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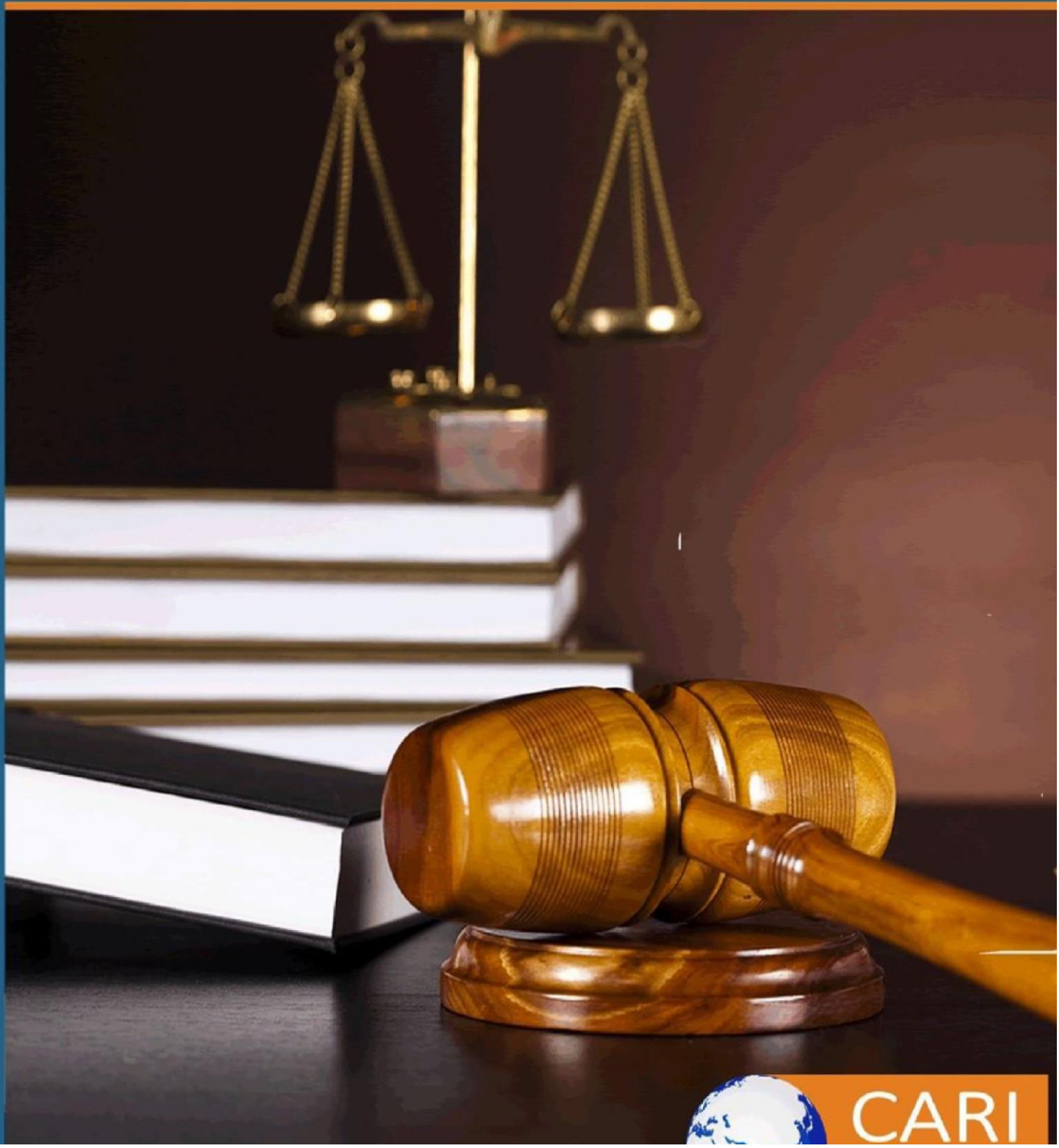
Exploring the Benefits and Challenges of Tourism in Outer Space



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Exploring the Benefits and Challenges of Tourism in Outer Space

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Abstract

Purpose: This article primarily explores the benefits and challenges of outer space tourism and also makes the case that a new international convention is desperately needed since the space tourism business cannot be supported by the current legal framework.
Methodology: This research will be carefully conducted by providing an overview of the history space tourism. The concept will be understood by a survey of the literature on the types of space tourism, and the theories of space tourism. A thorough analysis will be carried to analyze the benefits and legal challenges of space tourism and also identify the gaps in the international space law framework that pertain to space tourism. The essay used papers from conferences, academic books, and articles.
Findings: Man has always been a curious creature, eager to discover and visit new and interesting places. Since the beginning of the space age, the prospect of conducting open space missions has been a secret agenda item for the spacefaring nations. The next logical step for tourism might be space travel. Space tourism seeks to provide easy access to thrilling destinations for leisure and adventure. People are constantly seeking for new places to visit. People aspire to transcend boundaries and travel beyond, even to the heavens.
Unique Contribution to Theory, Practice and Policy (Recommendations): Even though space tourism has many advantages, getting to space presents new commercial, legal, and technical difficulties as well as advances. The booming space tourism business cannot be supported by the current space law regime because "the backbone of international space law" is too inflexible to be a stabile basis for space tourism The advantages of space tourism, the difficulties it presents in the age of commercialization, and the policies and governance that must be in place for space travel to be effective are all covered in this article.

Keywords: *Space Tourism, Space Governance, Space Policy, Aerospace Challenges, Space Business.*

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1.0 INTRODUCTION TO SPACE TOURISM

The significance of space travel today is not just a walk in the park, but it also transcends the confines of the imagination. Man has always been a curious creature, eager to discover and visit new and interesting places. Since the beginning of the space age, the prospect of conducting open space missions has been a secret agenda item for the spacefaring nations. The next logical step for tourism might be space travel. Space tourism seeks to provide easy access to thrilling destinations for leisure and adventure. Thus, a space tourist is someone who visits space in search of adventure and leisure. (Annadurai et al., 2011)

There are several spaceports, knowledgeable instructors on hand to assist, cutting-edge simulators available, and new ships that make the journey more comfortable and easy than ever before. The Space Tourist, p. 12.After Dennis Tito's first commercial voyage to orbit in 2001, space tourism—which had been a little known form of frontier tourism since the first crewed orbital mission in 1961—gained significant mainstream recognition.[1]

Beyond travelers snapping photos from space and space firms collecting money, space tourism is a concept. It provides the opportunity for regular people to view the world in a way that has never been possible before.[2] However, the exclusive character of this celestial world might be eroding. Because the space industry has grown more commercialized over the past ten years, access to outer space has been more accessible to anyone.[3] To put it another way, in the beginning of 2021, one could hardly count the number of space travelers; by the end of the year, however, the number had surpassed thirty. Three distinct commercial spacecraft had their triumphant tourist debuts in that year.

Another significant achievement for commercial aerospace companies is thought to be the successful launch of the SpaceX Dragon spaceship, which occurred recently. Space tourism is growing due to a combination of factors such as continuous technological

[1] Richard Branson Business Stripped Bare: Adventures of a Global Entrepreneur Virgin Books 2008) 228.

[2] Space Tourism Industry Emergence: Description and Datahttps://www.liebertpub.com/doi/full/10.1089/space.2019.0040

[3] See Qasim Mohammad, Opportunities and Challenges in Commercializing Space Privately, TECHCRUNCH (Sept. 9, 2016, 2:00 PM PDT), https://techcrunch.com/2016/09/09/opportunities andchallenges-in-commercializing-space-privately/ ("In 2015, VC investment in the sector increased by 253 percent year-over-year, and a whopping 2,052 percent since 2012.").

advancements like computer sciences and reusable launching systems, as well as the internationalization, privatization, and commercialization of aerospace in the new millennium. These factors differ from the political and military drivers of aerospace development in the twentieth century. (Cohen & Spector, 2019a; Cole, 2015; Denis et al., 2020)

Space travel and transportation problems are not new. There are already space tourism organizations that "provide customers with direct or indirect experience with space travel."[4]

These topics have previously been covered in a number of international fora. In the 1960s, some observers noted that the private sector was already involved in space exploration. A new era of space tourism appears to be upon us, and space travel seems like a fantastic adventure. Space tourism may really contribute to the popularization of space, given the encouraging trend and advancements in this field.[5] Although satellites were the focus of the first commercial space programs, [6] the opportunities that will increase public accessibility to outer space are now the focus of space entrepreneurs' attention.[7]

A further niche market within the aviation sector aims to provide visitors with the opportunity to become astronauts and experience space flight for leisure, business, or other reasons. This is known as space tourism. There is a relatively tiny percentage of

[4] Stephan Hobe and Jürgen Cloppenburg 'Towards a new Aerospace Convention Selected Legal issues of "Space Tourism"' (Proceedings of the Forty Seventh colloquium on the Law of outer Space Vancouver October 2004) 377,377

[5] Antonella Forganni, "The potential of space tourism for space popularisation: An opportunity for the EU Space Policy?," Space Policy 41 (2017) : 48–52.

[6] See Yun Zhao, Space Commercialization and the Development of Space Law, PLANETARY SCI. (July 30, 2018), https://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-42 (noting how the commercial satellite market began to flourish in the 2000s and 2010s).

[7] See Michael Sheetz, Super-Fast Travel Using Outer Space Could be $20 Billion Market, Disrupting Airlines, UBS Predicts, CNBC (Mar. 18, 2019, 2:50 PM EDT), https://www.cnbc.com/2019/03/18/ubsspace-travel-and-space-tourism-a-23-billion-business in-a-decade.html ("Even though space tourism 'is still nascent,' UBS said they believe the sub sector 'will become mainstream as the technology becomes proven and cost falls.'").

people that can afford to acquire a space experience due to the high cost of space tourism.[8] Companies are now trying to lower the cost of these journeys in an effort to offer a more accessible service. Currently, these lights can cost anywhere between £60,000 and £120,000, but several businesses are working on producing space-flight vehicles that will cost a fraction of what they do now. It is anticipated that prices would decrease by 90% in the near future as a result of these improvements.[9]

In addition to discussing the advantages of space tourism, this article looks at some of the organizational, legal, safety, and security issues that come with a system of space travel. Moreover, the existing legal framework was created exclusively to support the advancement of governmental use and space exploration, not to handle these new commercial endeavors. As a consequence, there are several legal and regulatory issues with commercial space flight and space tourism.

1.1 RESEARCH METHODOLOGY

This research will be carefully conducted by providing an overview of the history space tourism. The concept will be understood by a survey of the literature on the types of space tourism, and the theories of space tourism. A thorough analysis will be carried to analyze the benefits and legal challenges of space tourism and also identify the gaps in the international space law framework that pertain to space tourism. The essay used papers from conferences, academic books, and articles

1.2 THE DEVELOPMENT AND HISTORY OF SPACE TOURISM

Space tourism is a business service that government-funded or privately-run organizations offer to its clients so they can travel into space for a variety of reasons. For example, business, leisure, and research. The concept of Space Shuttle, which was initially meant to bring 74 passengers into orbit together with the essential construction and research cargo for the early Space Station, gave rise to the idea of modern space tourism in the early 1970s. (Stimac, 2020)

Humanity has long been fascinated by space flight. However, the concept of space travel is not new; from ancient times to the present, people have had this impression of

[8] Isaac Levi Henderson and Wai Hong Kan Tsui, "The role of Niche Aviation Operations as Tourist Attractions, Air Transport: a tourism perspective," 2019, https//www .sciencedirect.com/topic/social-

it..(YAZICI & TİWARİ, 2021) Space tourism is a relatively new idea. Space Adventures was established in 1998 by American millionaire Richard Garriott, a video game

science/space –tourism.

[9] 'Space Tourism and Commercial Space Travel' (Paramount Business jets) < www.paramount businessjets.com/space_tourism.php> accessed 04 December 2011.

developer. To date, Space Adventures is the only private enterprise to launch paying customers into orbit.[9]

The business operated for roughly ten years as a kind of space travel agency, arranging for paying clients to board Soyuz rockets used by the Russian space program when there were open seats. Dennis Tito, a 60-year-old client, became the first tourist to enter space in April 2001.[10]

As of right now, seven people have paid to travel to space. The first space tourist was Dennis Tito, an American multimillionaire who visited the International Space Station in 2001. The National Aeronautics and Space Administration (NASA) rejected requests from the firm to provide seats to tourists on NASA's shuttles and protested to Tito's voyage, citing inadequacies in his preparation. Between 2001 and 2009, Space Adventures launched seven paying clients into space, including Garriott, who orbited the Earth for 12 days in 2008. With NASA's shuttle program ending in 2011, space tourism came to an end.

Following that, seats on Soyuz rockets were reserved for American astronauts traveling to the International Space Station (ISS) in accordance with a diplomatic arrangement between the United States and Russia; no additional tickets were available for tourists. ISS is a low-Earth orbit modular space station. Five space agencies are involved in this

[9] The first private astronaut to fly beyond the Karman Line, the widely recognized edge of space, was test pilot Mike Melville in a Spaceship One built by aerospace engineering company Scaled Composites in 2004. Melville was not a paying customer, and as such is classified as a private astronaut and not a tourist for purposes of this report.

[10] Catherine Clifford, "What it's Like to Travel to Space, from a Tourist who spent $30 Million to Live there for 12 Days," CNBC, October 18, 2019 at https://www.cnbc.com/2018/10/19/what-its-like-in-spacefrom-a-tourist-who-spent 30-million-to-go.html.

global collaboration: NASA, the United States; Roscosmos, Russia; JAXA, Japan; ESA, Europe; and CSA, Canada.(Polkowska, 2021).

The International Space Station completes 15.5 orbits around the planet every day in around 93 minutes. Tito boarded a Soyuz spaceship and paid $20 million USD to visit the International Space Station. Only eight space trips were completed by seven space travelers between 2001 and 2009. Although there was only one scheduled space tourism flight, it was postponed indefinitely, and there haven't been any since 2009. Orbital tourist flights were scheduled to begin in 2015.[11]

It appears that the number of private companies prepared to launch as suborbital from the land will increase significantly in the near future. Airspace traffic will result from it. Currently, there are many various launch infrastructures, such as those in the United States, Great Britain, Switzerland, and Russia, each with its own set of safety regulations for managing people or other third parties on the ground. It might be necessary for the spacecraft returning to Earth to make a priority landing.

A spaceship manufacturer called SpaceX also declared in 2018 that they intended to launch space travelers on a free-return orbit around the moon.[13] According to a report by orbit Watch Global on February 4, 2021, Elon Musk plans to launch tourist into orbit. The launch of Inspiration4, the first all-commercial astronaut trip to orbit, by Falcon 9 from historic Launch Complex 39A at NASA's Kennedy Space Center in Florida is scheduled for no sooner than the fourth quarter of this year, according to SpaceX.[14]

2.0 TYPES OF SPACE TOURISM

Sub-orbital space tourism, orbital space tourism, intercontinental point-to-point rocket transportation in space, and orbital space travel with lodging in an ISS or space hotel are some of the different forms of space tourism.(Padhy & Padhy, 2021)

First, suborbital space tourism: This refers to the practice of paying to be transported "to sufficiently high altitudes [Karma Line] to watch the earth's curvature and blackness of space." (Chang, 2014, p. 79).

The use of spacecraft to transport tourists that crosses the atmosphere of Earth in a commercial capacity. In the upcoming years, Virgin Galactic plans to commercially launch this kind of tourism activity above the Karman line. Its main goals are to provide visitors with a fast-paced, weightless experience and a view of Earth's curvature. Such

[11] Marco Aliberti and ksenia Lisityna, Russia's Posture in Space, prospects for Europe (New York:

commercial operations will prevent spacecraft from fully rotating and circling the orbit of the planet.(YAZICI & TİWARİ, 2021)

Springer, 2019), 63–64.

[13] Turystyka kosmiczna – jak wygląda przyszłość lotów w kosmos?, https://www.speedtest.pl/wiadomosci/esej/turystyka-kosmiczna-jak-wyglada-przyszlosc-lotow-w kosmos/.

[14] SpaceX will fly four tourists on Dragon into space, https://spacewatch.global/ 2021/02/spacex-will-flyfour-tourists-on-dragon-into-space/?utm_source=rss&utm_medium =rss&utm_campaign=spacex-will-flyfour-tourists-on-dragon-into-space&mc_cid=a 166dadaf10&mc_eid=UNIQID

According to Chang and Chern (2018), suborbital space travel is the term used to describe flying in an aircraft over the Karman Line, which is the highest point at which regular flights are feasible, and the edge of space. Prior to returning to the same spot where they left Earth, suborbital space travelers will experience weightlessness for roughly five minutes.[12]

The second kind of space tourism is orbital space tourism, which is essentially a business venture offering visitors the chance to experience a full circle around the earth. Only Space Adventures Ltd. has worked with Mir Corp. to arrange for the $20 million cost of recreational space travel for guests inside the International Space Station (ISS). Because orbital travel requires spacecraft to attain orbital speeds of roughly 7.7 kilometers per second (almost 28,000 kilometers per hour), depending on the altitude, it is more complex and costly than suborbital travel.(Byers & Boley, 2023)

As they go further from Earth—between 370 and 460 kilometers in the case of the International Space Station—orbital travelers also spend longer time in space. Crew Dragon, SpaceX's recently constructed human-rated spacecraft, not only carries people from NASA and other space agencies to the International Space Station (ISS), but it also provides a passenger service to orbit for anybody who can afford the high cost of a ticket.

[12] Factors influencing the emergence of suborbital space tourism https://commons.erau.edu/cgi/viewcontent.cgi?article=1493&context=ijaaa

Thirdly, tourism that takes place beyond of Earth's orbit: This includes any commercial endeavor that aims to offer visitors an experience that takes place outside of Earth. When Space Adventures Ltd. presented its proposal in 2007 to provide its customers a visiting loop around the lunar orbit at a cost of $100 million, this sort of tourism initially gained international interest. SpaceX recently revealed its intention to use its Starship idea to transport visitors around the lunar orbit for a cost of $70 million.(YAZICI & TİWARİ, 2021)

2.1 THE COMMERCIALIZATION OF OUTER SPACE

The National Aeronautics and Space Administration (NASA) declared more than ten years ago that the technology needed to support the growth of space tourism was essentially in place. A 1998 study by NASA and the Space Transportation Association concluded that space tourism is expected to overtake all other commercial uses of space in the near future.[13] Space laws that enable and encourage private partners to exploit space and build successful businesses based on passenger transportation are in place in space powers like the United States.[14]

The opportunity of the U.S. Commercial Space Launch Activities Act (USC Ch. 509) is mentioned, among other places, in Title 51—National and Commercial Space Programs in Subtitle V—Programs Targeting Commercial Opportunities. Congress finds that—private applications of space technology have achieved a significant level of commercial and economic activity and offer the potential for growth in the future, particularly in the United States.

Project Artemis, which aims to put a woman and a man on the moon by 2024 and use cutting-edge technology to explore more of the lunar surface than ever before, is an example of a commercial partnership of this kind.(Polkowska, 2021)

Several newer companies have begun selling tickets or advertising future dates for tourist flights to space.

[13] Collins, P. (2001). Public choice economics and space policy: Realising space tourism. Acta Astronautica, 48(5), 921–950.

[14] Ram S. Jakhu and Yaw Otu M. Nyampong, "International regulation of emerg ing modes of space transportation," in Space Safety Regulations and Standards, eds. Joseph Pelton and Ram S. Jakhu (London: Elsevier, 2010), 215–238, https://doi.org/10.1016/ B978–1–85617–752–8.10017–0.

Virgin Galactic made its maiden voyage to near space in December 2018. A height of more than 82 kilometers was attained by two pilots. In addition, they intended to conduct more test flights and explore the prospect of sending its founder, Richard Branson, as the first passenger into space. Tickets for Virgin Galactic have already been sold for between $200,000 and $250,000 USD.[15]

As of February 2020, Virgin Galactic, a publicly traded company, reportedly had over 8,000 reservations for travel on its rocket.[16] Of those consumers, 600 have reportedly given down payments to the corporation. According to the flight plan, it will fly with an airplane and a second-stage vehicle that will separate from the primary ship once it reaches a specific height and launch it into suborbital space, where passengers will be able to temporarily experience weightlessness without going into orbit. No paid passenger has ever taken to the skies in a suborbital spacecraft before.[17]

Using a launch site in West Texas, Blue Origin, a privately held corporation run by Jeff Bezos, the CEO of Amazon.com, is developing a passenger rocket and capsule that will carry a crew of up to six people into space for a few minutes. With a sensor-covered dummy on board, the business has tested the rocket, New Shepherd, twelve times to see how journeys would impact potential human clients. When visitors might be able to take a ride on the rocket, what kind of training could be needed, or how much a flight is expected to cost have not been disclosed by Blue Origin.

In March 2020, Space Exploration Technologies (SpaceX), a commercial enterprise under Elon Musk's ownership of Tesla Motors and renowned for its ability to launch satellites atop reusable rockets, declared its intention to transport three passengers to the

[15] Irene klotz, Virgin Galactic Aims to Fly Space Tourists in 2018, CEO Says, Space.com - 28 April 2017, https://www.sierracountynewmexico.info/press-coverage/virgin-galactic-aims -to-fly-space-tourists-in2018-ceo-says

[16] Catherine Thorbecke, "Virgin Galactic to Resume Selling Tickets to Space, Reports Skyrocketing Demand," ABC News, February 26, 2020.

[17] Ken Davidian, "Space Tourism Industry Emergence: Description and Data," New Space, vol. 8, issue 2 (June 2020).

International Space Station for ten days in 2021. It is stated that the cost of the one journey is $55 million.[18]

Elon Musk, Richard Branson, and Jeff Bezos—the so-called space barons of today—are driven by the financial prospects that come with space exploration as well as the chance that awaits the first person to successfully cross the last uncharted territory in space.[19]

Here is a compilation of polls conducted in several nations between the 1980s and 2010s to study the space tourism sector in order to gain a sense of people's interest in this industry. Below are the summary findings from a few of the nations:

- During the early 1980s, a survey conducted in the United Kingdom revealed that over 50% of individuals under 45 and 65% of those under 25 expressed a desire to have a vacation in space.
- Germany: Initial research indicates that 4.3% of the German population would have been willing to pay roughly an annual salary (roughly several thousand USD in the mid-1990s) for a vacation into space, according to follow-up market studies carried out by Deutsches Zentrum für Luft-und Raumfahrt (DLR, German Space Agency). .(Dabhade & Warke, 2024)

3.0 SPACE TOURISTS' LEGAL STATUS UNDER EXISTING FRAMEWORKS

The first step would be to look into current international rules pertaining to outer space in order to decide whether or not space tourists should have the same legal standing as "astronauts" or other "personnel of a spacecraft." The fundamental basis for all legislation pertaining to outer space is formed by the five United Nations treaties, which constitute the sine qua non of this analysis.[20] Three agreements—the Moon Treaty of 1979, the Rescue Agreement of 1968, and the Outer Space Treaty of 1967—are included in these

[18] Sean O'Kane, "SpaceX Will Send Three Tourists to the International Space Station Next Year," The Verge, March 5, 2020, at https://www.theverge.com/2020/3/5/21166657/spacex-tourists-iss-internationalspace-station-orbit-falcon-9 dragon

[19] Space Tourism: A Historical and Existential Perspective https://www.mdpi.com/2071-1050/16/1/79

[20] See, e.g., Alex S. Li, Opening Outer Space: Safety and Stability through Open Standards and Open Source, 126 PENN. ST. L. REV. 667, 673 (2022) (noting these treaties became the first set of laws addressing Outer Space) [hereinafter Opening Outer Space].

five treaties[21] provide clues that indicate "space tourists" would not have the same status as "astronauts" or "personnel of a spacecraft." **a. Outer Space Treaty of 1967**

The treaty's primary goal is the peaceful exploration and utilization of outer space,[22] There are various clauses of the Outer Space Treaty that deal with human activity in this area.[26] But given that manned activities in Outer Space was still in its infancy at the time of its negotiations, the treaty does not discuss "space tourists."[23] However, the Outer Space Treaty does discuss the treatment of "astronauts." Specifically, the treaty considers "astronauts" as "envoys of mankind in outer space."[24] Thus, it states that astronauts have the right to receive "all possible assistance."[25]

In addition, a clause in the treaty mandates that all state parties report to one another right away any "phenomena they discover in outer space... which could constitute a danger to the life or health of astronauts." This provision serves to safeguard astronauts.[26] Thus, if space tourists have the same legal status as "astronauts," they would be entitled to a significant degree of international safeguard**.**

b. The Moon Treaty of 1979

The idea that "space tourists" have a different status than "personnel of a spacecraft" seems to be supported by the Moon Treaty as well. According to the Vienna Convention, later treaties can shed light on how a treaty should be applied.[27] Although the Moon Treaty is largely regarded as a failed agreement,[28] however, the Moon Treaty can provide contextual clues to aid in the interpretation of other agreements in this series of treaties.

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[21] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, opened for signature Dec. 18, 1979, 1363 U.N.T.S. 22 [hereinafter Moon Treaty]

[22] See Ruling Outer Space, supra note 22, at 715 ("Hence, the treaty was drafted with the primary goal of ensuring that only peaceful activities shall take place in Outer Space."). [26] See Megan McCauley, Astro-Not? How Current Space Treaties Could Fall Short of Protecting Future Space Tourists, 50 U. PAC. L. REV. 453, 463 (2019).

[23] See id. at 465–66

[24] Outer Space Treaty, supra note 23, art. V.

[25] *Id.*

[26] *Id.*

[27] Vienna Convention, supra note 327, at art. 31(3)(a).

[28] Ruling Outer Space, supra note 22, at 722.

Under the Moon Treaty, the drafters noted that all parties must "adopt all practical measures to safeguard the life and health of persons on the Moon."[29]

The agreement then clarifies that for such duty, all parties "shall regard any person on the Moon as an astronaut within the meaning of the [Outer Space Treaty] and as part of the personnel of a spacecraft within the meaning of the [Rescue Agreement]."[30] This clause serves as a straightforward declaration, but it also offers further support for the claim that "space tourists" were not first regarded as "astronauts" or "personnel of a spacecraft."(Li, 2023) Interpretations that clear up misunderstandings are highly encouraged under the Vienna Convention. Therefore, the Moon Treaty serves as additional evidence that the Rescue Agreement's use of the term "personnel of a spacecraft" and the Outer Space Treaty's use of the term "astronaut" are equivalent.

C. Rescue Agreement of 1968

Of the five United Nations treaties on outer space, the Rescue Agreement is the shortest and only addresses the safety and support that member states are required to provide to "astronauts" in case of emergency. [31] However, under this agreement, the Rescue Agreement chooses to refer to these people as "personnel of a spacecraft" rather than astronauts, as defined by the Outer Space Treaty.[32]

This implies that "personnel of a spacecraft" may be comparable to how the term "astronauts" is used in the Outer Space Treaty, even though the agreement may have avoided using the phrase "astronauts" because it is an American-centric term. A significant point made in the preamble of the Rescue Agreement is that it is intended to "develop and give further concrete expression" to the Outer Space Treaty's mandate of "rendering of all possible assistance to astronauts in the event of accident, distress or emergency landing, [as well as] the prompt and safe return of astronauts."[33]

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[29] Moon Treaty, supra note 313, at art. X.

[30] Id

[31] See Outer Space Treaty, supra note 23, at art. V; see also Rescue Agreement, supra note 310, at pmbl. (noting that it expands on Outer Space Treaty's rescue provisions).

[32] See Rescue Agreement, supra note 310, at art. I–IV.

[33] Rescue Agreement, supra note 310, at pmbl. (emphasis added).

3.1 THE ISSUE OF SPACE LAW VS. AIR LAW

The main question in the delimitation of outer space is where outer space starts and where air space stops. In order to distinguish between actions that are subject to other legal regimes and those that are space activities as defined by international space law, the answer to this question is crucial. Outer space is not subject to the sovereignty of any one state, according to international law, unlike air space, which is governed by the territorial sovereignty of the underlying state.

The operational models of contemporary aircraft vehicles differ greatly from one another. For instance, Virgin Galactic's Spaceship 2 employs a hybrid model that combines spacecraft and airplanes. First, the airplane component ignites, raising the spacecraft to a predetermined altitude within the atmosphere. At that point, the spacecraft's attached component, Spaceship 2, is ignited, and it is propelled into space. Determining the appropriate legal regime, such as space law versus air law, is a challenging task when dealing with hybrid aerospace vehicles.[34]

The two legal regimes are mutually exclusive and squarely different from each other.[35] The space law regime is founded on the "freedom of use" principle and forbids any claim to sovereignty or national appropriation, whereas the air law regime is grounded in the sovereignty of the underlying State. Due of this, there is currently a "border dispute" between space and airspace.[36]

Despite the opinions of some observers who believe that drawing a boundary around space would be premature or even unneeded, it is obvious that a clear barrier is important to prevent confusion and potentially dangerous circumstances.[37] It is quite settled that outer space begins where airspace ends. However, the international air law treaties like Chicago Convention fail to provide any clarity on the maximum geographical limit of

[34] M. McKellar, The question of aerospace Vehicles: in support of dual legal systems for a dual purpose craft, Indian J. L. Tech. 13 (2017) 39–61.

[35] R. Balleste, Worlds apart: the legal challenges of suborbital flights in outer space, N.Y.U. J. Int'l L. Pol. 49 (2017) 1033–1062.

[36] B. Cheng, The legal regime of airspace and outer space: the boundary problem functionalism versus spatialism: the major premises, Ann. Air Space Law 5 (1980) 323–362 (n.d.).

[37] Diederiks-Verschoor Introduction to Space Law 15. Cheng 1995 Air and Space Law 298.

airspace.[38] As a matter of customary international law, it is currently acknowledged that the legally relevant "edge of space" is 100 kilometers above sea level, or what is known as the Von Kármán line.[3940]

Accordingly, anything that is done and anything that is positioned more than 100 kilometers above sea level are considered space-related actions and items. States frequently use this boundary in their national legislation to distinguish between activities and objects that are subject to their national air laws and those that are not, even though this delimitation is still up for debate in theory and could change over time due to technological advancements.[41]

3.2 THEORIES OF AIR LAW AND SPACE LAW

The question of liability for damages resulting from space tourism operations is thus significantly affected by the demarcation of air space and outer space, since this liability may be based on either air law or space law. There is still disagreement over the standards to be applied in order to determine which legal system will apply. In this regard, various theories have been established.

3.2.1 SPATIALIST APPROACH

The spatialist view states that the appropriate legal system will be determined by the spacecraft's position, i.e., whether it is in space or the air.[42] They propose for a clearly defined boundary—an imaginary line—between air space and outer space. Beyond that point, the aeronautical vehicle ought to be regarded as a spacecraft and subject to space law. The aerospace vehicle may be considered an "aircraft" for the purposes of air law if

[38] D.N. Reinhardt, The vertical limit of state sovereignty, J. Air Law Commer. 72 (2007) 65. ProQuest Diss. Theses. MR22695 (2005) 92-92 pp.

[39] Neger and Walter "Space Law" 240-241. Also see Diederiks-Verschoor Introduction to Space Law 19-

[40] . Cheng 1995 Air and Space Law 299

[41] Neger and Walter "Space Law" 241. South Africa's Space Affairs Act 84 of 1993 defines outer space as "the space above the surface of the earth from the height at which it is in practice possible to operate an object in an orbit around the earth".

[42] Sgrosso International Space Law 283.

it is below the specified line.[43] Presently, it is agreed that the region below 80 km comes under airspace. However, the region between 80 and 110 km remains controversial.[44]

The limit is fixed at 100 km by Australian space legislation, which endorses the spatialist perspective. The spatialist method has come under fire since some claim that drawing boundaries too closely could result in some states forbidding space travel and other spacerelated activity under the guise of airspace limitations.

Furthermore, some have argued that since space technology is still in its infancy and it is too early to determine the outer boundary of air space, it is impossible to change the limits once they are set because future aircraft will have a greater altitude reach due to advancements in aviation technology.Furthermore, without peacefully settling the claims made by equatorial States in the Bogota Declaration, it would be challenging to decide on a demarcation line.

3.2.2 FUNCTIONALIST APPROACH

On the other hand, the nature of the activity is the main emphasis of the functional theory. Space law will be in effect both when the aerospace vehicle is traveling through air space and if it is intended for missions in orbit.[45] Space law would still remain in effect even if the spacecraft was not able to enter orbit after launch because it would still be considered a space activity.[46]

If the purpose of the activity is to connect two points on earth by flying through outer space, air law shall apply.[47] Some legal scholars have argued that drawing such a line is unnecessary. The deciding factor should be the nature of the activity rather than the vehicle's location. The term "functionalist approach" refers to this viewpoint. The functionalist approach has substantial support in the United States. They contend that the

[43] D.N. Reinhardt, The vertical limit of state sovereignty, J. Air Law Commer. 72 (2007) 65. ProQuest Diss. Theses. MR22695 (2005) 92-92 pp.

[44] J.C. McDowell, The edge of space: revisiting the karman line, Acta Astronaut. 151 (2018) 668–677, https://doi.org/10.1016/j.actaastro.2018.07.003.

[45] Sgrosso International Space Law 283. Also see Lyall and Larsen Space Law 169-170; Diederiks Verschoor Introduction to Space Law 18-20.

[46] Lyall and Larsen Space Law 170.

[47] Sgrosso International Space Law 283 [51]

Sgrosso International Space Law 283

boundary dispute should be left unresolved because it hasn't yet produced any issues.(Padhy & Padhy, 2021)

3.2.3 EXCLUSIVE UTILIZATION SPACE OR NEAR SPACE APPROACH

According to a third view, states should come to an agreement and establish a special regime to modify the current air and space law regulations to apply to aeroplanes.[51]

Prominent space law jurists such as Dr. Paul Stephen Dempsey have expressed concern about the lack of acceptance of the spatialist approach by major spacefaring nations, particularly the United States, and the need for clarity in the legal standards guiding space tourism operations[48], Using the Exclusive Economic Zone under the 1982 United Nations Convention on Law of the Sea as an analogy, Dr. Fabio Tron Chetti and Hao Liu have proposed a peaceful and practical compromise in the form of a buffer zone known as Exclusive Utilization Space or Near Space, which is located between 18 and 100 km above sea level. According to this method, no State would be able to exercise sovereignty over the Exclusive Utilization Space.[49]

4.0 THE BENEFITS OF SPACE TOURISM

"Mankind is drawn to the heavens for the same reason we were once drawn into unknown lands and across the open sea. We choose to explore space because doing so improves our lives, and lifts our national spirit. So let us continue the journey"- **George Bush.** By the middle of the 1960s, orbital passenger space flight services most likely would have begun. Rather than being created from the ground up as passenger vehicles, launch vehicles were adapted from long-range missiles because rocket development was "high-jacked" by the Cold War rivalry between the USA and USSR. Government space agencies have not stopped developing replaceable rockets, the safety and cost/passenger of which ineluctably resemble those of missiles rather than automobiles. (Although it was partially expendable, the space shuttle's main purpose was to satisfy a military need rather than to enable inexpensive space travel.)

Therefore, the development of passenger space flight has been delayed for more than fifty years. The world population was half of what it is today when space flight might have

[48] P.S. Dempsey, M. Manoli, Suborbital flights and the delimitation of air space vis- ` a-vis outer space: functionalism, spatialism and state sovereignty, Comm. Peace. Uses Outer Sp. 351 (2018) 1–47

[49] R.S. Jakhu, J.N. Pelton (Eds.), Global Space Governance: an International Study, Springer International Publishing, Cham, 2017, https://doi.org/10.1007/978-3- 319-54364-2.

begun, and the amount of energy and other resources used, as well as the amount of pollution produced, were all only 1/4 of what they are now. This information is important to comprehend the ramifications of this delay and the cost to society. There was 100 times less air travel safety than there is now, and as a result, people were generally less riskaverse . (Collins & Autino, 2010)

In light of this, space tourism development would have been simpler back then than it is now. But there is also a huge unmet demand for passenger space flight, and overall technical skills and experience have increased significantly in every discipline in recent years. In light of this, this industry has the potential to grow far more quickly now than it did in the 1950s when it eventually does. Apart from the plethora of prospects that such a scenario presents for the expansion of the space industry, it also presents enormous potential advantages for humanity in a number of different domains, as each of the following sectors is covered in turn:

a. Economic growth

This dearth of new sectors has been greatly exacerbated by the decades-long delay in space travel development. Today's governments frequently state that they anticipate job development in industries including energy, robotics, information technology, healthcare, tourism, and leisure. Nevertheless, there are some skeptics who point out that a lot of these tasks are already being outsourced to less expensive nations. While the number of manufacturing jobs in the US has rapidly decreased, low-paid service labor has accounted for the majority of net new jobs produced in the country so far in the twenty-first century.[50]

Although the development of passenger space travel services has accelerated recently, there is a common but false belief that space tourism will only be a niche industry for the very rich. The commencement of space travel services is actually long overdue and has the potential to develop fast into a significant new industry. This is because space flight has been delayed for more than thirty years due to government space agencies' inability to utilize even a small portion of the commercial potential of space.

That is to say, if space tourism is given public support—even 10% of space agency budgets—it has the potential to expand to a turnover of 100 billion euros annually within

[50] P Roberts, 2008, "The Fading American Economy: Government is the Largest Employer", http://www.counterpunch.org/roberts04092008.html

a few decades. This is due to both technical and business know-how. This advancement could stop the "resource wars," which have started so menacingly, from spreading by drastically lowering the cost of obtaining space resources. Therefore, nothing provides more economic benefits than the quick development of affordable space tourist services. To reflect this, a number of government policies need to be updated.

Due to increased global government activities and investments, the space tourism sector is expanding significantly. Through the provision of infrastructure, legal frameworks, and financial support, governments are playing a crucial role in promoting the growth of space tourism.

The search for more eco-friendly and effective propulsion systems is being prompted by the growing awareness of environmental sustainability. This is expected to assist space tourism companies in addressing issues regarding their carbon footprint.

Modern advancements in materials science, manufacturing processes, and propulsion systems are also resulting in spacecraft that are safer, more effective, and easier to access. The advancement of these innovative space technologies will provide travelers with an once-in-a-lifetime opportunity to experience space flight. This is shown in Table below.

TABLE 1: SPACE TOURISM MARKET OUTLOOK FROM (2024 AND 2034)

Attributes	**Key insights**
Space Tourism Market Size in 2023	US$ 747.1 million
Estimated Space Tourism Market Size (2024)	US$ 851.7 million
Projected Space Tourism Market Value (2034)	US$ 5,191.7 million
Expected Space Tourism Market CAGR (2024 to 2034)	19.8%

b. Employment

Since the majority of people do not own substantial amounts of land, employment is the economic cornerstone of social life in the majority of these nations. It gives people the means to support stable families and generates revenue. Therefore, the high rate of unemployment in the majority of nations today is not only wasteful but also contributes to widespread poverty and misery, damages society, and poses new issues for the future. Therefore, one justification for funding the advancement of passenger space flight is that

it may open up significant new job opportunities that will likely continue to expand for as long as we can see into the future.

There are currently about 50 million people working in the passenger air travel business, which includes airlines, airports, hotels, and other tourism-related jobs made possible by air travel. This is roughly 20 times the number of people engaged in aircraft manufacture alone. Passenger space travel has the potential to generate employment opportunities that far exceed those of expendable launch vehicles. These opportunities could arise in various domains such as vehicle operations and maintenance, spaceport operations, orbiting accommodation, staff training, certification, insurance, and a growing array of allied businesses.(Collins & Autino, 2010)

c. Space-based Industry

Millions of passengers per year could be carried by orbital travel by the 2030s with significant investment, which would encourage the emergence of various space-related industries. From straightforward tasks like upkeep of circling hotels to the industrial utilization of asteroidal resources, these will gradually expand. For instance, the advancement of SSP would result in a variety of industrial operations that capitalize on the benefits of space, such as low-cost power, strong vacuum, weightlessness, and minerals in shallow gravitational wells. There would be an increasing amount of industry operating outside of Earth's ecological system if SSP were to become a major supplier of the terrestrial energy market.

Industrial operations that are not part of the Earth's ecosystem do not necessarily result in environmental harm, even though most industries do when they expand in size. Consequently, the longer-term potential of disentangling economic growth from the constraints of the terrestrial environment is presented by the large-scale expansion of space-based manufacturing. In fact, it has been stated that the only way to preserve Earth's ecosystem and allow for enough economic growth to maintain civilized society is through the utilization of space resources, particularly SSP.[51]

d. Carbon-neutral Space Travel

The environmental impact of space flight might be completely eliminated by clean energy produced by SSP, and if desired, it could even become "carbon neutral".[56] Due to its

[51] M Bernasconi & C Bernasconi , 2004, " Why Implementing the Space Option is Necessary for Society",ActaAstronautica,Vol 54,pp 371-384; also at http://www.spacefuture.com/archive/why_implementing_the_space_option_is_

ability to create power practically continuously, as opposed to just during the day in clear weather, SSP also offers a far shorter energy pay-back period than terrestrial solar energy. Suborbital space flight is expected to significantly impact the environment, according to some skeptics.[57]

The extended view, however, shows that this is untrue, although appearing to be correct on the surface. A range of significant benefits in the future, like as the supply of low-cost, carbon-neutral SSP and other space-based industry, would be prevented if space tourism were prevented from growing in order to avoid its early, tiny environmental impact. This would be a risky mistake.

e. Global Cooling

There is a sizable subset of climatologists who, although accepting the "greenhouse effect's" physical mechanism, contend that other natural influences—such as the current global cooling trend that is bringing about the next Ice Age—outweigh the uncertainty surrounding climate change.[58] During the previous Ice Age, which lasted for tens of thousands of years, ice up to a depth of one kilometer blanketed most of Northern Europe! Against this formidable foe, it is noteworthy that SSP satellites spanning tens of square kilometers, be it via microwave power transmission or sunlight reflected by massive orbiting mirrors, could contribute in a unique way to counteracting Ice Age cooling by melting snow and ice across vast regions. By doing this, the vicious cycle of rapid cooling brought on by more sunlight reflecting off of snow-covered places might be avoided.[59]

4.1 THE CHALLENGES IN OUTER SPACE TOURISM

necessary_for_society.shtml

[56] P Collins, 2004, "Synergies Between Solar Power Supply from Space and Passenger Space Travel ", 4th International Conference on Solar Power from SPACE, SPS '04, Granada; also athttp://www.spacefuture.com/archive/synergies_between_solar_power_supply_from_space_and_passenger_space_travel.shtml.

[57] http://www.publications.parliament.uk/pa/cm200607/cmselect/cmsctech/66/7022101.htm [58] http://www.climatecooling.org.

[59] J Gribbin & M Gribbin, 2003, "Ice Age: How a Change of Climate Made Us Human", Penguin Press Science.

Space travel is hazardous and risky. Since the 1972 liability convention and the 19 declaration of legal principles governing the activities of States in the exploration and use

of outer space, the OST and the space tourism should be given priority when examining space tourism from a legal perspective. These issues and challenges pertain to the current liability regime of the *corpus iuris spatialis in iuri gentium*,[52] controlling liability has been an essential component of controlling space.

In this regard, some observers suggest a more expansive meaning. There are additional concerns about culpability (criminal or civil) in space tourism. Passengers are not covered by the 1968 UN Astronauts Rescue Agreement; only astronauts and staff are.

4.1.1 LIABILITY ISSUES

The difficulties in applying both space law and air law to a single space tourism trip are particularly apparent when considering liability, as previously mentioned. The legal regulations pertaining to liability in outer space are state-oriented and have not yet been interpreted by the courts, in contrast to aviation law, which has well-established guidelines regarding passenger, operator, and third-party liability.[53] Article II of the Liability Convention specifies the absolute liability concept that may apply to space tourism operations. Alternatively, Article III of the Liability Convention outlines fault liability based on negligence that may be applied to space tourism activities. Therefore, states are accountable for both their own space activities and those of non-governmental organizations that launch spacecraft from their borders.

Furthermore, the relevant state must authorize and oversee the operations of nongovernmental organizations on a continuing basis. In contrast to the comparable framework in international aviation law, which holds the state only accountable for regulating private companies like airlines and not accountable for any harm they may cause, space law provides a more expansive system of accountability.[54] This provision in the Outer Space Treaty is significant, as space activities carried out by private entities are rapidly increasing.[55]

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[52] Convention on international liability for damage abused by Space 0bjects 19 72 s of 200 the convention has 2 ratifications and 2 signatories Three European intergovernmental organisations including the S have accepted the rights and obligations provided for in the convention

[53] Masson-Zwaan 2008 Proceedings of the International Institute of Space Law 541. Also see Ronan-Heath 2011 Proceedings of the International Institute of Space Law 203.

[54] Failat 2012 Irish Law Journal 131.

[55] Sgrosso International Space Law 110.

Regarding the due-diligence requirements, there are, nevertheless, a lot of unknowns. In Section VI. Aside from the ambiguity surrounding the definition of phrases like "national activities" and "appropriate state party" in relation to space. It is unclear how states will consistently carry out their duties under article VI. Certain jurisdictions, including South Africa, use statutory licensing systems to approve activities conducted in private spaces. On the other hand, several states do not specifically include a licensing system in their domestic space legislation, and France, a significant space power, has successfully operated without one for a number of years.[56]

Furthermore, it's uncertain if the amount of compensation for any harm caused by these space tourism activities should be set at a maximum or should be uncapped. In the eyes of the insurers, these things may be extremely important. Without clarity on the aforementioned difficulties, it would be impossible for insurers to assess the amount of realistic insurance coverage that may be granted for such space tourism activities, which could expose them to costly hazards that cannot be quantified.

Additionally, from the perspective of the passengers, it is necessary to have established legal precepts upon which they may assert pertinent damages resulting from such actions. To establish a healthy balance between the industry and the need to secure justice for space tourists, it is crucial to have clearly defined principles and rules dealing with the culpability of such actions.[57]

4.1.2 ENVIRONMENTAL ISSUES

And once more, the growing number of space visitors may contribute to space pollution. The specific environmental effects of these missions are impossible to determine, though, because regular sub-orbital and orbital human spaceflights are not conducted. Traveling through distinct layers of the atmosphere, suborbital and orbital space tourism missions have the potential to weaken the earth's atmosphere, particularly its uppermost layers. Radio communications may be distorted as a result of potential negative anthropogenic effects such as ozone depletion, climate change, modifications to the ionosphere's radiowave reflecting properties, and changes to the radiative properties of the

[56] Masson-Zwaan 2008 Proceedings of the International Institute of Space Law 543

[57] C. Bonnal, T. Masson-Zwaan, Private human access to space, Acta Astronaut. 92 (2013) 125–128, https://doi.org/10.1016/j.actaastro.2013.03.014.

atmosphere.[58] Increased Gz loading, pressure changes, motion sickness, weightlessness, and even pregnancy risks are all consequences of suborbital space travel.[59] A total of 1140 Americans have flown on suborbital and orbital spacecraft, according to data from the Federal Aviation Administration (2019a) of the United States; 921 of them people were on orbital flights, while 219 were on suborbital flights. Out of the 921 orbital travelers, 17 perished, while 3 out of the 219 suborbital travelers perished (this data only covers launches that did not reach outer space and only includes Americans). This means that the total risk of dying during suborbital and orbital travel is 1.75%.[60]

It is unclear how sub-orbital f lights are governed internationally. Which legal regime—space law or aviation law—applies is still up for debate. Just a small environmental protection clause, found in Article IX of the Outer Space Treaty, applies to space journeys. Although protecting the environment in space is the focus of Article IX of the Outer Space Treaty, the States are only subject to minimal restrictions under this provision. In particular, space debris is not addressed by it. In addition, there is no method to clean up or remove space trash in the international space treaties. In order to address the contemporary environmental challenges of space, the minimal environmental protection standards stipulated by space treaties are blatantly inadequate. (Padhy & Padhy, 2021)

4.1.3 PROPERTY RIGHTS

Another important issue that may arise in connection with space tourism is the protection of intellectual property rights. The people and things of the State Parties are generally protected in outer space under the Outer Space Treaty. Establishing jurisdiction and control principles for space objects is another of its functions. State Parties' intellectual property rights are not, however, specifically protected by the Outer Space Treaty. In the event that intellectual property rights (IPR) are violated in space, it also falls short of offering a sophisticated enforcement mechanism. .(Padhy & Padhy, 2021)

Moreover, the Treaty says nothing about non-signatory states' infringement of intellectual property rights in space. In a similar vein, ownership and registration of space objects—

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[58] S.M.M. Sameh, Suborbital Flights: environmental concerns and regulatory initiatives, J. AIR L. COM (2016) 65–91.

[59] Factors influencing the emergence of suborbital space tourism https://commons.erau.edu/cgi/viewcontent.cgi?article=1493&context=ijaaa

[60] Delineating acceptable risk in the space tourism industry https://scihub.st/https://doi.org/10.1080/02508281.2020.1747798

rather than intellectual property rights—are the main concerns of the Registration Convention.

Furthermore, the Registration Convention stipulates that States have international responsibility for their domestic space operations, without particularly addressing private third parties. The question of whether IPR rights violations, particularly those committed by private, non-state third parties, fall under the definition of damage as defined by the Liability Convention is still up for debate.[61] It is safe to say, then, that the current international space treaties do not adequately address possible infringements of intellectual property rights during space tourist operations. An international agreement that outlines and solidifies intellectual property rights in space is desperately needed. Any upcoming agreement on intellectual property rights protection in space can be modeled after the ISS Agreement. A different approach would be to expand the current IPR system while making a few small adjustments to make it more appropriate for the unique conditions of space travel.[62]

5.0 THE WAY FORWARD

The booming space tourism business cannot be supported by the current space law regime because "the backbone of international space law is too inflexible to be a stabile basis for space tourism".[63] As the foregoing explanation makes evident, the space treaties that are in place today are mostly out of date and ill-equipped to handle the special legal issues that the quickly growing space tourism sector presents. This is made worse by the fact that national laws and regulations, regional laws, international agreements, UN principles and guidelines, and treaties make up the extremely fragmented legal framework pertaining to space travel.

It is essential to develop clear international legal regulations pertaining to space tourism, where standards are established for the approval and oversight of these operations and the interests of states, travelers, and private actors are as fairly balanced as possible, in order to guarantee that space tourism does, in fact, benefit all of humanity. It is recommended that states create space policies that facilitate the commercial utilization of outer space. A

[61] B. Warners, Patents 254 miles up: jurisdictional issues onboard the international space station, UIC Rev. Intell. Prop. Lh. 19 (2020) 365–380.

[62] Y. Zhao, Intellectual property protection in outer space: reconciling territoriality of intellectual property with non-territoriality in outer space 7 (2017) 137–155.

[63] Wollersheim n 102 para 3 .1

variety of recommendations have been put up by observers regarding how laws pertaining to space tourism should be drafted and approved. A fully new legally binding framework based on the concepts of both space and aviation law has been proposed by some.[64]

An overview of the history of human spaceflight, the objectives of space tourism, and the various corporate projects being explored to enable commercial spaceflight are covered in this article. The term "space tourism" has also been expanded in this article to include its three subcategories: suborbital space tourism, orbital space tourism, and tourism beyond Earth's orbit, where companies like SpaceX and Space Adventures Ltd. are attempting to arrange a commercial visit around lunar orbit at a considerable expense. The benefits and challenges have been expanded.

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[64] See, for example, Yun 2009 J Air L & Com 982. In this regard Hobe and Cloppenburg 2004 Proceedings of the International Institute of Space Law 383 ask if the development of "a uniform legal aerospace regime" can be identified.

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