastmeijer, 2005) Bastmeijer's questions are rhetorical. No sound argument can be made for allowing tourists or Antarctic tourism companies to behave without restraint; failing to do so would have unforeseen and potentially irreparable consequences which could ruin the Antarctic environment, render it useless for activities of any kind, and permanently destroy its unique fauna and flora.

Insurance and Contingency Planning for Tourism, 2004

In 2004 the Antarctic Treaty Parties adopted *Measure 4 The Insurance and Contingency Planning for Tourism and Non-Governmental Activities in the Antarctic Treaty Area*. It requires tourism operators under the jurisdiction of Antarctic Treaty

parties to demonstrate contingency plans and sufficient arrangements for health and safety, search and rescue, and medical care and evacuation, without relying on support from other operators or programs without written agreement. *Measure 4* has not entered into force, but IAATO members voluntarily follow it (Secretariat of the Antarctic Treaty, 2004).

The range of tourism activities currently available on Antarctica did not exist even a few decades ago, and human imagination will arrive at ever riskier adventures, such as those demonstrated in the X Games and via the Darwin Awards, and through activities such as bungee jumping and sky diving, challenging the tenets of the ATS and its signatories. Antarctic motorcross events, weddings, survival courses, hotels or casinos, and vehicle testing facilities (Bastmeijer, 2003) are among the possibilities that may be faced in the immediate future.

Tourism can interfere with scientific endeavors, including fishery, avian, and mammal population studies, biological and geological surveys, and shipping related to the movement of scientific equipment and support operations. Risks to the pristine Antarctic ecosystem, however, have the most severe consequences, since the damage tends to be long-term or irreversible. Human interaction in more familiar and accessible environments has demonstrated that humans have a unique ability to inflict damage without considering the potential impact (Molenaar, 2005). Without regulations to govern interaction with the Antarctic environment, our species would undoubtedly find other means to simultaneously injure ourselves and the Antarctic environment.

Antarctic tourism does, however, have its benefits, primarily the creation of “ambassadors for Antarctic conservation and science” (Molenaar, 2005). Exposing a

growing number of Antarctic tourists and crews to this fragile, unique, and extreme environment increases world-wide awareness of the dangers that it, and other delicate environments face. Cruise lines have also begun to educate their employees about environmental protection, creating programs to encourage crewmembers to submit suggestions to improve environmental procedures and policies (Wright, 2008-2009).

Lee (2005) recommended that sovereignty in Antarctica be relinquished and that a single authority, the ICJ, become the sole arbiter of disputes. He proposed that this would eliminate a need for consensus, states would be required to appear before the Court, individuals would no longer be excluded from legal standing, and offenses of any nature, whether the abuse of governmental power or an affront to the environment, would be resolved in the same tribunal. Political pressure imposed by more powerful states would be neutralized and global justice in Antarctica could potentially be achieved. He rejected the idea of allowing the U.N. to resolve legal issues in Antarctica, because it behaves as a horizontal institution, rather than a vertical one, controlled by powerful governments.

Antarctic treaties and oversight cannot guarantee environmental preservation, tourist safety and good behavior, international cooperation, scientific success, and appropriate resource management. Without legal agreements, however, none of these is likely possible nor sustainable.

IX. INTERNATIONAL SPACE STATION: SAFETY, TRAINING, AND MEDICINE

The reality of human nature is such that as humankind settles in space, whether on celestial objects such as the Moon or planets, or in space stations orbiting planets or traversing into the unknown, law and order must be maintained on board these settlements. How such order is maintained, and what law will be used to do so, will by necessity, and ideally by choice, be the result of careful thought, consideration, and negotiation.

Hans P. Sinha
*Criminal Jurisdiction on the International
Space Station, 2004*

International Governmental Agreement, 1998

The *1998 Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station* (1998 IGA), an updated version of the 1988 agreement, that now includes Russia. This agreement is not a treaty, but in most states, including the U.S., where it is considered a “Congressional-Executive agreement,” it carries the weight of a treaty (Sinha, 2004).

International space agreements that address jurisdiction must consider existing international law, state laws, and inter-agency codes governing the conduct of humankind in space. Criminal jurisdiction in space, for example, can be defined as “the competence of a state to prescribe and apply policy with respect to particular events defined as

criminal by the state in question, and occurring in outer space” (Sinha, 2004), and pertains to a state’s ability to extend or exert its sovereign powers over a territory or into space. States have chosen to apply their individual criminal laws to acts occurring in outer space, but have agreed, as ISS partners to enact a single criminal code specifically for the ISS (Sinha, 2004).

The 1998 IGA clearly defines criminal jurisdiction on the ISS. Article 5 provides the general jurisdictional framework which relies upon the principles of territoriality and nationality. The territoriality principle is invoked by a partner registering its ISS flight element in accordance with the Article II of the Registration Convention, a state can then, pursuant to Article VIII of the Outer Space Treaty, retain jurisdiction over that flight element. Article 5(2) also provides a jurisdictional foundation based on the nationality principle, stating that “each Partner shall retain jurisdiction and control over the elements it registers...” and can retain jurisdiction over not only acts occurring in one of its flight elements, but also over acts committed by its nationals regardless of on or in which flight element that national may commit an offense (Sinha, 2004).

Article 16 defines “launch vehicle” as an object intended for launch, launched from or returning to Earth which carries payloads, persons, or both, and a “payload” as property to be flown or used on or in a launch vehicle or the ISS. More importantly, this article also addresses cross-waiver of liability (National Aeronautics and Space Administration and the European Space Agency, 1998), defined as

a set of promises made by parties to an agreement in which each of the parties pledges not to sue the other for damages caused by the other, except under specific circumstances. Moreover, each party also pledges that not only will it not sue the other, but also it will ensure that any entity related to it will not sue the

other or any entity related to the other, except, again, in those same very few, and very limited, circumstances (Mirmina, 2012).

This is of particular interest, since it both deviates from and adheres to parts of the Liability Convention, which holds that states are strictly liable for damage caused on Earth by space objects, depending on close cooperation among partner states with the goal of strengthening strong space-based relationships (Zhao, 2004).

Article 22(2) addresses the international nature of activities aboard the ISS, and situations where misconduct among personnel of different states has the potential to affect prosecutorial interest (Sinha, 2004):

in a case of misconduct in orbit that: (a) affects the life or safety of a national of another Partner State or (b) occurs in or on or causes damage to the flight element of another Partner State, the Partner State whose national is the alleged perpetrator shall, at the request of any affected Partner State, consult with such State concerning their respective prosecutorial interests (National Aeronautics and Space Administration and the European Space Agency, 1998).

Article 22(3) is an innovative solution to the issue of non-terrestrial extradition. It addresses the situation where no extradition treaty exists between two states, for example, between the U.S. and Russia (Sinha, 2004):

If a Partner State which makes extradition conditional on the existence of a treaty receives a request for extradition from another Partner State with which it has no extradition treaty, it may at its option consider this Agreement as the legal basis for extradition in respect of the alleged misconduct on orbit. Extradition shall be subject to the procedural provisions and the other conditions of the law of the requested Partner State (National Aeronautics and Space Administration and the European Space Agency, 1998).

As Sinha (2004) stated:

Whatever legal framework is eventually adopted for future space settlements, whether on celestial bodies, or in space stations, the criminal

jurisdiction will certainly be influenced by, if not patterned on, the principles agreed upon in Article 22 of the 1998 IGA.

Crew Code of Conduct, 2000

The 2000 *Code of Conduct for the International Space Station Crew* (ISS Code of Conduct) is the “core document” (Brüner and Soucek, 2007) defining astronaut behavior aboard the ISS. The ISS Code of Conduct establishes “a clear chain of command on-orbit,” “a clear relationship between ground and on-orbit management,” and sets “forth standards for work and activities in space” (National Aeronautics and Space Administration and the European Space Agency, 2000). Section 2 provides that all aspects of flight, including safety, general standards of behavior:

pre-flight, on-orbit and post-flight activities, they shall comply with the ISS Commander's orders, all Flight and ISS program rules, operational directives and management policies, as applicable. These include those related to safety, health, well-being, security and other operational or management matters governing all aspects of ISS elements, equipment, payloads and facilities, and non-ISS facilities, to which they have access... (National Aeronautics and Space Administration and the European Space Agency, 2000).

Crew Selection, 2001

In 2001, the ISS Multilateral Crew Operations Panel (MCOP) was charged with “defining the processes, standards and criteria for selection, assignment, training, and certification of Space Station crew for flight.” The MCOP *Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers: Revision A* (ISS Crew Selection) defined four different categories for space travelers:

- a professional astronaut/cosmonaut is an individual who has completed the official selection and has been qualified as such at the space agency of one of the ISS partners and is employed on the staff of the crew office of that agency;

- a space flight participant is an individual engaged in commercial, scientific, engineering, educational, journalistic, artistic, tourist or other programs or activities, or a crewmember of non-partner space agency, sponsored by one or more partners, as part of a short-term contract;
- an expedition, or main crewmember responsible for implementing planned activities; and
- a visiting crewmember, usually an astronaut or cosmonaut, who travels to or from the ISS, but is not part of the expedition crew.

The ISS Crew Selection agreement provides a list of conditions that would be used to disqualify potential crewmembers, including

criminal, dishonest, infamous, or notoriously disgraceful conduct;
intentional false statement or fraud in examination or appointment;
habitual use of intoxicating beverages to excess; abuse of narcotics, drugs,
or other controlled substances

and allowed for consideration of the “age of person at time of the misconduct” and

“contributing social or environmental conditions” (International Space Station

Multilateral Crew Operations Panel, 2001). Crew members are also required to meet medical standards, and sponsoring agencies need to consider a candidate’s

relevant operational experience; demonstrated performance under stress;
ability to function as a team member; high moral integrity;
adaptability/flexibility; and motivation consistent with the program
mission (International Space Station Multilateral Crew Operations Panel,
2001).

Selection criteria for space tourists will not have to meet the same strict requirements, but boundaries will need to be established for acceptable behavior and medical fitness.

According to MCOP definitions, there are clear distinctions between space flight participants, and crew members. Many space tourists will want to engage in at least some of the activities defined by the MCOP on both short- and long-duration flights, and these definitions, along with suitable selection criteria and codes of conduct, can be used to enforce appropriate behavior. These became relevant before Tito’s 2002 flight to the

ISS, which raised concerns among ISS partners from Europe, Canada, Japan, and the U.S. They requested that the RSA ensure that Tito would not risk the safety of the ISS crew, and objected because Tito had not completed mandated MCOP training, his presence was not appropriate given the intensity of the on-orbit operations during the proposed flight, and RSA had not followed appropriate legal and administrative steps to include Tito on the flight (Spaceref.com, 2001). After further discussion, the Multilateral Coordination Board (MCB) agreed to allow Tito to visit the ISS provided that he assumed personal monetary liability for any damage he caused and that he consented to not file claim against any ISS partner in the case of any injuries he suffered. Because Russia had already agreed to allow Tito's ISS visit, it was forced to take out a \$100,000 insurance policy to comply with the demands of the ISS partners. Satisfied by the success of his trip to the ISS, NASA and the other partners agreed to visits by other space tourists (Failat, 2012).

Medical Standards, 2002

The purpose of common physical and psychological medical standards, evaluation lists, and regulations is to certify crewmembers and space tourists, develop in-flight procedures, address environmental issues, and create post-flight rehabilitation schemes after long-duration flights. Once the RSA began offering space tourists seats on Soyuz vehicles in order to visit the ISS, specific criteria were needed to define space tourist selection to ensure that they would meet minimum health standards and that they would not endanger the crew or the mission. The first document specifically addressed requirements for space tourists, who would be on the ISS for less than 30 days. The *Medical Standards and Certification Procedures for Space Flight Participants* (Medical

Standards) was approved in May, 2002, and provides the partners with the authority to medically certify space tourists (Duncan et al., 2008).

Balance Agreement, 2006

In 2006, NASA and the Federal Space Agency of the Russian Federation signed the *Second Addendum to the Implementing Arrangement Entitled “Protocol Including Terms, Conditions and Assumptions, Summary Balance of Contribution and Obligations to International Space Station (ISS) and Resulting Rights of NASA and RSA to ISS Utilization Accommodations and Resources, and Flight Opportunities”* (Balance Agreement). Noteworthy for its lengthy title, it recognizes that space-related activities are dynamic, rather than static, enterprises:

The specific objectives of this Addendum are to establish common approaches to key operational issues and effect a Balance Agreement Addendum partial rebalance of the NASA and Roscosmos efforts until such time as a more complete evaluation and comprehensive rebalance can be completed through future adjustments of the Balance Agreement (National Aeronautics and Space Administration and the Federal Space Agency of the Russian Federation, 2006).

It also lists specific responsibilities of NASA and the RSA, including those related to crew size, safety, habitation, stowage, propellant, and waste removal requirements.

Article 5 requires that all space activities will be conducted under the respective laws of the United States and Russia. Article 6 allows for amendments, Article 7 allows for new agreements to supersede the existing agreement, and Article 8 allows parties to withdraw (National Aeronautics and Space Administration and the Federal Space Agency of the Russian Federation, 2006).

X. CONCLUSIONS AND RECOMMENDATIONS

Lessons from the Aviation Industry

...the label of 'space tourism' is too limited as a legal category: its focus on the motivation (for pleasure, as opposed to science or training) as the decisive criterion to set these activities apart from more traditional spaceflight is a doubtful legal distinguisher. For purposes of air law (one of the areas of law often referred to in the context of legal issues concerning space tourism), for example, the motivation for someone to take a flight is basically irrelevant.

Frans G. von der Dunk
Space Tourism, Private Spaceflight and the Law: Key Aspects, 2011

ICAO and Space Tourism Oversight

A March, 2010 FAA report noted the importance of airspace traffic management and that no single federal agency currently has total responsibility for the operations of U.S. commercial space flights, and that neither aviation regulations nor current space-related laws consider even suborbital space flight. The report also confirmed that the ICAO would be in the best position to develop safe and orderly regulations for commercial space tourism transportation (Nase, 2012). Incorporating international space tourism under the ICAO, per the Chicago Convention and its annexes, would support consistent international standards and recommended practices for space transportation and create an effective mechanism for their implementation at the international level (Jakhu and Nyampong, 2010).

The lobbying effort to create an international ICAO for commercial space flight began in 2007 at the International Association for the Advancement of Space Safety (IAASS) meeting, with a draft document proposing an extension of ICAO's mandate to include space traffic management and safety up to and including geostationary orbit (Flightglobal, 2007). Integrating air and space transportation systems, retitling the Chicago Convention as the *Convention on International Civil Aerospace Transportation*, and renaming the ICAO as the International Civil Aerospace Organization would provide needed support for the space tourism industry (Jakhu and Nyampong, 2010).

Existing space safety regulations are currently the domain of individual state agencies, such as FAA/AST and the European Aviation Safety Agency (EASA), established in 2002. EASA is responsible for implementing air-related rules adopted by the European Commission, including airworthiness certification and compliance for suborbital airplanes, passenger safety and equipment, and ground facilities. Cooperation with ESA, FAA and ICAO is considered essential to EASA's international success (Marciacq, 2010). There are no international agreements, however, that require EASA or other state space tourism regulating agencies to consistently follow FAA/AST regulations. The "special contracts" clause of E.U.'s Brussels I, Article 15 applies to E.U. citizens (Chatzipanagiotis, 2011), but how its application in the space tourism industry will affect civil judgments and forum selection is unknown.

Bilateral and multilateral agreements, manifestations of diplomatic optimism, are positive steps in achieving international goodwill, but governments can essentially modify the terms of those agreements after-the-fact by enacting new laws, creating ambiguity about the legality of previously instituted agreements. The bilateral 1992

Russian Federation Agreement, for example, facilitated international cooperation between the U.S. and the Russian Federation. The 1993 Russian Space Activity Law, which applies to both military and civilian space efforts, instituted RSA safety standards that differ from those of ESA and NASA (United Nations Office for Outer Space Affairs, 1993), which could be interpreted as a legal attempt to “change the rules.”

As the number of states involved in space tourism activities increases, inconsistencies among bilateral and multilateral agreements, real and perceived differences in safety standards, and legal means for enforcement, have the potential to negatively impact the space tourism industry. When passengers have no guarantees that safety standards are maintained, most passengers will be unwilling to take unnecessary risks. International oversight is necessary to ensure that commercial space efforts will produce consistent legal regimes and safety standards to minimize risk, confusion, and disaster. Space tourism is an industry already characterized by an absence of a safety record and as yet unrealized flight expectations. Minimizing ambiguities and differences among international space tourism laws, procedures, and processes can best be achieved by an International Civil Aerospace Organization.

Spaceports and Space Traffic

Space traffic management, as defined by the International Academy of Astronautics in its 2006 *Cosmic Study on Space Traffic Management* report, means

the set of technical and regulatory provisions for promoting safe access into outer space, operations in outer space and return from outer space to Earth free from physical or radio-frequency interference (Ailor et al., 2006).

In the U.S., the FAA/AST requires spaceport applicants to submit information on the proposed launch site operator, launch site location, foreign ownership interests, and launch site operations (Mineiro, 2010), spacecraft trajectory, and emergency plans (Federal Aviation Administration, June 15, 2005). Spaceports, like airports, will be a mix of publicly coordinated functions and private enterprise corporations. As of 2013, there were 17 U.S. spaceports either in the planning stage or under construction, under FAA or federal control, and four located in other states (Jakhu and Nyampong, 2010).

As commercial launch rates increase, as passengers, inflatable space habitats, and space hotels go into orbit, and as the launch rate and distribution of spaceports across the U.S. accelerates, the National Airspace System (NAS) will need to support, balance, and incorporate suborbital, and orbital spaceflight traffic into the Space and Air Traffic Management System (SATMS). According to the FAA, this will require establishing reserved airspace near spaceports and incorporating the air traffic control (ATC) system to verify that space tourism vehicles remain within their designated airspace during descent and landing (Federal Aviation Administration, June 15, 2005).

Commercial Spaceflight Federation

The Commercial Spaceflight Federation (CSF) is comprised of “the leading businesses and organizations working to make commercial human spaceflight a reality” (Commercial Spaceflight Federation, 2014), including Alaska Aerospace Corporation, Blue Origin, Boeing, Cecil Field Spaceport, Masten Space Systems, Mojave Spaceport, Paragon SDC, Planetary Resources, Sierra Nevada Corporation, Southwest Research Institute, Space Adventures, Space Florida, Spaceport America, SpaceX, United Launch

Alliance, Virgin Galactic, and XCOR Aerospace (Commercial Spaceflight Federation, November 27, 2013).

Universities, educational and non-profit institutions can become Research and Education Affiliates. Among these are Berkeley, Embry Riddle Aeronautical University, George Mason University, Iowa State University, Johns Hopkins, Princeton, Purdue, and the University of Central Florida (Commercial Spaceflight Federation, November 30, 2013).

CFS' mission is

to promote the development of commercial human spaceflight, pursue ever-higher levels of safety, and share best practices and expertise throughout the industry...which include commercial spaceflight developers, operators, spaceports, suppliers, and service providers, are creating thousands of high-tech jobs nationwide, working to preserve American leadership in aerospace through technology innovation, and inspiring young people to pursue careers in science and engineering (Commercial Spaceflight Federation, November 22, 2013).

CSF, more than any other commercial, state, or international space organization, has the expertise and leadership to make space tourism a reality. The ICAO must work with CSF to establish appropriate regulatory structures and performance criteria for all phases of the space tourism industry because CSF organizations have the technical, development, manufacturing, and operating expertise (Crowther, 2011) that as Rutan noted, government regulators do not.

Launching State and Licensing

International consensus to resolve technical, costly, and risky state and international issues arising from space tourism launches will need to be fair, transparent, logical, and balance the safety, economic, and technological aspects of launch operations

(von der Dunk, 2011). The approach must enable the space industry to develop in the same way as the aviation industry did over the last century (von der Dunk, 2012). Some states are taking the initiative to establish spacecraft licensing systems, which include regulations regarding reimbursement by private launch operators in the case of accidents and which require that licensees carry sufficient insurance. In the U.S., space tourism licensing is handled by the FAA/AST per the 1984 Commercial Space Launch Act and its subsequent amendments.

The Chinese government is currently not focused on space tourism efforts and ITAR prevents Chinese citizens from participating in U.S. space tourism flights (Jin, 2008). Eventually, the Chinese government will create its own space tourism industry to provide its citizens and those from other banned states with space tourism opportunities, whether motivated by competitive political ideology or scientific exploration. In 2001, Order No. 6 of the Commission of Science, Technology, and Industry for National Defense and the Ministry of Foreign Affairs of the People's Republic of China created the *Measures for the Administration of Registration of Objects Launched into Outer Space* (Measures for Registration). Article 3 states: "These measures shall apply to all space objects launched in the territory of China, and the space objects jointly launched abroad by China and other States" (P.R.C. Ministry of Foreign Affairs, 2001).

The Chinese Commission of Science and Technology and Industry for National Defense (COSTIND) is responsible for space object registration. Measures for Registration requires that the Department of International Cooperation and the Ministry of Foreign Affairs also be consulted (P.R.C. Ministry of Foreign Affairs, 2001) under circumstances that are not clearly defined. Article 14 states:

For international registration of a space object jointly launched by China and other States, the State of Registry shall be determined by the Ministry of Foreign Affairs after consultation with concerned States in accordance with the Registration Convention (P.R.C. Ministry of Foreign Affairs, 2001).

The Registration Convention, however, requires that where there are two or more launching states involved in a launch, they shall jointly determine which one will register the object (United Nations Office for Outer Space Affairs, 1974). This is only one example of a discrepancy between the application of international law and state practice.

The Chicago Convention and its associated SARPs provided the licensing structure and, as noted, communication protocols to encourage international expansion of the aviation industry. SARPs for space tourism will be necessary to ensure international launch and licensing procedures to maintain communication, safety, and risk standards as space tourism demands increase and as new states enter the space tourism market.

Liability and Insurance

Despite an excellent and continually improving safety record there are certain risks inherent in space travel and an extremely high cost of payload. Because of this it is necessary for the Space Carrier to advise you that it cannot be responsible for the return of your body to Earth should you become deceased on the Moon or en route to the Moon. However, it wishes to advise you that insurance covering this contingency is available in the Main Lounge.

Thank you.

Arthur C. Clarke and Stanley Kubrick
A Space Odyssey Screenplay, 1968

Title 14, Chapter 2, Subchapter A, Part 205, *Aircraft Accident Liability Insurance*

requires that

- (a) A U.S. or foreign direct air carrier shall not engage in air transportation unless it has in effect aircraft accident liability insurance coverage that meets the requirements of this part for its air carrier or

foreign air carrier operations (Legal Information Institute, November 28, 2013).

Consequently, there is already a well-established air and space insurance industry, with approximately 30 insurance providers currently offering coverage for launch and in-orbit operations of government and commercial satellites. Most of the providers are large insurance companies, which could manage their exposure to the space industry (Freeland, 2010).

Third party liability insurance under air law covers claims of third parties on the grounds of death, personal injury, or property damage. There is no current international space law framework for third party liability. FAA regulations for space tourism vehicles launching from the U.S. are the most comprehensive, and require that the operator obtain liability insurance or demonstrate financial responsibility for the maximum probable loss from claims by a third party and to the U.S. government, for damage to, or loss of, government property. The maximum insurance coverage required for third party liability is \$500 million; above that amount, up to \$1.5 billion in third party claims will be paid by the federal government, but for amounts in excess of \$1.5 billion, the operator is liable (van Oijhuizen Galhego Rosa, 2012).

Lack of international agreement on liability limits and insurance requirements complicates international space tourism operations. ICAO, FAA/AST, EASA, and private space tourism operators will need to create an international legal insurance framework that balances the interests of the state, its citizens, space tourists, and private operators (von der Dunk, 2012). This can be accomplished by establishing a “Warsaw Convention for Space Tourism” modeled on the 1929 Warsaw Convention and its

subsequent amendments, including the 1952 Rome I, which specifically addressed air carrier liability for those injured on the ground as a result of air transportation mishaps (United Nations International Civil Aviation Organization, 1952), the 1995 Intercarrier Agreement on Passenger Liability, which because of its simplicity, could be adapted to reflect the changing state of the air tourism industry.

Lessons from Antarctica: Preserving and Protecting the Space Environment

Antarctic tourism regulations attempt to balance scientific research, economic resource exploitation, and tourism activities to maintain the delicate Antarctic environment. Like Antarctica, space will be utilized for each of these, the extent of which has not yet been fully explored (Peterson, 1997). Without regulations similar to those of the 1959 Antarctic Treaty, 1988 Mineral Resources Convention, 1991 Environmental Protection Protocol, 1998 Declaration on Antarctic Tourism, the space environment may be subjected to its equivalent of *Exxon Valdez-like* disasters, or worse, as access to space goes beyond a small group of wealthy tourists. The need to protect and preserve space artifacts and biological material will necessarily follow as hotels, waste and storage facilities, and transportation routes have the potential to damage footprints, rover tracks, and equipment.

Our limited knowledge about planetary environments is expanding. The *Spirit*, *Opportunity*, and *Curiosity* rovers have not yet found signs of Martian flora or fauna, so establishing levels of protection for extraterrestrial life of any kind will depend on the nature of that life and the environment in which it is located. If identified, it is likely to be found in an environment similar to that of Antarctica.

A New Space Treaty System

Current space treaties are separate and distinct; the ATS framework incorporates an array of unified Antarctic treaties that build upon each other and address environmental management, such as the designation of special management areas or protected zones, the development of a comprehensive environmental protection protocol, and the establishment of codes of conduct for terrestrial tourists, can be similarly created for celestial environments, space operators, and space tourists (Ehrenfreund, 2012).

There is a vast array of outer space environments, from the terrestrial Martian surface and ice-covered Jovian moons, where life could exist, to the Moon and low-gravity asteroids, where life will not exist. Both types of environments require protection to prevent accidental contamination, exploitation and destruction.

International Association of Space Tourism Operators

An IAATO for the Moon and other celestial bodies, an International Association of Space Tour Operators (IASTO) could advocate for responsible travel into space, define acceptable space tourist activities, and protect previous landing sites and space-related property. Under traditional property law, property is considered abandoned when it is vacated with the intention of not returning. Future lunar tourism operators might claim that the U.S. abandoned Apollo property because the U.S. has no concrete plans to retrieve Apollo artifacts, and if the courts were to agree, the U.S. would have relinquished its ownership claims to lunar artifacts, however, current space law contains no legal mechanisms for declaring space property as abandoned, subject to salvage, or removable without the owner's permission (Kleiman, 2011). The U.S., however, has taken no action

to indicate that it has abandoned lunar artifacts, and an IASTO could take a leadership position in preserving and protecting U.S. and Russian landing sites.

This is an important point because it implies that the U.N. will defer to the ATCPs to self-regulate legal disputes.

International Declaration on Space Tourism

There is a substantial volume of artifacts left on the lunar surface from U.S., Soviet, and Japanese manned and unmanned missions. On January 29, 2010, the California State Historical Resources Commission voted unanimously to designate more than 100 items at the Apollo 11 lunar landing site as protected resources. This innovative action was based on the participation of and in support of the companies and employees of California corporations that had worked on the Apollo missions, and that many of the historically significant items that they produced remain on the lunar surface (McKinley, 2010). But it is not internationally binding.

Preservation of probes, rovers, lunar modules, experimental equipment, cameras, jettisoned objects at six lunar landing sites, astronaut footprints, and personal items, such as Alan Shepard's Apollo 14 golf balls and Charlie Duke's Apollo 16 family photo, are invaluable and irreplaceable traces of human exploration, and belong to all mankind (Spennemann, 2007). They are an integral part of human history, of a vast technological, political, economic and social enterprise that directly and indirectly touched the lives of millions of humans and which will be forever part of the human experience. Space tourism operators need to ensure that their passengers are able to access these objects only through a camera lens.

As we venture into space appropriate tourism activities need to be defined.

Masson-Zwaan and Freeland (2010) asked several interesting questions related to our future use of outer space and celestial bodies:

Would it be acceptable, for example, to allow advertising billboards to be constructed, or casinos or even brothels to be established on the moon to cater to space tourists? How do space tourism activities correlate with the underlying philosophy of international space law, namely that the exploration and use of outerspace shall be carried out for the benefit and in the interests of all countries and that they shall be the province of all mankind?

These questions are similar to those that were addressed by the Declaration on Antarctic Tourism in 1998. Should parts of space be permanently preserved from tourist activities? Should certain activities be banned? Should structural facilities, such as hotels, visitor centers, and platforms, be restricted? No sound argument can be made for allowing space tourists or space tourism operators to behave without restraint; failing to do so would have unforeseen and potentially irreparable consequences which could ruin the space environment, render it useless for activities of any kind, and permanently destroy life or the potential for life on celestial bodies.

Lessons from the International Space Station

Regulations on short suborbital or orbital flights will differ from those on longer duration flights, to the Moon and beyond. Short flights will not require space tourists to demonstrate technical expertise, since they will be restricted to their seats like airline passengers, who obviously require no special training. Longer flights, however, will likely mandate that space tourists possess skills and behaviors to protect the physical and mental well-being of other passengers, demonstrate proper use life support and

communication systems in case of emergencies, and take steps to preserve the spacecraft and outer space environment.

Space Tourist Code of Conduct

The ISS Code of Conduct would serve well as the basis for a future *Space Tourist Code of Conduct* (STCC) and could be modified to include language specifically relevant to space tourist training, certification, in-flight activities, and interaction with other tourist participants as well as control, launch, and flight crews. All space tourists will need to be held accountable during preflight training activities and should be subject to removal from flight consideration if they fail to abide by an STCC.

Safety Standards and Human Factors Considerations

Safety First. Basic emergency response training, prescribed by our regulators will be at the forefront. Activities to familiarize you with the spaceflight environment will follow a close second.

Virgin Galactic
The Dream, 2013

Every space tourism vehicle must be sufficiently robust to endure meteor impacts, radiation, and other known space environment dangers. The spacecraft should also be stocked with emergency supplies and a reliable life support system. This leads to the necessity for a “lifeboat,” an attached vehicle, or one on Earth, which can be quickly deployed to initiate a space rescue. ISS practice requires a vehicle be attached to the habitat in the event that the station needs to be evacuated. Space operators could keep a small fleet of space tourism vehicles operating simultaneously to initiate rescues (Beamer-Downie, 2012).

In 2008, Congress mandated that spacefaring nations engage in discussions that would ensure common docking systems on all space vehicles. For the ISS, as an international endeavor, this was a necessity; for the space tourism industry, it should also be a requirement, since common systems greatly increase the possibility of successful rescue missions (Beamer-Downie, 2012). While this may prove to be initially expensive, cooperation among space tourism operators will inform space tourists that safety is an industry priority, and will encourage their participation in space-related tourism activities.

Crew Training

The greatest challenge in the early days of space tourism will be ensuring the space participant safety, which will require proper crew training. In the event of an emergency, the crew's skill at saving passengers could determine their fate as well as that of the space tourism company (Sundahl, 2009). Space tourism operators will need to establish crew resource management practices and safety systems to mitigate risk. Rules, regulations and standard practices must be the result of collaborative efforts between the private sector and regulators (Beamer-Downie, 2012). Many of those have been articulated in the 2005 Draft Guidelines for Crewed Commercial Suborbital RLV Operations and Draft Guidelines for Passengered Commercial RLV Operations.

Passenger Training

Of all of the aspects of space tourism, those concerning passengers are the most unpredictable. Space tourists are not astronauts in the conventional sense. They receive minimal training, do not need to meet the same strenuous medical standards as astronauts or cosmonauts, have not been studied as a group or as individuals to assess their physical or psychological reactions to stressful situations, and have not engaged in a wide variety

of scientific, medical, technological, and social experiments as those who have been in space repeatedly or for long time periods.

Peeters (2010) characterized space tourism as: “a once-in-a-lifetime experience that will attract people who are not risk averse...tourists want to be a part of the astronaut experience and are willing to undergo (limited) training.” To meet that expectation, commercial entities have designed training opportunities for space flight participants. Atlas Aerospace offers General Space Training (GST), Specialized Space Training (SST), and Preflight Space Training (PST). Atlas markets the program to cosmonauts, astronauts, and pilots, but also to

space tourists who get ready to participate in short-time manned missions on Russian space ships ‘Soyuz’, and on other prospective space crafts built for implementation of space orbital or suborbital flights” (Atlas Aerospace, 2013).

Black Sky Training also offers training for space flight participants, but that training is obviously not as rigorous as those required of pilots or crew members:

The FAA also realizes the value of training and requires that each space flight participant, before flight, be trained in “how to respond to emergency situations, including smoke, fire, loss of cabin pressure, and emergency exit.” Each spaceflight participant will undergo training to prepare them for the flight. The lessons will be tailored for the vendor they will fly with and the spacecraft they will ride. These lessons include emergency situations, G tolerance, high altitude and pressure suit training. Mock ups of the spacecraft they will ride will be used in emergency simulation drills as well as orientation rides in the BST rocket trainer (Black Sky Training, 2013).

Training that meets FAA requirements would likely take several weeks. Virgin Galactic, however, plans on only three days of pre-flight preparation for sub-orbital travel which raises questions about the effectiveness of that training especially in emergency situations (Reddy et al., 2012).

No matter how they are defined, astronaut or space tourist, the risks of voyaging into space will remain. Space is a dangerous environment, but risks can be mitigated through the application of safety standards and appropriate training to provide space participants with unique and profound experiences.

Medical Requirements

The most likely illness encountered by space tourists during flights longer than two hours will be space motion sickness (SMS), characterized by nausea, headache, dizziness. Two-thirds of all astronauts experience SMS during the first hours in space, it is difficult to predict and cannot necessarily be induced by ground-based or parabolic flight training (ISU Summer Session Students, 2000).

Other medical problems were experienced by astronauts and cosmonauts in the last 50 years, but because they undergo lengthy training, some of those problems can be identified or mitigated before they enter space. This will not be the case with space tourists, whose symptoms may not appear until they are actually in space, under low gravity. During short orbital and suborbital missions, some of which will be shorter than normal airplane flights, these conditions will likely not be serious. For very short duration sub-orbital flights, only guidelines similar to those for variable gravity rides, like roller coasters may be necessary.

For orbital, lunar, or long-term flights, hypertension, heart disease, psychiatric illness and pregnancy would exclude prospective passengers from traveling into space. Cardiovascular, hematological, and musculoskeletal may manifest themselves during the flight or even after they return to Earth (Stewart et al., 2007). Kluge et al. (2012)

suggested that a medical questionnaire, flight surgeon screening, training, reevaluation, and preflight checkout could prevent sending unfit passengers into space.

All space tourists, with few exceptions, would need to be physically able to enter and exit the spacecraft. Passengers denied tickets on this basis, or those not meeting some physical or psychological standard for space flight, might sue under the *Americans with Disabilities Act*. If disabled passengers are allowed to fly in space, whether or not they would be able to bring helper animals raises another issue, as do minimum and maximum minimum passenger ages (Scott, 2000). Virgin Galactic founder Richard Branson has also publicly stated that his 91-year-old father plans to fly with him on the first commercial *SpaceShipTwo* flight (Futron Corporation, 2006).

In the event of a medical emergency, a carrier could be sued for failing to have resources and equipment available to save a passenger. FAA/AST flight crew guidelines require all members of a space tourism flight crew to be to operate the vehicle in the event of an emergency, but do not list recommendations for emergency medical training. In the absence of legal regulations covering space tourism, space tourism operators should provide reasonable medical support by including first aid equipment and communication channels with medical experts on Earth (Marsh, 2006).

The ISS serves as a good example for commercial space operators. Two members of each ISS crew are trained crew medical officers (CMO), responsible for station medical treatment. ISS crew have an advanced life support pack, medical restraints, a protection kit in the event of toxic contamination, an ultrasound, a defibrillator, and an emergency respiratory support pack for stabilization prior to emergency transportation back to Earth. CMOs have the support of an entire medical team of physicians,

biomedical engineers, information technology specialists, nurses, and a flight surgeon, via radio and video communications (Marsh, 2006).

Space tourism companies would be well advised to carry basic medical equipment on suborbital, orbital, and long duration flights, and additional equipment for longer flights, and should adapt some of the processes and procedures currently used by NASA, RSA, and their partners, carefully developed over the last four decades during ISS missions. At a minimum, these should include on-call physicians for telemedical consultations, surgical facilities, sterilization and transfusion equipment, an automatic external cardiac defibrillator (Stewart et al., 2007) and appropriate pharmaceuticals for space sickness and heart conditions (Marsh, 2006).

A Global Code for Space Tourism

The most challenging problems of the planet are global—the environment and global warming and climate change, ocean management, poverty and diseases, food and energy, near earth objects and planet protection, war on terror, are examples. These problems, however, are shared and cannot be solved by any one nation alone. Space is a global common and shared resource, and space technology potentially a valuable tool for the mitigation of these problems. Yet, when collaborative space initiatives are suggested as solutions, policy and governance serve as barriers.

Joseph Fuller, Jr., David Vaccaro and
Dustin Kaiser
*Space Policy and Governance as Barriers to
International Collaboration*, 2010

In 2001, the United Nations World Tourism Organization (UNWTO) adopted the *Global Code of Ethics for Tourism* (Tourism Code). Article 4(1) states "Tourism resources belong to the common heritage of mankind; the communities in whose territories they are situated have particular rights and obligations to them..." (United Nations World Tourism Organization, 2001). The "common heritage of mankind"

principle is a recurring theme in many of the laws, treaties, and codes that reference human behavior. A modified version of this code may serve as a potential model for a future space tourism code.

The majority of the laws, regulations, codes and declarations that control commercial space tourism operators and their passengers have been created by political entities, state and international governments, and the U.N., through agreements arrived at through the deliberations of government representatives. While these may suffice for now, in the future many will be ineffective and unenforceable. Behavioral norms, enacted by states in a non-global society, are unsustainable in a modern, globalized world, characterized by

- boundaries that transcend territorial limits, formed by invisible colleges, invisible markets and branches, invisible professional communities, invisible social networks that call for the emergence of new laws;
- legislative bodies of diminishing importance; global law is produced in self-organized processes of structural coupling of law with ongoing globalized processes of a highly specialized and technical nature;
- independence; legal processes in some states have become insulated and may be enforced in the foreseeable future, but global laws will work to reduce their weaknesses; and
- legal evolution that relies upon a variety of legal sources (Teubner, 1997).

In the world of the future space tourist, a new set of laws which are the result of a “plurality of competing laws” (Robé, 1997) will need to be established for space, which extends far beyond the global arena. As Teubner (1997) suggested

The new living law of the world is nourished not from stores of tradition but from the ongoing self-reproduction of highly technical, highly specialized, often formally organized and rather narrowly defined, global networks of an economic, cultural, academic or technological nature.

In a space society, where existing legislative bodies not only lack the technical expertise to regulate the space tourism industry and enact damaging laws, like the Arms

Export Control Act and the ITAR, state regulations will be replaced by codes created by future space tourists and the commercial entities that get them into space. Over time, the space tourism industry will create its own *Global Code of Ethics for Space Tourism*.

While this new Space Code could be modeled, in part, after the 2001 U.N. WTO *Global Code of Ethics for Tourism*, it will need to go beyond the

decisive and central role of this Organization, as recognized by the General Assembly of the United Nations, in promoting and developing tourism with a view to contributing to economic development, international understanding, peace, prosperity, and universal respect for, and observance of, human rights and fundamental freedoms...(United Nations World Tourism Organization, 2001)

and attend to

responsible and sustainable tourism is by no means incompatible with the growing liberalization of the conditions governing trade in services and under whose aegis the enterprises of this sector operate and that it is possible to reconcile in this sector economy and ecology, environment and development...(United Nations World Tourism Organization, 2001).

The Space Code should adhere to many of the same principles as the Tourism Code, in

“the understanding and promotion of the ethical values common to humanity,” the

promotion of safety and security, the protection of cultural and natural heritage, and

“mutual tolerance and for learning” (United Nations World Tourism Organization, 2001).

Article 7(1) of the Tourism Code provides that

The prospect of direct and personal access to the discovery and enjoyment of the planet’s resources constitutes a right equally open to all the world’s inhabitants, the increasingly extensive participation in national and international tourism should be regarded as one of the best possible expressions of the sustained growth of free time, and obstacles should not be placed in its way (United Nations World Tourism Organization, 2001).

Article 7(1) of the Future Space Code may instead say

The prospect of direct access to discover and view the Earth from above, whether from suborbital or orbital flight, or on the way to a lunar adventure, constitutes a right equally open to all the world's inhabitants, the increasingly extensive participation in space tourism should be regarded as one of the best possible expressions of the sustained growth of free time, and obstacles should not be placed in its way.

As a global society, we are about to go *en masse*, “where no one has gone before”

(Duane and Reaves, 1987). While the last half century has provided legal guidelines, court cases, treaties, declarations, codes, warnings, and lessons, the space tourism industry will go figuratively and literally far beyond 20th century doctrines.

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