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TO INFINITY & BEYOND: LEGAL IMPLICATIONS FOR SPACE TOURISM

❖ NOTE ❖

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I. INTRODUCTION

In 1903 the first powered and manned flight was successfully achieved at the then desolate Kill Devil Hills, North Carolina.[1] The Wright brothers perfected an innovation that would redefine the nature of human transport for centuries. Approximately a century later in 2004, *Mojave Aerospace Ventures* won the Ansari X –Prize with their suborbital flight of *SpaceShipOne*.[2] The X-Prize

[1] *See,* Tom Benson, *History of Flight,* NASA (June 12, 2014), https://www.grc.nasa.gov/www/k-12/UEET/StudentSite/historyofflight.html.

[2] The team was funded by Paul Allen and led by industry pioneer Burt Rutan of *Scaled Composites.* The X-Prize Foundation awarded $10 million to the first private company to launch a reusable space craft into space twice within a two-week window. *A Brief History*

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garnered the attention and veneration of many as it marked the first privately funded venture into suborbital space.

After the successful demonstration of *SpaceShipOne,* Richard Branson, via his space company *Virgin Galactic*, partnered with *Scaled Composites* to develop a commercial space craft for space tourism.[3] The viability and prospect for space tourism ignited a private "arms race" in the United States.

There are now a plethora of companies eliciting private missions to space. The demand is significant with estimates the global space tourism market could reach upwards of $34 billion by 2021.[4] Indeed, a simple Google search reveals numerous options for low earth, lunar, and even Mars based missions starting as early as 2018.[5] The curious or even intrepid observer can't help but marvel at the possibility of paying for a "mission" to space. However, the equally skeptical observer cannot help but wonder if these ventures will manage to liftoff if legal barriers present a stronger deterrent than even that of Earth's gravity.

II. BACKGROUND

The list of companies planning or even offering space tourism opportunities are bountiful and varied. *SpaceX*, founded by Elon Musk in 2002, has several promised missions in place but the soonest mission is an anniversary orbit around the moon to mark the orbital trip of *Apollo 8*.[6] *SpaceX* has also made notorious headlines for their plans to colonize Mars.[7]

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of Human Spaceflight, VIRGIN GALACTIC, https://www.virgingalactic.com/human-spaceflight/history-of-human-spaceflight/.

[3] *Id.*

[4] *See,* Jesse Maida, *Top 3 Emerging Trends Impacting the Global Space Tourism market from 2017-2021:Technavio,* BUSINESSWIRE (June 16, 2017), https://www.businesswire.com/news/home/20170616005756/en/Top-3-Emerging-Trends-Impacting-Global-Space.

[5] *See, SpaceX To Send Privately Crewed Dragon Spacecraft Beyond The Moon Next Year,* SPACEX (Feb. 27, 2017), http://www.spacex.com/news/2017/02/27/spacex-send-privately-crewed-dragon-spacecraft-beyond-moon-next-year.

[6] *Id.*

[7] *See,* Nadia Drake, *Elon Musk: In 7 Years, SpaceX Could Land Humans on Mars,* NATIONAL GEOGRAPHIC (Sept. 29, 2017), https://news.nationalgeographic.com/2017/09/elon-musk-spacex-mars-moon-bfr-rockets-space-science/.

World View Enterprises plans to launch a helium balloon into low earth orbit with a capsule attached in order to demonstrate the curvature of the earth and the minor effects of gravity[8]. *Blue Origin*, founded buy *Amazon's* Jeff Bezos, appears to be heading into the space industry with unfettered determination given the rapid evolution of their design and testing.[9] There are even companies such as the *Zero Gravity Corporation* that currently offer space tourism like opportunities via trips to the upper atmosphere that simulate low gravity.[10] The company merely flies an old airliner into the upper atmosphere and then dives towards the earth to simulate low gravity for a few minutes.[11]

Given the drastic rise of numerous companies in the industry the prospects of viable and even cost-conscious space tourism appear to be in reach. This entirely new frontier promises immense rewards in terms of financial remuneration for the companies involved, but there are significant legal issues that remain entirely unanswered in the resounding body of case law. The companies involved may face significant legal headwinds or even complete failure if the risks are not adequately accounted for.

The age of the space race and the cold war gave rise to a global recognition for the need to regulate space missions. The first international treaty was signed in 1967 as the Outer Space Treaty.[12] The treaty was designed to lay out straightforward principles regarding rules for space travel. The treaty provided for jurisdiction allocation and limits based upon the country a spacecraft originated from.[13] The treaty also expressly restricts any military activity in

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[8] *See, The Experience,* WORLD VIEW (2017), https://www.worldview.space/voyage/.
[9] The Blue Origin method utilizes a traditional rocket design in which a space capsule is launched into space via a large rocket. The rocket returns to Earth and lands itself to be reused again so as to reduce costs. *Recent Updates,* BLUE ORIGIN (2017), https://www.blueorigin.com/news.
[10] *See, How It Works,* ZERO G (2017), https://www.gozerog.com/index.cfm?fuseaction=Experience.How_it_Works.
[11] *Id*.
[12] *See*, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205.
[13] *Id.*

space.[14] Given the extremely limited scope of the Outer Space Treaty there have been several international agreements targeted at specific legal issues with space travel. The Convention on International Liability for Damage Caused by Space Objects addresses a few items of liability for travel to and from space.[15] The Convention agreement assigns liability to the nation from which a spacecraft originates.[16]

Finally, in 1984 the United States Congress passed the first significant piece of legislation specifically targeted at space travel. The Commercial Space Launch Activities Act provides various regulations for space travel and was amended in 2004.[17] The Act requires private space companies to obtain licenses, insurance, and compulsory registration of their spacecraft.[18] Finally, the amendment placed the entire umbrella of space regulation under the control of the Federal Aviation Administration (FAA).[19] But as Spencer Bromberg - an attorney and avid scholar of emerging businesses - points out the Commercial Space Act provides a basic legal framework and leaves many aspects of the industry in uncertain terms.[20] While the Act imposes requirements for insurance there is no guidance on issues such as the apportionment of liability. The other glaring issue with the Act and the enforcement by the FAA is the uncertainty of applying law intended for aviation within the realm of the space transportation industry.

For the purposes of this note it will be helpful for the reader to distinguish between different launch vehicle designs and methods. There are primarily two methods of launch: one being the mothership and space craft model utilized by *Virgin Galactic* and the other being the traditional rocket design. The *Virgin*

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[14] *Id.*
[15] *See,* Convention on International Liability for Damage Caused by Space Objects Mar. 29, 1972, 24. U.S.T. 2389.
[16] *Id.*
[17] *See,* Commercial Space Launch Act, 49 U.S.C. §§ 7010.1.
[18] *See,* Commercial Space Launch Amendments Act of 2004, Pub. L. No. 108-492, 118 Stat. 3974 (Dec. 23, 2004).
[19] *Id.*
[20] *See,* Spencer H. Bromberg, *Public Space Travel - 2005: A Legal Odyssey into the Current Regulatory Environment for United States Space Adventurers Pioneering the Final Frontier*, 70 J. Air L. & Com. 639 (2005).

Galactic method utilizes a large "mother ship" fixed wing airplane to carry a space ship attached below the aircraft to an altitude around 50,000 feet.[21] The space ship is then released and rockets ignite to carry the space ship into space.[22] The space ship remains in space for a few minutes and then proceeds to glide back to Earth and lands as a normal aircraft would.[23]

The traditional rocket method is slightly different. Here, a large rocket includes a crew capsule at the top of the rocket.[24] The rocket launches from the ground, and at a certain altitude the crew capsule separates.[25] The rocket returns back to Earth and commences a landing procedure so as to be recycled once again.[26] Meanwhile the crew capsule continues upwards via another propulsion system into space. [27]The crew capsule may enter an orbit around the Earth, or it may remain in space for a few minutes, but eventually falls back to Earth.[28]

The note proceeds with an analysis of the existing legal and regulatory framework including a discussion of the legal requirements for a company involved in space travel in the United States. Part c of the analysis includes a discussion of legal liabilities for private space tourism companies. Part four of the note will present recommendations. Part five will conclude.

III. ANALYSIS

Given the regulatory nature of the space tourism industry under the FAA, there are several problems regarding the application of aviation law towards space law. The first issue is a clear definition of the altitude above the Earth's surface for which space starts. There is indeed some confusion regarding the precise delimitation of the space boundary.[29] The FAA defines the boundary of space for

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[21] *A Brief History of Human Spaceflight, supra* note 2.
[22] *Id.*
[23] *Id.*
[24] *Recent Updates, supra* note 9.
[25] *Id.*
[26] *Id.*
[27] *Id.*
[28] *Id.*
[29] *See,* Dan Kois, *Where Does Space Begin?,* SLATE (Sept. 30, 2004), http://www.slate.com/articles/news_and_politics/explainer/2004/09/where_does_space_begin.html.

a pilot as being the point in which an aircraft can no longer generate aerodynamic lift and thus must be kept aloft by some type of propulsion system.[30] Unfortunately, such an altitude varies widely for different types of aircraft or spacecraft. NASA awards an individual the status of astronaut for a flight above 50 miles.[31] So, the FAA needs to create a very clear definition of where space starts. This will help to define whether aviation law applies or if space law applies.

A. Licensure

The Commercial Space Launch Amendment Act of 2004 requires an entity involved in space flight activities to obtain licensure.[32] In 2007 the FAA enacted further regulation for space flight operators.[33] The requirements for a space flight operator include several items aimed at safety and informed consent.[34] The licensee must provide a participant with written notice regarding the dangers of the operation. The participant must be given an opportunity to orally ask questions before flight. The operator must obtain from the participant written informed consent. The operator must also provide participants with training regarding the nature of the space flight as well as the implementation of security measures that ensure the participant doesn't jeopardize the safety of the other flight participants or the public broadly. These requirements may seem to be limited in scope upon first glance. However, these regulations are specifically targeted at the growing space tourism industry.[35] These rules are essential as they provide a minimum level of safety and security for the industry, which should in turn help to minimize legal risks in the future.

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[30] *Id.*
[31] *Id*.
[32] *See,* Commercial Space Launch Amendments, supra note 18.
[33] *See,* Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. 75, 615 (Dec. 15, 2006).
[34] *Id.*
[35] *Id.*

B. Registration

The registration of an aircraft helps to solve issues regarding the exercise and location of jurisdiction. According to the Chicago Convention an aircraft is considered to have nationality in the country in which it is registered and therefore jurisdiction is located in the country or state of registration.[36] The same seems to be implied from the nature of the Outer Space Treaty as it states the location of registration, "shall retain jurisdiction and control over such object, and over any person hereof, while in outer space."[37] Unfortunately, this needs some clarification and the FAA could provide further guidance regarding various definitions of spacecraft.

C. Liability

The concern regarding liability is the most glaring issue for any entity interested in providing space tourism services. It is also the area of extreme legal uncertainty on an international scale. The legal framework for liability in the U.S. is generally accounted for via contractual liability, which can certainly serve to ensure the viability and growth of the space tourism industry.

Professor Hobe, Director of the Institute of Air and Space Law at the University of Cologne, points out the possibility of applying the Montreal Convention for passenger liability in which the operator has unlimited liability in the international transportation of persons by aircraft.[38] The issue with utilizing the Montreal Convention with space tourism is the notable distinction in which space tourists are not traveling via aircraft, and the destination of outer space is not international as intended by the Convention terms. The primary historical source that addresses liability for space law is The Convention on International

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[36] *See,* Convention on International Civil Aviation ("Chicago Convention"), Dec. 7, 1944, 61 Stat. 1180, U.N.T.S. 295, Ninth Edition ICAO Doc. 7300/9 (Annex) (2006).
[37] *See,* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205.
[38] *See,* Stephan Hobe, *Legal Aspects of Space Tourism*, 86 Neb. L. Rev. 439, 458 (2007).

Liability for Damage Caused by Space Objects (Liability Convention).[39] The Liability Convention determines absolute liability for the launching state of a space craft for injury or damages caused by the space craft while not on the surface of the earth.[40] The Liability Convention is directed at third party liability for acts occurring in space and thus likely does not allow passengers or tourists to pursue compensation under the Liability Convention. Given the likely inapplicable nature of the Liability Convention, the next source of law for liability purposes can be found via the national laws of the United States. Fortunately, as will be discussed further below, the U.S. law of allowing for liability waivers is perhaps the best solution for startup space tourism companies. The previously mentioned U.S. legislation Human Space Flight Requirements for Crew and Space Flight Participants allows for a company to require space tourists to sign a waiver of liability as a precondition for travel.[41]

Third party liability may have applicability under the existing international law found in the Liability Convention.[42] Under the current law the United States could be held liable if a space craft crashes in Japan for instance.[43] The U.S., as the launching state, is liable to a third-party state but can pursue risk sharing, as the U.S. does via legislation.[44] Under Section 701 of Title 49 of the U.S. Code, a company is required to obtain $500 million in liability insurance or demonstrate financial responsibility for said amount.[45] The U.S. government assumes responsibility for valid claims ranging from $500 million to $1.5 billion, and the company is then again responsible for anything in excess of $1.5 billion.[46]

The many aspects of liability for space tourism operators will be of great concern. There is also immense legal uncertainty as international law is largely

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[39] *See,* Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24. U.S.T. 2389.
[40] *Id.*
[41] Human, *supra* note 25.
[42] Convention, *supra* note 15.
[43] *Id.*
[44] *Id.*
[45] *See,* 49 U.S.C. § 70104-70105.
[46] *Id.*

inadequate, and legislation in the United States is minimal.[47] As discussed above, the course for U.S. space tourism companies is to establish liability via contract for damages to the passengers. The Liability Convention does provide needed third party liability between states and the U.S. provides itself a level of recourse against companies by requiring minimal levels of insurance in order to obtain licensure.[48] The areas of uncertainty including specific launch methods, devices, or aircraft and rocket system hybrids such as *Virgin Galactic,* will need to be resolved via further legislation or through the court system.

IV. RECOMMENDATIONS

Under the current U.S. regulatory framework there is much left to be sorted out. The FAA should concern themselves with an immediate effort to clarify certain definitions and classifications for the space tourism industry. The first matter is a clear definition of where space begins. The FAA should also provide a revised cap on the Class A airspace where commercial airlines operate. The FAA should provide definitions regarding the various types of crewmembers and the distinction with space tourists or passengers. This note did not delve into the intricacies of the space craft and the launch method. The *Virgin Galactic* design is clearly an airplane while it travels to the launch altitude and the jettisoned *SpaceShip* is clearly a space craft. The FAA could easily provide guidance regarding the distinctions between air law and space law.

While the FAA does not require space tourism operators to obtain liability waivers, this is certainly the best option to safeguard the long-term success of the industry. It should not come as a surprise that a space tourism operator would require a participant to waive nearly all of their rights and relinquish the company of any liability as a necessary prerequisite for travel. Given the novelty, the price, and the obvious danger associated with launching a vehicle into space a participant should be willing to assume all of the risk. The caveat is the pilots and other required employees for an expedition into space will not assume the risk

[47] Stephen Hobe, *supra* note 30.
[48] *Id.*

themselves for repeated launches. It is also unlikely that a space tourism operator will merely compensate their employees with extremely high salaries to justify the risk. The Commercial Space Act is intended to protect the employees involved commercial space activities.[49] This note argues that such a regime is too strict. If a company is forced to assume strict liability for their employees then even a small accident could bankrupt the company and even threaten the viability of the industry. Instead, a hybrid solution of risk sharing should be maintained via the government, the employee, and the company. The government could act to assume some responsibility or mandate a minimum salary for certain types of commercial space employees. Such a structure could work harmoniously amidst the existing requirements for liability insurance.

V. CONCLUSION

As soon as this year humans may start to leave the bounds of the earth for purely private endeavors as tourists. While the industry is launching into orbit amidst many areas of legal uncertainty there is at least a minimal framework of regulation and contractual liability in which the companies can operate safely. The U.S. government should monitor these endeavors via the Department of Transportation and provide guidance to help maintain the growth, viability, and full-fledged success of the industry. As time progresses the industry will benefit with more legal certainty as various cases make their way through the courts. However, this will not be possible if any single entity has to bear all of the risk, which may well cause the industry to never achieve apogee.

[49] Commercial, *supra* note 17.