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A Regulatory Scheme for the Dawn of Space Tourism

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A Regulatory Scheme for the Dawn of Space Tourism

ABSTRACT

Today, companies like Blue Origin and Virgin Galactic have successfully launched paying customers into space, forging the future of the space tourism industry. While a growing space tourism industry promotes scientific advancement and opens an activity once reserved for trained astronauts to the public, the industry generates new issues and reveals the vulnerabilities of international space law. This Note explores the history of commercial spaceflight and the international agreements that comprise the current legal regime. It argues that space tourism presents a need for a new international agreement to address three vulnerabilities in the current international regime: environmental protections, protections for space tourists, and regulations for commercial spaceflight companies. This Note draws on the examples of the Antarctic Treaty System, the Treaty for Amazonian Cooperation, and the United Nations Convention on the Law of the Sea to show how this new international agreement can successfully balance promoting the growth of commercial spaceflight while ensuring the environment and passengers are adequately protected.

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I. INTRODUCTION

Since the launch of Sputnik in 1957, activity in space has grown exponentially, paving the way for space tourism to become a reality.¹ Space tourism is any commercial activity that offers the public direct or indirect experiences of space travel.² Once thought of as a distant possibility, the recent commercial spaceflights operated by Jeff Bezos's Blue Origin and Richard Branson's Virgin Galactic confirm that space tourism is now a reality.³ While companies are gearing up to take advantage of space tourism, the international community remains ill-equipped to respond to the variety of problems posed by its expansion.

The majority of treaties regulating space activity today were enacted during the Cold War era and do not contemplate the expansion of tourist activity in space.⁴ These treaties focus on regulating the activity of states, not commercial entities like Blue Origin and Virgin Galactic.⁵ Consequently, there are no international agreements that

1. See Tanja Masson-Zwaan & Steven Freeland, *Between Heaven and Earth: The Legal Challenges of Human Space Travel*, 66 ACTA ASTRONAUTICA 1597, 1597 (2010).

2. See Stephen Hobe, *The Legal Regime for Private Space Tourism Activities – An Overview*, 66 ACTA ASTRONAUTICA 1593, 1593 (2010).

3. See Caitlin O'Kane, *Billionaires Jeff Bezos and Richard Branson Have Both Gone to Space. Here's the Difference between Their Blue Origin and Virgin Galactic Flights*, CBS NEWS (July 20, 2021), <https://www.cbsnews.com/news/blue-origin-bezos-launch-richard-branson-space-flight-differences/> [https://perma.cc/YDP7-SGAX] (archived July 16, 2022).

4. See Masson-Zwaan & Freeland, *supra* note 1, at 1598.

5. See *id.*

regulate commercial spaceflight operators to ensure the safety of space tourists and mitigate possible environmental damage caused by increased traffic in space. The international community must create a regulatory scheme for space tourism to ensure this up-and-coming industry is safe for future space tourists and for those who remain back on Earth.

Currently, space tourism is limited to short-term flights, barely meeting the definition of space travel.⁶ However, this is only the beginning of this industry. SpaceX successfully launched and returned its Crew Dragon capsule, which sent four civilians on a three-day trip orbiting around the Earth.⁷ SpaceX will continue to grow its space tourism activities in the future and has already contracted to complete five more private missions.⁸ Space tourism today is a pastime for the exceedingly wealthy, but as companies are able to reduce costs in the future, space tourism may be available to more individuals. The industry will undoubtedly expand beyond the current short-term flights into enterprises that could allow visitors to walk on the moon or visit farther celestial bodies like Mars.

The opportunities created by space tourism are not without their drawbacks. Increased rocket use could cause damage to layers of the atmosphere and deposit air pollutants like black carbon into the atmosphere.⁹ Space tourism could also harm the environments of potential destinations. While the current space treaties do instruct states to prevent the disruption of the celestial environment during missions, they do not specifically contemplate tourism activities by non-state actors and how those could also need regulation to protect the moon's scientific and historical value.¹⁰ Other celestial bodies remain without any treaties to protect them from future harm. The issue of environmental disruption is especially salient for travels to Mars, as scientists continue to search for evidence of life there.

Space tourism poses other legal challenges, such as how to protect the individuals who chose to embark on space travel, especially considering that they lack the knowledge and specialized training routinely given to state-sponsored astronauts. Current international agreements assign liability based on states, leaving open questions

6. See O'Kane, *supra* note 3.

7. See Jackie Wattles, *SpaceX Capsule Returns Four Civilians from Orbit, Capping Off First Tourism Mission*, CNN (Sept. 18, 2021), <https://www.cnn.com/2021/09/18/tech/spacex-inspiration4-splashdown-scn/index.html> [<https://perma.cc/S3PX-WLKW>] (archived July 18, 2022).

8. See *id.*

9. See Jennifer Friedberg, *Bracing for the Impending Rocket Revolution: How to Regulate International Environmental Harm Caused by Commercial Space Flight*, 24 COLO. J. INT'L ENV'T L. & POL'Y 197, 207 (2013).

10. See *generally* Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter *Moon Treaty*].

about how states should regulate commercial flight companies that launch from within their borders.¹¹ A state-by-state system of regulation is not well suited to regulating space activity because it has broad international effects. Thus, the international community must convene to create a new regulatory scheme for space tourism, while the industry is in its early stages, to prevent confusion and harm as it grows.

This Note advocates for a new international agreement focused on regulating space tourism activity. Part II surveys the emergence of space tourism and the current international agreements governing activity in space. Part III analyzes the gaps in the current regulatory scheme governing activity in space. Part IV proposes a novel solution for filling these gaps by looking at the examples of other international agreements, which focus on balancing commercial use of historically- and environmentally-significant destinations with the protection of these sites for the benefit of future generations. These agreements provide a model for how the international community can enjoy the benefits of space tourism while protecting Earth's environment and the environments of celestial destinations.

II. BACKGROUND

A. *The Emergence of Space Tourism*

Blue Origin and Virgin Galactic were not the first companies to provide flights for space tourists. In 2001, Dennis Tito became the first space tourist, spending millions to fly to the International Space Station (ISS) alongside Russian cosmonauts for a week-long visit.¹² Several others followed in Tito's footsteps, utilizing the services of the space tourism agency, Space Adventures, to take their own trips to the International Space Station.¹³ Today, SpaceX, Blue Origin, and Virgin Galactic are at the forefront of space tourism. With their successful commercial passenger flights in late 2021 and 2022, these companies are poised to strengthen their capabilities to continue to offer these short-term flights and longer experiences to more space tourists in the near future.¹⁴

Blue Origin's first commercial space flight crossed the Kármán line, a boundary defined by the Fédération Aéronautique Inter-

11. See generally Michael Mineiro, *An Intersection of Air and Space Law: Licensing and Regulating Suborbital Commercial Human Space Flight Operations*, 22(4) A.B.A. AIR & SPACE L. 9 (2010).

12. Francesca Street, *First Space Tourist Dennis Tito: "It Was the Greatest Moment of My Life,"* CNN (July 20, 2021), <https://www.cnn.com/travel/article/space-tourism-20-year-anniversary-scn/index.html> [<https://perma.cc/C2L7-JF2G>] (archived July 18, 2022).

13. See *id.*

14. See O'Kane, *supra* note 3; Wattles, *supra* note 7.

nationale as the demarcation between outer space and Earth's atmosphere.¹⁵ While Virgin Galactic's flight did not travel as far, it surpassed the fifty-mile altitude recognized as the boundary by both the National Aeronautics and Space Administration (NASA) and the Federal Aviation Administration (FAA).¹⁶ Both flights provided only minutes of weightlessness to their passengers, a lucky few paying customers and other passengers invited by the companies' respective founders.¹⁷ On October 13, 2021, William Shatner became the oldest person to visit space on a free trip provided by Blue Origin.¹⁸ He was accompanied by other guests, one of whom paid \$28 million at auction for a ticket.¹⁹ Virgin Galactic's tickets cost about \$450,000, an amount above the median home price in the United States.²⁰ The costs of commercial spaceflight tickets reveal that the industry is currently only focused on catering to exceedingly wealthy or well-connected individuals. In the future, the market may support economies of scale that will allow for lower prices, making spaceflights a reality for more individuals.

The short flight experiences offered by Blue Origin, Virgin Galactic, and SpaceX are only the beginning of space tourism. Soon, companies could provide opportunities to visit the moon, Mars, and other celestial bodies in our solar system as the technology becomes less cost prohibitive.

B. *Current International Agreements Regulating Spaceflight*

The current international regime regulating space activity is comprised of five agreements. Each of these agreements contemplate a different aspect of space travel, yet none specifically consider how nonstate actors such as commercial spaceflight companies fit into the regime they create. The regulation of outer space began when, in 1959, the United Nations General Assembly created the United Nations Committee on the Peaceful Uses of Outer Space.²¹ Since its creation, the UN Committee on the Peaceful Uses of Outer Space has played an

15. See O'Kane, *supra* note 3.

16. *Id.*

17. See *id.*

18. See Jackie Wattles, *William Shatner Is Now the Oldest Person Ever to Go to Space: "The Most Profound Experience,"* CNN (Oct. 13, 2021), <https://www.cnn.com/2021/10/13/tech/william-shatner-space-blue-origin-everything-you-need-to-know-scn/index.html> [<https://perma.cc/9H8T-S5AS>] (archived July 18, 2022).

19. *Id.*

20. *Id.*

21. See *Committee on the Peaceful Uses of Outer Space*, U.N. OFF. FOR OUTER SPACE AFFS., <https://www.unoosa.org/oosa/en/ourwork/copuos/index.html> (last visited Aug. 2, 2022) [<https://perma.cc/WF6X-R64M>] (archived Aug. 2, 2022).

instrumental role in the formulation of each international agreement concerning activity in outer space.²²

1. The Outer Space Treaty

The bedrock of international space law is the Outer Space Treaty (OST), which took effect in 1967.²³ One hundred twelve states ratified the treaty, while another twenty-three signed the treaty but did not complete the ratification process.²⁴ The treaty calls for all activities carried out in space to be for peaceful purposes and in the interests of all countries regardless of their level of economic or scientific development.²⁵ The OST also aims to ensure that all countries cooperate to allow for the free use and exploration of space.²⁶ Under the terms of the treaty, nations cannot appropriate outer space or any celestial bodies through occupation or other means.²⁷ Parties must follow international law and abstain from orbiting, carrying, or installing weapons in outer space or on any celestial body.²⁸ Under the OST, astronauts are considered envoys of mankind and are entitled to assistance when participating in an activity in outer space.²⁹ The treaty also sought to promote cooperation internationally by requiring states to make their space activities public and requiring that their installations and equipment placed on celestial bodies be open to the other parties on the basis of reciprocity.³⁰

The OST assigns responsibility to individual states for ensuring the compliance of all government agencies and non-governmental entities, authorizing activities in outer space, and providing supervision of missions to outer space.³¹ States bear responsibility for their activities in space as well as those of non-governmental entities that operate within their borders.³² Finally, the treaty creates the basis for each subsequent treaty on outer space activity by establishing liability,

22. *See id.*

23. 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.

24. *See* U.N. OFF. FOR OUTER SPACE AFFS., STATUS OF INTERNATIONAL AGREEMENTS RELATING TO ACTIVITIES IN OUTER SPACE AS AT 1 JANUARY 2022 5–10 (Mar. 28, 2022), https://www.unoosa.org/res/oosadoc/data/documents/2022/aac_105c_22022_crp/aac_105c_22022crp_10_0_html/AAC105_C2_2022_CRP10E.pdf [<https://perma.cc/6Q3C-W6FY>] (archived Sept. 10, 2022).

25. *See* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *supra* note 23.

26. *See id.* art. I.

27. *See id.* art. II.

28. *See id.* art. III–IV.

29. *See id.* art. V.

30. *See id.* art. XI–XII.

31. *See id.* art. VI.

32. *See id.*

registration, and rescue requirements.³³ State parties resolve issues arising out of space activities through an “appropriate international organization” or state members of an international organization that are parties to the OST.³⁴ While the OST is widely recognized and accepted in the international community, it fails to employ strict enforcement mechanisms and leaves important commercial spaceflight regulations up to individual states.

2. The Rescue Agreement of 1968

The Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space (Rescue Agreement) elaborates on the rescue provisions of the OST. It provides that all states should assist astronauts in distress and assist other states in recovering launched objects that land within their territory, regardless of which state launched the object.³⁵ Ninety-eight states ratified the Rescue Agreement and twenty-three signed but did not complete the ratification process.³⁶ Under the agreement, states notify one another in the event of a rescue or recovery, cooperating to ensure that both the personnel and the natural environment are safe.³⁷ All expenses for the recovery and return of objects are the responsibility of the launching authority under the agreement.³⁸

3. The Liability Convention of 1971

The United Nations General Assembly expanded upon Article VII of the OST in its Convention on International Liability for Damage Caused by Space Objects (Liability Convention) in 1971.³⁹ Like the Rescue Agreement, ninety-eight countries ratified and twenty-three countries signed the Liability Convention.⁴⁰ The Liability Convention assesses fault by state, leaving to individual states the responsibility to internally regulate commercial spaceflight companies that launch

33. See *id.* art. V, VII–VIII.

34. *Id.* art. XIII.

35. See Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, Apr. 22, 1968, 19 U.S.T. 7570.

36. See STATUS OF INTERNATIONAL AGREEMENTS RELATING TO ACTIVITIES IN OUTER SPACE AS AT 1 JANUARY 2022, *supra* note 24, at 5–10.

37. See Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, *supra* note 35, art. 1.

38. See *id.* art. 5.

39. Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 961 U.N.T.S. 187.

40. See STATUS OF INTERNATIONAL AGREEMENTS RELATING TO ACTIVITIES IN OUTER SPACE AS AT 1 JANUARY 2022, *supra* note 24, at 5–10.

from within their borders.⁴¹ The convention assigns absolute liability to launching states, states which launch spaceflights from within their borders, for damage caused to aircraft or Earth's surface.⁴² If the damage is caused elsewhere, the state is only responsible if the damage is due to its own fault or that of persons for whom the state is responsible.⁴³ The convention also assigns joint and several liability between states to the extent which an individual state is at fault for damage.⁴⁴ There are procedures for making compensation claims for damage,⁴⁵ and the convention establishes a claims commission to resolve disputes if states cannot reach a claim settlement within a year.⁴⁶

4. The Registration Convention of 1976

The Convention on Registration of Objects Launched into Outer Space (Registration Convention) further built upon the regime enacted by the prior UN treaties and expanded the scope of the United Nations' Resolution 1721B, passed in 1961.⁴⁷ Seventy-two states ratified and three states signed but did not ratify the convention.⁴⁸ The convention requires launching states to register any object launched into Earth's orbit or beyond and provide registration and flight information to the UN Secretary-General.⁴⁹ States must provide the name of the launching state, a designation or registration number for the object, the date and location of the launch, orbital parameters, and the general function of the object.⁵⁰ The information provided under this treaty allows the United Nations to track the number of objects in outer space. The Registration Convention aims to ensure that, if a space object causes any damage to a state or its citizens, a state can obtain information about the object and apply the rules established by the Liability Convention.⁵¹ Like the other treaties in the current regime, the Registration Convention places responsibility on states to monitor

41. See Convention on International Liability for Damage Caused by Space Objects, *supra* note 39, at 5–10.

42. See *id.* art. II.

43. See *id.* art. III.

44. See *id.* art. IV–V.

45. See *id.* art. X–XIII.

46. See *id.* art. XIV–XX.

47. *Convention on Registration of Objects Launched into Outer Space*, U.N. OFF. FOR OUTER SPACE AFFS., <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introregistration-convention.html> (last visited Sept. 30, 2021) [<https://perma.cc/76WA-4Q33>] (archived July 18, 2022).

48. See STATUS OF INTERNATIONAL AGREEMENTS RELATING TO ACTIVITIES IN OUTER SPACE AS AT 1 JANUARY 2022, *supra* note 24, at 5–10.

49. Convention on Registration of Objects Launched into Outer Space art. IV(I), Nov. 12, 1974, 28 U.S.T. 695, 1023 U.N.T.S.15, 17.

50. See *id.*

51. See *id.* Annex.

objects launched from within their borders and disseminate information on the objects to the broader international community.⁵²

5. The Moon Treaty of 1979

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Treaty) is the final piece of the current regulatory regime for outer space. The Moon Treaty recognizes the benefits of exploiting the natural resources found on the moon and other celestial bodies while seeking to protect them as scientific wonders that play an important role in space exploration.⁵³ Under the agreement, exploration and use of the moon is open to all mankind, and any activity should be carried out to benefit all countries while considering the interests of present and future generations.⁵⁴ Information about missions and their scientific findings are given to the public, especially when the information concerns phenomena that could endanger human life or shows organic life may exist beyond Earth.⁵⁵ When exploring the moon, parties must act to prevent disrupting its environment and protect the health and safety of any person on the moon.⁵⁶ Under the definitions of the agreement, any person on the moon is considered an astronaut and is, therefore, subject to the protections afforded by the Rescue Agreement.⁵⁷

While the Moon Treaty made important additions to the international regime created by the previous agreements, the treaty failed to achieve wide acceptance.⁵⁸ Only eleven countries signed the agreement, and more importantly, the major players in outer space activity, the United States, Russia, and China, have all failed to sign and ratify it.⁵⁹ These countries chose not to sign the agreement, at least in part, due to the provisions of Article 11.⁶⁰ Article 11 states that “the moon and its natural resources are the common heritage of mankind” and parties will establish an international regime that provides for “an equitable sharing by all States Parties in the benefits derived from those resources” with special consideration given to developing

52. See *id.* art. IV.

53. See generally Moon Treaty, *supra* note 10.

54. See *id.* art. 4(1).

55. See *id.* art. 5(1), (3).

56. See *id.* art. 7(1), 10(1).

57. See *id.* art. 10(1).

58. See April Greene Apking, *The Rush to Develop Space: The Role of Spacefaring Nations in Forging Environmental Standards for the Use of Celestial Bodies for Governmental and Private Interests*, 16 COLO. J. ENV'T L. & POL'Y 429, 450 (2005).

59. See STATUS OF INTERNATIONAL AGREEMENTS RELATING TO ACTIVITIES IN OUTER SPACE AS AT 1 JANUARY 2022, *supra* note 24, at 5–10.

60. See Barbara Ellen Heim, *Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space, and Antarctica*, 23 VAND. J. TRANSNAT'L L. 819, 834 (1990).

countries.⁶¹ Opponents of the treaty worried that these provisions would limit their returns on potential investments in mining and other economic activities on the Moon and they did not want to be bound by such provisions.⁶² Failure to gain the backing of any major player in space activity “has essentially rendered the Moon Treaty irrelevant.”⁶³

These five agreements—the OST, the Rescue Agreement, the Liability Convention, the Registration Convention, and the Moon Treaty—form the bedrock of regulation for activity in outer space but fail to anticipate a time when commercial space activity is an accessible reality. These agreements are also weakened by their reliance on states to internally regulate space activity originating within their borders. This reliance creates a patchwork of regulations that fails to protect the global community from potential harms caused by a growing space tourism industry. Space tourism cannot properly be regulated on a state-by-state basis and will require a new agreement to ensure that no member of the international community is harmed.

III. ANALYSIS: HOLES IN THE INTERNATIONAL REGULATORY SCHEME

The current international regulatory scheme has several major areas that remain unsettled. These areas will increasingly cause problems for the international community as the commercial space tourism industry grows. In this section, this Note will analyze three holes in the current regulatory scheme: environmental protections, protections for space tourists, and regulations for commercial spaceflight operators.

A. *Environmental Protections*

The increased use of outer space for commercial flights poses a significant threat to the environment. Rocket launches deplete the ozone layer and deposit black carbon, a major air pollutant.⁶⁴ Potential environmental harms are not limited to Earth; each celestial body could be drastically changed by the humans that travel there. Space tourism ventures will likely cause harm to Earth’s atmosphere. The rocket systems used today deposit ozone-depleting compounds and affect air quality at the lowest levels of the atmosphere.⁶⁵ While rocket launches currently deplete the ozone layer at insignificant rates compared to other sources, an increase in launches due to the

61. Moon Treaty, *supra* note 10, art. 11.

62. See Heim, *supra* note 60, at 835.

63. Lawrence D. Roberts, *Ensuring the Best of All Possible Worlds: Environmental Regulation of the Solar System*, 6 N.Y.U. ENV'T L.J. 126, 144 (1997).

64. See Friedberg, *supra* note 9, at 207–08.

65. See Martin Ross, Darin Toohey, Manfred Peinemann & Patrick Ross, *Limits on the Space Launch Market Related to Stratospheric Ozone Depletion*, 7 ASTROPOLITICS 50, 51 (2009).

expansion of the commercial space tourism industry could cause irreparable harm to the ozone layer.⁶⁶

Rocket plumes damage the ozone layer by causing the formation of localized holes in the layer.⁶⁷ Rocket launches also release submicron radical particles, such as nitrogen oxide, into the atmosphere, which can globally reduce ozone levels.⁶⁸ A single such molecule “can destroy up to [approximately ten thousand] ozone molecules before being deactivated and transported out of the stratosphere.”⁶⁹ Furthermore, rocket emissions are injected into the upper layers of the atmosphere, where there is little atmospheric mass and a greater potential to change global temperatures by affecting the energy balance of the atmosphere’s layers.⁷⁰ Rocket emissions are the “only human-produced source of ozone-destroying compounds injected directly into the middle and upper stratosphere,” making them uniquely and especially harmful to the environment.⁷¹

Suborbital spaceflights, like those launched by Virgin Galactic and Blue Origin, also cause harm to Earth’s environment by releasing black carbon into the atmosphere.⁷² If enough black carbon is introduced into the atmosphere, it could change global weather patterns, causing droughts in various parts of the world.⁷³ In the United States, the FAA and the Associate Administration for Commercial Space Transportation (AST) implored commercial spaceflight companies to research their impact on the atmosphere and work to mitigate those impacts in their 2001 Guidelines for Compliance with the National Environmental Policy Act and Related Environmental Review Statutes for the Licensing of Commercial Launches and Launch Sites.⁷⁴ While this was an important step, these guidelines only ask commercial spaceflight companies to do additional research without any mechanisms to incentivize companies to do so.⁷⁵ These guidelines also only apply to companies that operate within the United States. States must go beyond these guidelines and convene to create a comprehensive scheme to regulate rocket emissions before rocket

66. *See id.*

67. *See id.* at 54.

68. *See id.*

69. *Id.*

70. *See* Friedberg, *supra* note 9, at 208.

71. *See* Ross, Toohey, Peinemann & Ross, *supra* note 65, at 52.

72. *See* Friedberg, *supra* note 9, at 209.

73. *See id.* at 210.

74. *See generally* OFF. OF THE ASSOC. ADM’R FOR COMMERCIAL SPACE TRANSP., FED. AVIATION ADMIN., GUIDELINES FOR COMPLIANCE WITH THE NATIONAL ENVIRONMENTAL POLICY ACT AND RELATED ENVIRONMENTAL REVIEW STATUTES FOR THE LICENSING OF COMMERCIAL LAUNCHES AND LAUNCH SITES (Feb. 22, 2001), https://www.faa.gov/space/legislation_regulation_guidance/media/Guidelines_Compliance_EPA_AST.pdf [<https://perma.cc/62SK-Z37J>] (archived Sept. 10, 2022).

75. *See id.* at 5–6.

launches increase to such a level so as to irreparably harm Earth's atmosphere. Since it is currently unclear what level of launch activity will lead to irreparable damage, states must act now to ensure Earth's environment is not a casualty of space tourism's expansion.

The Moon Treaty and the other international agreements concerning space activities failed to create a regime of environmental protections for the moon or other celestial bodies. Like the environment on Earth, the environments of celestial bodies may be threatened by the activities of space tourism. For one, space tourists may leave their trash in space, exacerbating the already growing threat of space debris.⁷⁶ Space debris is comprised of "artificial objects, including derelict spacecraft and spent launch vehicle orbital stages which no longer serve a useful purpose."⁷⁷ Before the 2000s, spent rocket engines were jettisoned after launch, adding orbital debris.⁷⁸ Modern rocket systems no longer require jettisoning their engines due to advances in rocket design.⁷⁹ Despite this improvement, space tourism will still create debris, which could be added to the current mass of debris orbiting Earth, causing serious collisions and threatening the future safety of spaceflights.⁸⁰ Many scholars have stressed the need for the international community to create a system for removing this dangerous debris from Earth's orbit, yet there remains no international system in place to address the growing threat of space debris.⁸¹

Debris could also accumulate on destination sites. The moon alone is currently littered with nearly four hundred thousand pounds of man-made material, ranging from various types of spacecraft and research tools to boots and human waste.⁸² Tourist visits to the moon and beyond are likely to leave their own debris behind. Due to the distance from Earth and the lack of international regulation incentivizing the removal of space waste, these objects are likely to remain in outer space for the considerable future.

76. See DAVID BAIOCCHI & WILLIAM WELSER IV, NAT'L DEF. RESEARCH INST., *CONFRONTING SPACE DEBRIS: STRATEGIES AND WARNINGS FROM COMPARABLE EXAMPLES INCLUDING DEEPWATER HORIZON*, xiii (2010).

77. NAT'L AERONAUTICS & SPACE ADMIN., *HANDBOOK FOR LIMITING ORBITAL DEBRIS*, NASA Handbook 8719.14 (2008).

78. See BAIOCCHI & WELSER, *supra* note 76, at 2.

79. See *id.*

80. See Mary Button, *Cleaning Up Space: The Madrid Protocol to the Antarctic Treaty as a Model for Regulating Orbital Debris*, 37 WM. & MARY ENV'T. L. & POL'Y REV. 539, 543 (2013).

81. See *id.*

82. See Megan Garber, *The Trash We've Left on the Moon*, ATLANTIC (Dec. 19, 2012), <https://www.theatlantic.com/technology/archive/2012/12/the-trash-weve-left-on-the-moon/266465/> [https://perma.cc/J795-75M4] (archived July 20, 2022).

B. *Protections for Space Tourists*

Space exploration is potentially a personally dangerous endeavor for those who choose to participate. Throughout the history of space exploration, several astronauts have lost their lives in catastrophic accidents.⁸³ These fatalities have occurred both in preparation for missions and during spaceflight.⁸⁴ While many of the fatalities and injuries associated with spaceflight occurred during the early years of manned spaceflight, one pilot died in 2014 during a Virgin Galactic test flight.⁸⁵ Deadly accidents associated with spaceflight will always be possible, especially as companies push the bounds of technology. Thus, a strong liability regime is necessary to protect potential passengers on commercial spaceflights.

The current regime for space law does not make clear how to classify space tourists. Should they be considered astronauts and thus receive the protections afforded under the OST and the Rescue Agreement, or should they receive some lesser status? Both the OST and the Rescue Agreement provide specific protections for astronauts, yet neither agreement defines the term “astronaut.”⁸⁶ This leaves an important hole in the regulatory regime that needs to be filled. If there is an accident on a commercial spaceflight, it is unclear whether the responsibility for rescue lies with states, as outlined in the Rescue Agreement, or if it should lie with the commercial entities providing space travel services.⁸⁷

Passengers on commercial spaceflights do not appear to correspond with the “astronauts” originally envisioned by the OST. The treaty states that astronauts should be regarded as “envoys of mankind in outer space.”⁸⁸ The first astronauts who went to space and made groundbreaking scientific discoveries certainly fit with the vision of an envoy representing all who remain back on Earth. Current commercial spaceflight passengers, however, are not conducting research and are not sent to space as representatives of any nation. Rather, most of these individuals are spending their own fortunes on an opportunity to

83. See generally DAVID SHAYLER, *DISASTERS AND ACCIDENTS IN MANNED SPACEFLIGHT* (2000) (describing the history of spaceflight and detailing the preparations, attempts, and fatalities by crews to achieve space exploration).

84. See *id.*

85. See Street, *supra* note 12.

86. See Ankit K. Padhy & Amit K. Padhy, 184 *ACTA ASTRONAUTICA* 269, 271 (2021); see also Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *supra* note 23; Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, *supra* note 35.

87. See Padhy & Padhy, *supra* note 86, at 271.

88. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *supra* note 23, art. V.

travel into outer space for only short periods. This suggests that, perhaps, commercial passengers should be afforded a different set of protections due to the commercial nature of their voyage and their ability to use the market to gain superior safety protections, while the individuals thought of as “true” astronauts on state-sponsored missions do not have the same ability.

The Multilateral Crew Operations Panel for the International Space Station, which represented the interests of various space agencies participating in International Space Station operations, created an agreement specifying that there are two types of crewmembers.⁸⁹ The first type is the “professional astronaut/cosmonaut,” defined as an individual “who has completed the official selection and has been qualified as such at the space agency of one of the International Space Station partners and is employed on the staff of the crew office of that agency.”⁹⁰ The second type is the “spaceflight participant,” defined as an individual from “commercial, scientific and other programs,” a crewmember of a non-partner space agency, or an engineer, scientist, teacher, journalist, filmmaker, or tourist sponsored by one or more partners.⁹¹ This type of crewmember is “[n]ormally . . . a temporary assignment that is covered under a short-term contract.”⁹²

Recently, the United States created its own distinction between individuals the US government sends to space and those who travel to space with solely commercial entities.⁹³ Thus, the United States Commercial Space Launch Competitiveness Act differentiates between “government astronauts” and “spaceflight participants.”⁹⁴ Perhaps the international community could adopt a distinction similar to the distinctions outlined by the International Space Station and the United States to resolve the ambiguity in the usage of “astronaut” in the OST.

The status of passengers on commercial spaceflights is particularly salient for the application of the Liability Convention. The Liability Convention is inapplicable when damage is caused by a space object of a launching state to its nationals and foreign nationals “during such time as they are participating in the operation of that

89. See ISS Multilateral Crew Operations Panel, *Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers*, SPACEREF (Nov. 28, 2001), <https://spaceref.com/status-report/principles-regarding-processes-and-criteria-for-selection-assignment-training-and-certification-of-iss-expedition-and-visiting-crewmembers/> [https://perma.cc/X53P-2NVP] (archived July 20, 2022).

90. *Id.*

91. *Id.*

92. *Id.*

93. See U.S. Commercial Space Launch Competitiveness Act §§ 103, 112, Pub. L. No. 114–90, 129 Stat. 704 (2015).

94. *Id.*

space object from the time of its launching . . . until its descent.”⁹⁵ This would suggest that the protections of the convention do not apply to passengers regardless of their nationality. However, passengers on commercial spaceflights do not “participat[e] in the operation” of any “space object” during their trip.⁹⁶ The current commercial space vehicles are manned by crew members on the ground, rather than by individuals inside the capsules. If the Liability Convention did apply to commercial passengers despite their lack of participation in the operation of a flight, the state from whose territory the flight launched would be absolutely liable for any damage. Absolute liability is a harsh penalty and may not be appropriate for injuries to space tourists because these individuals voluntarily assume a high risk.⁹⁷ Additionally, contract law, rather than space law, may be better suited to resolve disputes over faults and injuries occurring during commercial spaceflights.

Yet, leaving questions about legal protections for space tourists to a patchwork of individual contracts or a case-by-case determination on the applicability of the Liability Convention is not suitable for a rapidly growing industry with little international regulatory guidance. If the international community truly wants to protect growing numbers of space tourists, it must create a comprehensive regulatory regime.

C. *Regulations for Commercial Spaceflight Operators*

The current regulatory regime initially created by the OST assigns responsibility for national activities in space to individual states regardless of whether the state government or a commercial entity is sponsoring the activity.⁹⁸ While this regime was suitable for past activities in space, which were mainly sponsored by state governments, the regime is ill-suited for current activities in space, which are increasingly sponsored by commercial spaceflight companies.

The Liability Convention assigns liability for damage caused by space objects to the “launching state.”⁹⁹ The treaty defines this term to be “a state which launches or procures the launching of a space object” and “a state from whose territory or facility a space object is

95. Convention on International Liability for Damage Caused by Space Objects, *supra* note 39, art. VII; *see also* Stephen Hobe, *Legal Aspects of Space Tourism*, 86 NEB. L. REV. 439, 450 (2017).

96. Convention on International Liability for Damage Caused by Space Objects, *supra* note 39, art. VII.

97. *See* Hobe, *supra* note 95, at 450.

98. *See* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *supra* note 23, art. VI.

99. Convention on International Liability for Damage Caused by Space Objects, *supra* note 39, art. II.

launched.”¹⁰⁰ This broad definition ensures that there is always at least one state responsible even when a state government does not have the capability to launch an object from its territory and uses another state’s facilities to launch an object.¹⁰¹ Such breadth is beneficial when it incentivizes states to increase the safety of missions, but it is disquieting that states could pay enormous sums of money for injuries sustained from an incident where the government’s only role was to authorize the launch.¹⁰² While no state has yet paid compensation to a victim under the provisions of the Liability Convention for any damages caused by privately owned and operated space objects, the possibility remains and becomes more likely as private activity in space increases.¹⁰³

If the international community wants to support the growth of the commercial spaceflight industry, the current formulation of the Liability Convention and its potential to impose high payouts on states is unlikely to encourage states to back the industry. However, the potential for high payouts may not present any difficulties for states so long as their domestic legislation imposes insurance requirements on space activities, which would prevent the government from carrying the burden for any losses.¹⁰⁴ In the United States, private entities are required to obtain liability insurance or demonstrate financial responsibility of not more than “the maximum liability insurance available on the world market at reasonable cost if the amount is less than the applicable amount’ required by the ‘Maximum Probable Loss.’”¹⁰⁵ The Maximum Probable Loss is set by NASA and administered by the AST depending on the financial risk of the individual launch.¹⁰⁶ Belgium and France have similar policies to protect the state from paying for mishaps on missions the state does not sponsor.¹⁰⁷

The Liability Convention and the international agreements on space also fail to incentivize private companies to act responsibly and safely. Under the current regulatory regime, individual states are responsible for ensuring commercial spaceflight companies that operate within their borders comply with international treaties on activity in space.¹⁰⁸ This patchwork of domestic regulations may be

100. *Id.* art. I.

101. See Armel Kerrest, *The Concept of the “Launching State” in Commercial Launch Ventures*, in *COMMERCIAL USES OF SPACE AND SPACE TOURISM* 1, 5 (Jan Wouters et al. eds., 2017).

102. See *id.* at 6.

103. See *id.* at 5–6.

104. See *id.* at 14.

105. *Id.* (quoting 51 U.S.C. § 50914(a)(3)(B)).

106. Most launches range from \$15–250 million dollars but could reach as high as \$500 million. Kerrest, *supra* note 101, at 15.

107. *Id.*

108. See Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *supra* note 23, art. VI.

suitable for the current state of the industry: right now, only a few companies offer space flights for private individuals, and they mostly operate within the United States. However, this is unlikely to remain the state of affairs. There is reason to be concerned that domestic regulation will fail to embody the spirit of international space law, which sees space as shared by all states, even those that lack the means to send a mission into outer space.¹⁰⁹ The United States, for example, has chosen to limit regulation of the commercial spaceflight industry with the passage of the Commercial Space Launch Competitiveness Act in November 2015.¹¹⁰ As the title of the law suggests, US lawmakers hoped to aid the fledgling space tourism industry by taking a hands-off approach to its regulation.¹¹¹ The act extended the period during which the FAA would not promulgate any regulations until October 2023.¹¹² Other states may choose to take a similar approach to regulating commercial spaceflight companies.

The lack of strict domestic regulation promotes innovation in the industry and relieves companies from the costs of regulation. Thus far, no disasters have occurred which would make this particularly concerning. Yet, the possibility of a malfunction always exists due to the high-risk nature of spaceflight. “[A]nything could happen at any time,”¹¹³ even when the companies involved possess highly advanced technology. As the technology required for commercial spaceflights becomes cheaper, SpaceX, Blue Origin, and Virgin Galactic will not be the only options for private individuals hoping to travel to outer space. Profit motives are likely to outweigh commitments to protecting the environment and passengers. Outer space must remain “the province of all mankind”—a zone for exploration to the benefit of each member of the global community.¹¹⁴ Accordingly, the international community should not leave regulation of the industry to individual states or individual commercial entities.

109. *See id.* art. I.

110. *See generally* U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114–90, 129 Stat. 704 (2015).

111. *See* Katrin Nyman-Metcalf, *National and International Regulatory Aspects of Commercial Space Activities: Self-Regulation as the Way Forward*, in *COMMERCIAL USES OF SPACE AND SPACE TOURISM* 266, 278 (Jan Wouters et al. eds., 2017).

112. *Id.* at 279.

113. Rachel Rogers, *The Sea of the Universe: How Maritime Law’s Limitation on Liability Gets it Right and Why Space Law Should Follow by Example*, 26 *IND. J. GLOB. LEGAL STUD.* 741, 757 (2019).

114. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *supra* note 23, art. I.

D. *Current Proposed Regulations for Space Tourism*

As commercial spaceflights have rapidly increased since the summer of 2021, scholars have scrambled to find a suitable way to regulate the industry before it causes irreparable environmental harm or human casualties occur.

Some scholars, including Katrin Nyan-Metcalf, have called for self-regulation of the commercial space industry.¹¹⁵ Self-regulation would allow commercial spaceflight companies to create their own rules.¹¹⁶ It is considered appropriate for this industry because regulated entities have a better understanding of how the regulations will affect their business than a government entity could.¹¹⁷ Additionally, this proposal could save costs for governments and promote desirable values like freedom and self-determination.¹¹⁸ Self-regulation is also seen as particularly beneficial in other rapidly advancing areas like the internet.¹¹⁹ If the space tourism industry continues to advance at a rapid rate, self-regulation may be the only protective mechanism that can keep pace with the advancements.

However, there are reasons to be skeptical that self-regulation will create adequate protections for passengers and the environment. Commercial spaceflight companies will want to limit their liability for accidents and are thus unlikely to want regulations that would allow passengers to receive compensation in the event of mechanical components malfunctioning. These companies also do not have the proper incentives to limit flights or assume large expenses to create more environmentally friendly rocket engines to limit harm to the fragile ozone layer. While these companies have expertise in spaceflight operations, it does not follow that they will have the expertise to regulate every aspect of the industry and its effects beyond outer space. The input of parties beyond commercial spaceflight companies is necessary to ensure that more than corporate interests are represented.

Another notable proposal to regulate the space industry is to expand the purview of the International Civil Aviation Organization (ICAO).¹²⁰ The Convention on International Civil Aviation created ICAO in 1944 to set uniform international standards and procedures for civil aviation safety.¹²¹ Expanding the domain of ICAO to include commercial spaceflights would allow the industry to benefit from the

115. See Nyman-Metcalf, *supra* note 111, at 266.

116. See *id.* at 269–70.

117. *Id.* at 268–69.

118. *Id.* at 269.

119. See *id.* at 274.

120. See generally THE NEED FOR AN INTEGRATED REGULATORY REGIME FOR AVIATION AND SPACE: ICAO FOR SPACE? (Ram S. Jakhu et al. eds., 2011) [hereinafter JAKHU, SGOBBA & DEMPSEY].

121. See *id.* at 4.

same successful safety standards and air traffic management protocols used for flights on Earth.¹²²

The proposal to utilize ICAO for space regulation is supported by the International Association for the Advancement of Space Safety (IAASS).¹²³ The IAASS has proposed a supplement to the OST to add safety and environmental protections with its manifesto:

Ensure that citizens of all nations are equally protected from the risks posed by over-flying space systems and objects during launch and re-entry operations;

Ensure the space systems are developed, built, and operated according to common minimum ground and flight safety rules which reflect the status of knowledge and the accumulated experience of all space-faring nations;

Seek to prevent collisions or interference with other aerospace systems during launch, on-orbit operation, and re-entry;

Ensure the protection of the ground, air, and on-orbit environments from chemical, radioactive, and debris contamination related to space operations;

Ensure that mutual aid provisions for space mission safety emergencies are progressively agreed, developed, and made accessible without restriction anywhere on the Earth and in Outer Space.¹²⁴

The IAASS deems the United Nations Office for Outer Space Affairs (UNOOSA) ill equipped to regulate space activities and supports a “Space ICAO” with the means to enforce its regulations of commercial space activity.¹²⁵ The IAASS also promulgated a Convention on the Regulation of Near Space, an area it defines as “a region above and adjacent to the national airspace, subject to the specific legal regime provided under this Convention.”¹²⁶ The area is not outer space and thus is not governed by the OST but would be subject to its own set of regulations.¹²⁷ This convention would, therefore, solve many of the problems associated with regulating suborbital flights that do not reach outer space. However, the Convention calls for states to create their own national rules governing private operators in near space and continuously supervise their activities, which would result in a patchwork of inconsistent regulations just as occurs under the five international outer space activity treaties.¹²⁸ While the Convention

122. *See id.* at 117–39.

123. *See* Tommaso Sgobba, Arndt-Phillipp Menzel, Ram Jakhu & Joseph Pelton, *Manifesto for a Safe and Sustainable Outer Space*, 62 J. BRITISH INTERPLANETARY SOC'Y 241, 244 (2009).

124. INT'L ASS'N FOR THE ADVANCEMENT OF SPACE SAFETY, MAKING SPACE SAFE AND SUSTAINABLE 4 (Dec. 2021), <https://iaass.space-safety.org/wp-content/uploads/sites/24/2021/12/Making-Space-Safe-and-Sustainable-A4-v1-3.pdf> [https://perma.cc/R4AM-LQWY] (archived Sept. 10, 2022).

125. *Id.* at 4–5.

126. *Id.* at 25.

127. *See id.*

128. *See id.* at 27.

acknowledges many of the hazards posed by flights in “near space,” such as environmental pollution, it fails to create any specific regulations to mitigate the hazards.¹²⁹

Other proposals to solve the legal challenges of space tourism have focused particularly on protecting the environment. Jennifer Friedberg suggests that the 1979 Convention on Long-Range Transboundary Air Pollution (LRTRAP) could be used to regulate environmental damage caused by commercial spaceflights.¹³⁰ LRTRAP requires contracting parties to research potentially polluting activities and enact policies to mitigate air pollution.¹³¹ Since suborbital commercial spaceflights may not reach outer space but do affect the earth’s environment, pollution from commercial spaceflights may fall under LRTRAP.¹³² Like other international treaties, however, LRTRAP suffers from a lack of clear enforcement mechanisms. LRTRAP relies on voluntary compliance from signatories and could only be enforced through voluntary arbitration.¹³³ Other legal scholars have suggested that the regulations of the United States Environmental Protection Agency, the Madrid Protocol, or the Antarctic Treaty could serve as models for how the international community could craft a new international agreement to address the environmental impacts of commercial space travel.¹³⁴

Scholars have also given considerable thought to the Liability Convention and whether it is suitable for the realities of commercial spaceflight. Rachel Rogers believes the Liability Convention can no longer “continue living in the 1970s in the infancy of space exploration” when modern technology has drastically improved the ability to explore farther into outer space.¹³⁵ She argues that space and the sea are similar, and, therefore, space law should abandon the absolute liability regime created by the Liability Convention.¹³⁶ She argues a new law should be implemented to limit liability to support increased travel to outer space.¹³⁷

Despite many scholars reflecting on the legal challenges presented by space tourism, no comprehensive solution has emerged. Most of the aforementioned proposals focus on only one aspect of space tourism. A true solution to the challenges of space tourism must be an international solution that promotes and protects innovation in the industry while ensuring protections for the environment and passengers. This Note draws on the IASS proposal to supplement the OST to regulate space tourism and proposals like Rachel Roger’s that use

129. *See id.* at 27–28.

130. *See* Friedberg, *supra* note 9, at 216, 223.

131. *Id.* at 220.

132. *See id.* at 216.

133. *See id.* at 219–21.

134. *See generally* Apking, *supra* note 58; Button, *supra* note 80.

135. Rogers, *supra* note 113, at 757.

136. *Id.* at 743–44.

137. Rogers argues for following the example of the Limitation of Liability Act, 46 U.S.C. §§ 181–96. Rogers, *supra* note 113, at 741.

other international agreements as inspiration for a new agreement to regulate commercial space activity.

IV. SOLUTION

New international regulations for the space tourism industry are necessary to ensure the industry is safe for those in flight and those back on Earth. States can and have enacted domestic regulations; however, the inescapably international nature of space voyages calls for an international scheme. An international scheme could interface between various domestic regulations to promote international cooperation and foster healthy competition.¹³⁸

A. Utilizing Approaches from Other International Agreements

Regulation of the space tourism industry requires a careful balance of allowing businesses to profit from their innovation while ensuring that space remains protected for the benefit of future generations. Lessons can be learned from three international agreements: the Antarctic Treaty, the United Nations Convention on the Law of the Sea, and the Treaty for Amazonian Cooperation; each of these agreements considers how to balance these competing interests for the benefit of humanity. These agreements provide a framework for how a new international agreement on space tourism could achieve the right balance.

1. The Antarctic Treaty and the Antarctic Environmental Protocol

In 1959, the twelve countries active in the scientific exploration of Antarctica signed the Antarctic Treaty.¹³⁹ Since then, forty-six countries have acceded to the Treaty.¹⁴⁰ The contracting parties meet annually to discuss measures about the use and conservation of Antarctica.¹⁴¹ During one such meeting, the parties created the Protocol on Environmental Protection to the Antarctic Treaty (PEPAT) with the goal that “activities in the Antarctic Treaty area shall be planned and conducted to limit adverse impacts on the Antarctic

138. See Jean-Francois Mayence, *The Role of UNCOPUOS in the International Regulation of Non-Governmental Space Activities*, in *COMMERCIAL USES OF SPACE AND SPACE TOURISM* 254, 262 (Jan Wouters et al. eds., 2017).

139. See generally *The Antarctic Treaty*, Jan. 12, 1959, 402 U.N.T.S. 71.

140. *The Antarctic Treaty*, NAT'L SCI. FOUND., <https://www.nsf.gov/geo/opp/antarct/anttrty.jsp> (last visited Sept. 10, 2022) [<https://perma.cc/W3SK-64ZF>] (archived Sept. 10, 2022)

141. See *Antarctic Treaty*, *supra* note 139, art. IX; see also Button, *supra* note 80, at 559.

environment and dependent and associated ecosystems.”¹⁴² Under PEPAT, both governmental and private activities require that a Comprehensive Environmental Impact Evaluation be carried out according to specific procedures enumerated in Annex I.¹⁴³ Only activities determined to have “less than a minor or transitory impact” may proceed.¹⁴⁴

The Antarctic Treaty and PEPAT have been largely successful in creating regulations to protect Antarctica without many of the consensus issues that prevent other international organizations from achieving their goals.¹⁴⁵ This is due in part to the treaty’s division of parties into Consultative Parties and Observers.¹⁴⁶ Consultative Parties are parties that are sufficiently involved in activity in Antarctica to warrant voting power at the Antarctic Treaty Consultative Meeting (ATCM).¹⁴⁷ Observers can attend the annual meetings and weigh in on issues, but cannot vote on proposals.¹⁴⁸ This system ensures that the most-involved stakeholders have the most power in decision-making and limits the number of parties that must agree before action can be taken.

In addition to ensuring that Antarctica is preserved for scientific study, the ATCM adopted General Guidelines for Visitors to the Antarctic in 2011 to manage tourism in the area.¹⁴⁹ The Guidelines provide advice on visiting locations in the Antarctic in a way that protects its environment, its scientific missions, and its natural beauty from the adverse impacts of visitors.¹⁵⁰ After PEPAT was signed, seven tour companies operating in Antarctica founded the International Association of Antarctica Tour Operators (IAATO).¹⁵¹ The IAATO’s goal is to “advocate and promote the practice of safe and environmentally friendly private-sector travel to the Antarctic,” which it does by establishing operating procedures for tourism in Antarctica.¹⁵² These procedures include restrictions on the number of visitors that may come ashore, wildlife-watching guidelines to protect the natural habitat, and activity reporting requirements.¹⁵³ Many of

142. Protocol on Environmental Protection to the Antarctic Treaty art. 3(2)(a), Oct. 4, 1991, 30 I.L.M. 1455.

143. *Id.* art. 8.

144. *Id.* Annex I, art. I.

145. See Button, *supra* note 80, at 560.

146. *See id.*

147. *See id.*

148. *See id.*

149. See *The Antarctic Treaty*, INT’L ASS’N OF ANTARCTICA TOUR OPERATORS, <https://iaato.org/about-iaato/the-antarctic-treaty/> (last visited Jan. 21, 2022) [<https://perma.cc/JC9R-JYUC>] (archived July 17, 2022).

150. *See id.*

151. *The History of IAATO*, INT’L ASS’N OF ANTARCTICA TOUR OPERATORS, <https://iaato.org/about-iaato/our-mission/history-of-iaato/> (last visited Jan. 21, 2022) [<https://perma.cc/6XRC-FX69>] (archived July 14, 2022).

152. *Id.*

153. *See id.*

its guidelines have been formally adopted by Antarctic Treaty nations.¹⁵⁴ The IAATO works closely with the ATCM to ensure that the Antarctic environment is protected for future generations while allowing individuals from across the globe to enjoy its beauty in person.¹⁵⁵

2. The United Nations Convention on the Law of the Sea

The United Nations Convention on the Law of the Sea (UNCLOS), signed in 1982, established a legal framework for all maritime activity.¹⁵⁶ The parties to the Convention hoped to promote “peace, justice and progress for all peoples of the world” and “equitable and efficient utilization” of aquatic resources while protecting and preserving the marine environment.¹⁵⁷ Like the OST, UNCLOS states that certain areas of the sea, particularly the seabed and ocean floor, “shall be open to use exclusively for peaceful purposes by all States . . . without discrimination and without prejudice.”¹⁵⁸ While the provisions of UNCLOS cover a wide range of topics, its protections for the environment and promotion of economic activity are the most informative for creating a regulatory regime for outer space.

Part XII of UNCLOS creates a regime for protecting the marine environment.¹⁵⁹ States have a “sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment.”¹⁶⁰ States should take appropriate measures to “prevent, reduce and control pollution of the marine environment” and “protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life.”¹⁶¹ UNCLOS also encourages states to promote scientific research on pollution and other damage to marine ecosystems and exchange information with other states and international organizations.¹⁶² In 2016, an Arbitral Tribunal interpreted Part XII of UNCLOS broadly to resolve a dispute between the Philippines and China over China’s alleged harmful fishing practices.¹⁶³ The Tribunal used a broad interpretation of a

154. *See id.*

155. *See id.*

156. United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

157. *Id.*

158. *Id.* art. 141; *see also* R.V. Dekanozov, *The Principle of Peaceful Use in the Law of the Sea and Space Law*, 12 MARINE POL’Y 271, 273 (1988).

159. United Nations Convention on the Law of the Sea, *supra* note 156, pt. XII.

160. *Id.* art. 193.

161. *Id.* art. 194(1), 194(5).

162. *Id.* art. 200.

163. *See* Seokwoo Lee & Lowell B. Bautista, *Part XII of the United Nations Convention on the Law of the Sea and the Duty to Mitigate Against Climate Change:*

state's obligations under UNCLOS to hold China liable for breach and created a framework for how the convention can be used in the future to hold other states liable for damaging the marine environment.¹⁶⁴

UNCLOS also gives international organizations and all states, regardless of their location or level of development, the right to conduct research.¹⁶⁵ The convention also promotes the development of scientific and technological capacity, with a particular emphasis on "accelerating the social and economic development of the developing States."¹⁶⁶ UNCLOS goes beyond research interests and promotes economic uses of the marine environment. The convention creates exclusive economic zones for coastal states to exploit natural resources and opens the high seas for fishing, navigation, installing submarine cables and pipelines, and constructing artificial islands and other installations.¹⁶⁷ These uses of the seas remain subject to the environmental protections created by the other articles of UNCLOS.¹⁶⁸ Thus, UNCLOS allows for economic exploitation of the seas while ensuring that the exploitation does not cause irreparable environmental harm.

3. The Treaty for Amazonian Cooperation

On July 3, 1987, representatives from Brazil, Bolivia, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela signed the Treaty for Amazonian Cooperation (TAC).¹⁶⁹ The TAC aims to "promote the harmonious development of the Amazon region" and "permit an equitable distribution of the benefits of said development among the Contracting Parties so as to raise the standard of living of their peoples and so as to achieve total incorporation of their Amazonian territories into their respective national economies."¹⁷⁰ The treaty balances development of the Amazon with the "preservation of the environment" and "conservation and rational utilization of the natural resources."¹⁷¹

To achieve these aims, the TAC establishes a system where parties annually exchange scientific research and information on conservation measures.¹⁷² Moreover, the parties agreed to partake in joint studies to research the economic and social development of the Amazon.¹⁷³ The TAC also acknowledges the importance of tourism to

Making Out a Claim, Causation, and Related Issues, 45 *ECOLOGY L.Q.* 129, 135–36 (2018).

164. *See id.* at 137–41.

165. *See* United Nations Convention on the Law of the Sea, *supra* note 156, art. 238.

166. *Id.* arts. 266, 268–69.

167. *See id.* arts. 55–57, 87.

168. *See id.* art. 87.

169. Treaty for Amazonian Cooperation, July 3, 1987, 1202 U.N.T.S. 51.

170. *Id.*

171. *Id.* art. I.

172. *See id.* art. VII.

173. *See id.* art. XI.

the region, stating that the parties “shall cooperate to increase the flow of tourists.”¹⁷⁴ Finally, the TAC creates an Amazonian Cooperation Council, which meets once a year, to ensure treaty compliance and draw up rules and regulations for the proper functioning of the treaty.¹⁷⁵ The TAC also instructs the parties to create Permanent National Commissions to enforce the treaty and the decisions of the Amazonian Cooperation Council in their respective territories.¹⁷⁶

In 1998, the parties of the TAC amended the treaty to create the Amazon Cooperation Treaty Organization (ACTO) to further strengthen and implement the TAC.¹⁷⁷ ACTO follows the principles of sustainable development and sustainable livelihoods, pursued in harmony with nature and the environment to promote coordination between member states on resource management, protection of Amazonian cultures and indigenous peoples, and sustainable use of the forests, waters, and biodiversity of the Amazon.¹⁷⁸ ACTO is active in implementing the goals of the TAC. Recently, it embarked on the Amazon Basin Project to address pollution in the Amazon River caused by its commercial use.¹⁷⁹ This project and others launched by the TAC show how an international treaty can simultaneously promote economic development and environmental conservation.

B. *Application to the Space Tourism Industry: A New International Agreement*

The Antarctic Treaty and its progeny, UNCLOS, and the TAC highlight the ability of the international community to create instruments that balance economic considerations with the protection of the environment. This Note argues that the problems posed by growing space tourism should be solved with a new international treaty on outer space, building on those that came before. This Note cannot provide every possible provision of such a treaty. Instead, it utilizes the examples of the three treaties explored in subpart A to give an overall view of what this proposed treaty could look like and what provisions would assist in solving the issues of space tourism explored in this Note.

174. *Id.* art. XIII.

175. *Id.* art. XXI.

176. *Id.* art. XXIII.

177. *About Us*, AMAZON COOP. TREATY ORG., <http://otca.org/en/about-us/> (last visited Mar. 3, 2022) [<https://perma.cc/QMV7-2QN6>] (archived July 17, 2022).

178. *See id.*

179. *See Project Implementation of the Strategic Actions Program in the Amazon River Basin Considering Climate Variability and Change (Amazon Basin Project)*, AMAZON COOP. TREATY ORG., http://otca.org/en/ctp_otca_projetos/amazon-basin-project-2/#publications (last visited Mar. 3, 2022) [<https://perma.cc/2BPY-SBAC>] (archived July 17, 2022).

An international regime is suitable for addressing space tourism because all states have a potential stake in the commercial utilization of outer space and its preservation as an asset, regardless of whether they are currently able to commercially exploit it.¹⁸⁰ While bilateral and multilateral agreements could be ratified more quickly than an international treaty, such approaches would create a patchwork regulatory regime; an international treaty is more suited to space because space is the domain of all nations and should be treated as such. A new international agreement should continue to preserve the ideal of open and equal access woven throughout the five existing outer space treaties.

The proposed treaty will follow the examples of the Antarctic Treaty, PEPAT, UNCLOS, and the TAC to balance economic benefits with the protection of the environment. Each of these treaties allows states to utilize the resources of the environment for the economic gain of states and private enterprises while creating mechanisms to ensure that the utilization does not permanently destroy natural habitats.¹⁸¹

The treaty should have provisions to protect the environment through the implementation of a proposed activity process like the provisions of the Antarctic Treaty and PEPAT. Under the Antarctic Treaty and PEPAT, states must complete environmental impact studies before any activity can proceed.¹⁸² Any activity that would have a significant harmful impact on the environment is not allowed.¹⁸³ The same should be true in space. States or companies who wish to use outer space for tourism activity must outline how their proposed activity will impact not only the environment of the celestial body they visit but also Earth's environment. The proposed activities would be reviewed and approved by an international enforcement agency. The international enforcement agency would consist of representatives of various states, scientists and experts on space and the environment, and industry experts who can understand the type of technology employed by a state or company during the proposed activity. Like the Antarctic Treaty, there would be a distinction between consultative parties, who currently participate in significant levels of activity in space, and observers, who do not currently participate but have an interest in understanding how space activity could affect those who remain back on Earth.¹⁸⁴

The parties would also meet annually to discuss measures to protect the environment, just as they do under the Antarctic Treaty,

180. See JAKHU, SGOBBA & DEMPSEY, *supra* note 120, at 120.

181. See generally Antarctic Treaty, *supra* note 139; United Nations Convention on the Law of the Sea, *supra* note 156; Treaty for Amazonian Cooperation, *supra* note 169.

182. See Protocol on Environmental Protection to the Antarctic Treaty, *supra* note 142, art. 8, annex I.

183. See *id.* art. 3.

184. See Button, *supra* note 80, at 560.

PEPAT, and the TAC.¹⁸⁵ Annual meetings ensure international cooperation in creating environmental protections that respond over time to changes. The parties would utilize the research gathered for applications on proposed commercial activity and expert-collected scientific data to determine how to mitigate pollution released by rocket launches and other harm from commercial spaceflights.

The international body reviewing proposed commercial activity will also promulgate regulations for commercial entities to ensure that commercial spaceflight is safe. This body would act like ICAO to enforce minimum safety standards for space tourism activities. This will protect space tourists, who, unlike professional astronauts, do not receive rigorous safety training preflight. Thus far, the suborbital spaceflights popular with tourists have proven safe, but this may change as new companies enter the industry. New companies could choose to prioritize profits over safety; thus, an international body is needed to protect consumers in a rapidly changing market.

Finally, the proposed treaty would change the current liability regime that assigns absolute liability to states even when they only authorize a launch. The entity operating the flight, whether that is a state government or a private company, will be held liable for any injuries to passengers, damage to other space objects, or damage to the Earth. If a government and a private company work together on a commercial launch, they can contract to assign liability between them. This contracting approach ensures that commercial entities responsible for the operation of the flights, regardless of where they chose to launch, retain responsibility for their decisions. States that authorize launches can do so with the confidence that companies will be liable for their actions. Under this provision, companies will also be incentivized to act responsibly and safely because they continue to bear the costs of their mistakes.

This proposal for a new international treaty on outer space is far from comprehensive; the treaty will need the expertise of industry leaders, potential passengers, and states to succeed. This Note argues that this treaty should be guided by the examples of the Antarctic Treaty, PEPAT, the TAC, and UNCLOS, which have successfully balanced commercial interests with protecting the environment. This principle should be added to the principles of common heritage and open access embodied in the five existing outer space treaties. A new treaty will update an outdated regulatory regime that never considered the possibility of large commercial operations in outer space. It also will provide uniformity to an area of the law that is currently

185. See Treaty for Amazonian Cooperation, *supra* note 169, art. VII; Protocol on Environmental Protection to the Antarctic Treaty, *supra* note 142; Antarctic Treaty, *supra* note 139.

piecemeal, resulting in holes that leave passengers and the environment vulnerable to harm.

C. *Potential Vulnerabilities of This Solution*

While a new international agreement would provide a comprehensive and uniform solution to the problems created by an expanding space tourism industry, it is vulnerable for two reasons. First, it could be difficult to get states to agree on a new treaty regulating tourism in outer space. Second, even if states were to enact a new treaty, there could be problems with enforcement, especially since many international agreements are not self-executing and, thus, require the parties to implement legislation.¹⁸⁶

An international agreement regulating space tourism would require ratification by the major state players in space exploration to be effective. Several scholars, including Armel Kerrest, posit that a comprehensive approach—a “wholesale modification” of existing treaties or the adoption of a new international instrument—to regulating activity in outer space is undesirable.¹⁸⁷ He believes states would be unwilling to accept responsibility in the same way they did with the existing treaties on outer space, especially when it comes to modifying the liability regime created by the Liability Convention.¹⁸⁸ This is one reason why several multilateral or bilateral treaties could be a more effective and rapid solution.

The Moon Treaty exemplifies how difficult it could be to get the United States, China, and Russia to sign a new agreement on outer space. Only eleven countries signed the Moon Treaty,¹⁸⁹ and, without the backing of the three countries who participate in the majority of outer space activity, the agreement fails to have any real effect.¹⁹⁰ The fate of the Moon Treaty could befall any proposed new international agreement. The United States is currently home to SpaceX’s and Blue Origin’s operations; if the United States refuses to sign an agreement addressing commercial spaceflight and tourism in outer space, the agreement would have little effect on the industry.

There are clear economic benefits for states to reap in the arena of space tourism, which may lead to the type of opposition seen in the adoption of the Moon Agreement.¹⁹¹ Disagreement among states, especially those already heavily invested in outer space exploration, is likely. This Note proposes an agreement that requires balancing

186. See STEPHEN P. MULLIGAN, CONG. RSCH. SERV., RL32528, INTERNATIONAL LAW AND AGREEMENTS: THEIR EFFECT UPON U.S. LAW 15 (2018).

187. Kerrest, *supra* note 101, at 18.

188. *Id.*

189. See STATUS OF INTERNATIONAL AGREEMENTS RELATING TO ACTIVITIES IN OUTER SPACE AS AT 1 JANUARY 2022, *supra* note 24, at 5–10.

190. See Roberts, *supra* note 63, at 144.

191. See Heim, *supra* note 60, at 834–35.

economic activity with environmental protections. While this is a delicate balance that is likely to generate many opposing positions, treaties of this kind have been widely accepted and successful. The Antarctic Treaty System is the perfect example of how the international community created an agreement seeking to achieve the same balance between economic activity and environmental protections.¹⁹² Thus, while it will be difficult for the international community to agree on any proposed legal regime for space tourism, the failure of such an agreement is not a foregone conclusion. States who did not sign the Moon Agreement, including the United States, would be incentivized to sign a new treaty if it limits their liability for commercial flights as is the case with the treaty proposed by this Note.

Assuming a new treaty is successfully ratified by most states, including the most important players in outer space exploration, enforcement of the agreement may prove challenging. The existing five outer space treaties do not create an international enforcement body. The agreement proposed by this Note would have such a body, but this alone will not solve issues with enforcement. States will need to implement domestic legislation to enforce the treaty's provisions, which will not be self-executing.¹⁹³ Domestic legislation may prove to be difficult to pass and implement, but it is needed to ensure that states fulfill their treaty obligations. States can also use this legislation to go beyond the baselines established by the treaty and provide greater protections for their citizens, the environment, and private companies. This legislation, along with the treaty, will ensure that the regulatory regime for space tourism is robust. The United States has successfully passed domestic legislation on commercial spaceflight,¹⁹⁴ so it is possible to pass the legislation needed to enforce a new outer space treaty.

While there are potential roadblocks to enacting a new international treaty on outer space, it is possible to successfully ratify and enforce such a treaty. The international community overwhelmingly supported four of the five outer space treaties which have allowed spaceflight to develop to the point to allow for space tourism. It is possible for the international community to convene to update the space regulation regime with a new treaty.

V. CONCLUSION

As technology advances to allow more frequent and extensive tourism in space, the need to clarify applicable legal protections will

192. See generally Antarctic Treaty, *supra* note 139.

193. See generally MULLIGAN, *supra* note 186.

194. See U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, 129 Stat. 704 (2015).

increase. The international community must enact comprehensive regulation of the commercial spaceflight industry to ensure it is safe for participants and those who remain on Earth. This Note proposes a new international agreement inspired by other successful international agreements that would: (1) protect the environments of the Earth and other planets, (2) ensure the safety of space tourists, and (3) promote technological and scientific advancement. These goals would be accomplished through the assignment of liability and regulation of commercial spaceflight operators. The proposed agreement would replace the current patchwork of domestic regulation and outdated international agreements. While an international agreement faces challenges, it would nevertheless provide the possibility for a giant leap forward for mankind.

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