Problems with Enforcing International Space Law on Private Actors

This Note argues that the body of international space law is largely unenforceable on private actors. The author contends that the law may be better enforced by (1) creating a single international regulatory and judicial authority that is equipped with the enforcement mechanisms necessary to regulate private actors in space and (2) strengthening domestic space law. This Note will first discuss the background of commercial space activity, international space law, and provisions in space law that relate to private actors and enforcement. Secondly, this Note will address problems with enforcement of international space law on private actors, particularly concerning the ambiguities in the law that allow private actors to avoid enforcement, the lack of enforcement mechanisms within the international space law treaties and within United Nations regulatory agencies, and the inadequacies of the current framework of domestic law in enforcing international space law. Lastly, this Note will delve into potential solutions regarding how to satisfactorily enforce international space law on private actors. Specifically, this Note supports calls to strengthen the enforcement of domestic space laws and establish a new international space organization or authorize the United Nations Committee on the Peaceful Uses of Outer Space to regulate and adjudicate all international private space matters.

INTRODUCTION

"Listen now for the sound that will forevermore separate the old from the new," stated an announcer on NBC Radio as the Sputnik-1 satellite transmitted a simple "beep" from outer space for the first time.[1] Often considered "one of the greatest scientific advances in world history,"[2] this successful launch of the first manmade satellite into outer space in 1957 commenced a new era in space that involved its use by humankind. Shortly after the launch, and to compel international cooperation on issues relating to activities in outer space, the United Nations developed a legal framework to govern these activities through five international treaties.[3] These five treaties form the basis of international space law.[4] While these treaties were mainly aimed towards defining the rights and obligations of states in outer space, private actors have recently dominated the race to use and exploit what exists approximately sixty-two miles above the Earth's surface and beyond.[5] As a result, the treaties, and international space law as a whole, are not equipped with adequate methods to enforce their provisions

1. GERARD J. DEGROOT, DARK SIDE OF THE MOON: THE MAGNIFICENT MADNESS OF THE AMERICAN LUNAR QUEST 63 (2006).

2. *Id.*

3. These five treaties are: (1) the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies ("Outer Space Treaty") (1967), (2) the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (the "Rescue Agreement") (1968), (3) the Convention on International Liability for Damage Caused by Space Objects (the "Liability Convention") (1972), (4) the Convention on Registration of Objects Launched into Outer Space ("the Registration Convention") (1976), and (5) the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the "Moon Agreement") (1979). Yun Zhao, *Space Commercialization and the Development of Space Law*, OXFORD RES. ENCYCLOPEDIAS (July 2018), http://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-42 [https://perma.cc/25N2-JP8A].

4. *Id.*

5. *Id.*

upon private actors. This leaves private actors with much discretion in the policies and practices concerning space commercialization.

This Note argues that the body of international space law is largely unenforceable on private actors. The law may be better enforced by (1) creating a single international regulatory and judicial authority with the enforcement mechanisms necessary to regulate private actors in space, and (2) bolstering domestic space regulations. In Part I, this Note discusses the background of commercial space activity and the development of international space law, which also touches upon the enforcement infrastructure established from these laws. In Part II, this Note addresses problems with the enforcement of international space law on private actors. This Part focuses particularly on the ambiguities in the law that allow private actors to avoid enforcement, the lack of regulatory and adjudicative measures from international bodies, and the lack of uniformity among national space laws. Lastly, Part III delves into potential solutions regarding how to satisfactorily enforce international space law on private actors, such as through the creation of a stronger, centralized authority within existing international organizations, as well as suggestions in standardizing registration and liability requirements domestically.

I. BACKGROUND

While the roughly 60-year history of international space law and space commercialization is relatively short, understanding the history is crucial to pinpoint the problems of enforcing international space law upon private actors. Part I.A discusses the development of commercial space activity, which includes a brief summary of leading space commercialization industries and the private actors that serve as key players within those industries. Part I.B discusses the development of international space law by analyzing the five treaties that form the basis of international space law, the relation of these laws to private actors, and the enforcement mechanisms that are established through these treaties.[6]

6. There is a distinction between private activity and commercial activity. "Private activity" means activity conducted by private actors as opposed to public, government, or nonprofit actors. "Commercial activity" means "the profit-making transfer of goods and services." Kunihiko Tatsuzawa, *The Regulation of Commercial Space Activities by the Non-Governmental Entities in Space Law*, 31 PROC. ON L. OUTER SPACE 341, 341 (1988). While some consider that both public and private actors can engage in commercial activity, the United States' definition of "commercial space activity" provides that only private actors can conduct such activity. NATIONAL SPACE POLICY OF THE UNITED STATES OF AMERICA 10

A. Development of Private Space Activity

The advent of space activity did not involve private actors. It began with an apprehensive battle between two Cold War rivals—the United States and the Soviet Union—for spaceflight dominance. The "Space Race" began on August 2, 1955, when the Soviet Union challenged the United States in becoming the first nation to launch a satellite into outer space.[7] The Soviet Union won this battle on October 4, 1957, with its launch of Sputnik-1.[8] Approximately four months later, the United States successfully launched Explorer I, its first satellite in outer space.[9] From then until 1962, the United States and the Soviet Union were the sole actors in space, launching a variety of satellites, lunar rovers,[10] animals,[11] and humans.[12] The United Kingdom became the third actor in space when its satellite, Ariel 1, was launched into

(2010). President Donald Trump has modified a section of the 2010 National Space Policy, but this definition of commercial space activity has remained unchanged. *See* Reinvigorating America's Human Space Exploration Program, 82 Fed. Reg. 59,501 (Dec. 14, 2017). This Note will adopt the United States' definition of commercial activity and thus discuss commercial activity as activity conducted exclusively by private actors.

7. DEGROOT, *supra* note 1, at 54.

8. *Id.* at 60.

9. *Id.* at 88.

10. The Soviet Union's Luna 1 was the first lunar spacecraft launched into outer space. It was followed by Luna 2 and Luna 3. All three were launched in 1959. *See* Richard Cavendish, *The Soviet Union is First to the Moon*, HIST. TODAY, (Sept. 2009), https://www.historytoday.com/richard-cavendish/soviet-union-first-moon [https://perma.cc/3VB4-2L3A].

11. The USSR launched a dog into orbit on November 3, 1957, who did not survive the trip. The USSR launched two dogs into space on August 19, 1960, who both returned to Earth alive. The United States launched a chimpanzee into space on January 31, 1961, who survived the trip as well. *See* Karl Tate, *Cosmic Menagerie: A History of Animals in Space*, SPACE.COM (Apr. 12, 2013), https://www.space.com/20648-animals-in-space-history-infographic.html [https://perma.cc/TGD4-9LRR].

12. The first human to undergo human spaceflight was Soviet astronaut Yuri Gagarin on April 12, 1961. Mike Wall, *Alan Shepard's Space Race: Soviet Victory Frustrated First American in Space*, SPACE.COM (May 5, 2011), https://www.space.com/11578-nasa-alan-shepard-space-race-human-spaceflight.html [https://perma.cc/2DQE-5MGG]. His flight was followed by American astronaut Alan Shepard less than one month later, and Soviet astronaut Gherman Titov three months after Shepard's flight. *Id.*; *see* Michael Wines, *Gherman Titov, 65, Second in Quest to Be First in Space*, N.Y. TIMES (Sept. 22, 2000), https://www.nytimes.com/2000/09/22/world/gherman-titov-65-second-in-quest-to-be-first-in-space.html [https://perma.cc/A2XH-P7ER].

orbit by the United States in 1962.[13] This launch was the last one that occurred before the first private actor joined these states in outer space activities.

The first privately sponsored space launch was the launch of the Telstar 1 satellite by AT&T on July 10, 1962.[14] This was considered a "watershed technological event"[15] as it relayed the first television signals, telephone calls, and fax images through space.[16] However, it would take years for the privatization and commercialization of space to truly be embraced. While the satellite industry became the first commercial space industry, only nine commercial telecommunications satellites were launched and in service by 1980.[17] Meanwhile, on the public-sector side, the 1960s through 1980s proved to be monumental years of growth in space activity. States marked these decades with a series of satellite launches, rover launches, and human spaceflight trips—most notably, the trip that landed the first humans on the Moon.[18]

It was not until the early years of the twenty-first century when a "new era of commercial space business" commenced.[19] The dawn of this new era was ushered in through tragedy when the public sector had suffered serious and deadly setbacks in conducting its outer space activities. In February 2003, the NASA's space shuttle *Columbia* disintegrated upon a structural failure after liftoff and killed the seven-member crew.[20] Consequently, the United States suspended its space shuttle program, thus delaying further construction of the International Space Station.[21] In January 2004, the United States implemented its

13. *Ariel 1 Satellite: 50 Years of Britain in Space*, BBC (Apr. 26, 2012), https://www.bbc.com/news/av/uk-politics-17854280/ariel-1-satellite-50-years-of-britain-in-space [https://perma.cc/K97D-WSZX].

14. *July 12, 1962: The Day Information Went Global*, NASA (July 9, 2012), https://www.nasa.gov/topics/technology/features/telstar.html [https://perma.cc/WQU4-UVEK].

15. ANTHONY YOUNG, THE TWENTY-FIRST CENTURY COMMERCIAL SPACE IMPERATIVE 5 (2015).

16. Adam Mann, *Telstar 1: The Little Satellite That Created the Modern World 50 Years Ago*, WIRED, (July 10, 2012), https://www.wired.com/2012/07/50th-anniversary-telstar-1/ [https://perma.cc/RSZ3-DRTV].

17. YOUNG, *supra* note 15, at 5.

18. *Timeline: 50 Years of Spaceflight*, SPACE.COM (Sept. 28, 2012), https://www.space.com/4422-timeline-50-years-spaceflight.html [https://perma.cc/32CQ-D9E4].

19. YOUNG, *supra* note 15, at 1.

20. *Id.*

21. Elizabeth Howell, *Columbia Disaster: What Happened, What NASA Learned*,

"Vision for Space Exploration"—a plan that aimed to, *inter alia*, transform NASA into an organization that would "rely more heavily on private sector space capabilities to support activities in Earth orbit and future exploration activities."[22] This created a plethora of opportunities and incentives for private actors to take command of outer space activities.[23] The private sector embraced these opportunities and has increased its control over space activities ever since. To emphasize the private sector's stronghold over the space economy since the early 2000s, four prominent space industries are analyzed in turn: satellites, space launching services, space tourism, and asteroid mining.[24]

Since the early 2000s, the satellite industry has grown increasingly privatized. The first major mark of privatization occurred when INTELSAT, formed in 1964 as an intergovernmental organization with the purpose of owning and managing communications satellites, was privatized in 2001.[25] The privatization was just one example of many in a trend toward privatization in the global telecommunications industry during this time. This trend was spurred in part by the growing demand for communications services, the falling costs for satellite system equipment, and the reduction of governmental constraints on these global satellite companies.[26] Revenue from satellite-related commercial activities account for the vast majority of the space economy's overall revenue: in 2005, it accounted for approximately 71% of the revenue, and in 2015, it accounted for approximately 76%.[27] Meanwhile, the government space budgets throughout the world only amounted to approximately 29% of the total space sector revenue in 2005 and approximately 24% in 2015.[28] Since 2015, this largely privatized industry only continues to grow and stands as the largest sector

SPACE.COM (Feb. 1, 2019), https://www.space.com/19436-columbia-disaster.html [https://perma.cc/AWQ5-4Q7B].

22. *See* NAT'L AERONAUTICS & SPACE ADMIN., THE VISION FOR SPACE EXPLORATION 17 (2004), https://www.nasa.gov/pdf/55583main_vision_space_exploration2.pdf [https://perma.cc/DZC2-MSRW].

23. *See generally* YOUNG, *supra* note 15, at 5.

24. Zhao, *supra* note 3.

25. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-05-550T, TELECOMMUNICATIONS: MARKET DEVELOPMENTS IN THE GLOBAL SATELLITE SERVICES INDUSTRY AND THE IMPLEMENTATION OF THE ORBIT ACT 2 (2005) (statement of Jayetta Z. Hecker, Director Physical Infrastructure Team of U.S. Government Accountability Office).

26. *Id.* at 5.

27. Matthew Weinzierl, *Space, the Final Economic Frontier*, 32 J. ECON. PERSP. 173, 179 (2018).

28. *Id.*

of the space economy, accounting for $269 billion of the space economy in 2017.[29]

As for space launch services, private sector growth in this area has continued since 2004, which was the year that the U.S. Federal Aviation Administration began permitting commercial launches and began licensing commercial crew and cargo.[30] However, unlike the satellite industry, where private sector dominance occurred through the efforts of hundreds of private satellite companies, the space launch industry is dominated by a single private company: Space Exploration Technologies Corporation ("SpaceX"). SpaceX revolutionized the space launch industry when the company successfully launched and landed the first reusable rocket.[31] SpaceX's founder, Elon Musk, states reusable rockets will reduce rocket costs by a factor of 100.[32] The company has nearly monopolized space launch services: SpaceX's global market share of commercial launches is more than all other countries combined.[33] This may be a result of its ability to reuse rockets: the Falcon 9 family alone carried out seventy-eight launches since the initial launch in 2010.[34] While the global space launch market accounted for only approximately $10 billion in 2017,[35] a relatively small dollar amount compared to the global space industry at large, the high percentage of the revenue generated by a single company demonstrates the increased commercialization within this sector of the space economy.

29. Jeff Foust, *A Trillion-Dollar Space Industry Will Require New Markets*, SPACE NEWS, (July 5, 2018), https://spacenews.com/a-trillion-dollar-space-industry-will-require-new-markets/ [https://perma.cc/96ZN-3948].

30. Weinzierl, *supra* note 27, at 182.

31. Nadia Drake, *SpaceX Makes History with First-Ever Recycled Rocket*, NAT'L GEOGRAPHIC (Mar. 30, 2017), https://news.nationalgeographic.com/2017/03/spacex-first-reused-rocket-space-science/ [https://perma.cc/QU3W-MDZM].

32. Dom Galeon, *Elon Musk: With New SpaceX Tech, Rocket Costs Will Drop by a Factor of 100*, FUTURISM (Sept. 14, 2017), https://futurism.com/elon-musk-with-new-spacex-tech-rocket-costs-will-drop-by-a-factor-of-100 [https://perma.cc/SE9K-Y6YU].

33. Jay Bennet, *One Chart Shows How Much SpaceX Has Come to Dominate Rocket Launches*, POPULAR MECHANICS (July 13, 2017), https://www.popularmechanics.com/space/rockets/a27290/one-chart-spacex-dominate-rocket-launches/ [https://perma.cc/83YB-HQ7T].

34. *Completed Missions*, SPACEX, https://www.spacex.com/missions [https://perma.cc/A9DS-FRKK] (last visited Jan. 20, 2020).

35. *Space Launch Services - A Global Outlook (2017-2026)*, RES. & MKT. (May 2018), https://www.researchandmarkets.com/research/h2sftm/global_space?w=4 [https://perma.cc/L2GD-74GJ].

Space tourism is an industry that is currently controlled by private actors.[36] Space tourism realizes the science fiction fantasy of traveling to space for leisure, recreation, or business purposes. Space tourism activities are typically separated into three types of experiences: suborbital, orbital, and trips beyond Earth's orbit. Suborbital tourism, meaning that the trajectory of the spacecraft does not circle the Earth, began when Mike Melvill completed the first manned private spaceflight by flying SpaceShipOne into space in 2004.[37] Orbital tourism, meaning that the trajectory of the spacecraft does in fact orbit the Earth, began in 2001 when Dennis Tito became the first space tourist to visit the International Space Station.[38] While tourist trips beyond Earth's orbit have not yet occurred, SpaceX proposed to launch between seven and nine artists around the Moon in 2023, and Space Adventures Ltd. announced a similar circumlunar mission for $100 million per ticket.[39] In 2016, the global space tourism market accounted for nearly $20 billion, and this amount is expected to increase to $34.46 billion in 2021.[40]

Mining asteroids or other celestial bodies for valuable resources is nascent—as of yet, no entity has mined celestial bodies for commercial profit. However, a few private actors started the initiative to pursue the "gold rush" of outer space.[41] The financial payouts from

36. *List of Space Tourism (Personal Spaceflight) Companies*, RANKER, https://www.ranker.com/list/space-tourism-_personal-spaceflight)-companies/reference [https://perma.cc/W6PT-UMCU] (last visited Nov. 20, 2019).

37. Tim Sharp, *SpaceShipOne: The First Private Spaceflight*, SPACE.COM (Oct. 2, 2014), https://www.space.com/16769-spaceshipone-first-private-spacecraft.html [https://perma.cc/QW6A-NGT6].

38. Valerie Stimac, *A Definitive History of Space Tourism & Human Spaceflight*, SPACE TOURISM GUIDE (Apr. 11, 2018), https://spacetourismguide.com/history-of-space-tourism/ [https://perma.cc/FB8S-Y6M3]. Dennis Tito's trip has since been replicated by six other private citizens.

39. Associated Press, *$100 Million May Buy a Ticket to See the Far Side of the Moon*, L.A. TIMES (Aug. 11, 2005), http://articles.latimes.com/2005/aug/11/nation/na-moon11 [https://perma.cc/X7CP-J84F].

40. Jesse Maida, *Top 3 Emerging Trends Impacting the Global Space Tourism Market from 2017-2021: Technavio*, BUSINESS WIRE (June 16, 2017), https://www.businesswire.com/news/home/20170616005756/en/Top-3-Emerging-Trends-Impacting-Global-Space [https://perma.cc/F59K-6YQK].

41. Chloe Cornish, *Interplanetary Players: A Who's Who of Space Mining*, FIN. TIMES (Oct. 19, 2017), https://www.ft.com/content/fb420788-72d1-11e7-93ff-99f383b09ff9 [https://perma.cc/G578-74PD]. While the leading asteroid mining companies were Deep Space Industries, Inc., and Planetary Resources, both have recently undergone fundamental structural changes. In 2019, space systems manufacturer Bradford Space Group acquired

mining asteroids could be huge: as of September 2016, 711 known asteroids possess an estimated value exceeding $100 trillion.[42] One asteroid in particular, 16 Psyche, possesses a value of over $10,000 quadrillion,[43] which may be 2,000 times more valuable than the Earth itself.[44] Astrophysicist Neil deGrasse Tyson has predicted that the first trillionaire will be an asteroid miner,[45] and companies are taking notice. Of all the industries discussed in this Note, the space mining industry is likely to present the most problems regarding territorial and property rights in outer space, on which the Outer Space Treaty and the Moon Agreement elaborate.

As a whole, the commercial space industry has only continued to grow in recent years. In 2017, commercial spacecraft deployments increased by 200 percent.[46] That same year, the global space economy totaled $348 billion.[47] This number is expected to reach $1 trillion in

Deep Space Industries, Inc. *Bradford Space Group Acquires Control of Deep Space Industries, Inc.*, DEEP SPACE INDUSTRIES (Jan. 2, 2019), http://deepspaceindustries.com/ [https://perma.cc/69UN-36YD]. In 2018, blockchain venture production studio ConsenSys, Inc. acquired Planetary Resources. *ConsenSys Acquires Planetary Resources*, PLANETARY RESOURCES (Oct. 31, 2018), https://www.planetaryresources.com/2018/10/consensys-acquires-planetary-resources/ [https://perma.cc/AHX8-4LRA]. Under new ownership, the future of asteroid mining through these companies is uncertain. Jeff Foust, *The Asteroid Mining Bubble Has Burst*, SPACE REV. (Jan. 7, 2019), https://thespacereview.com/article/3633/1 [https://perma.cc/B6TH-M7N5].

42. DANIEL MIKELSTEIN, INTERGALACTIC TRAVEL AND ASTEROID MINING xxxii (2019). For specific asteroids, see ASTERANK, http://www.asterank.com/ [https://perma.cc/ZL4F-8EAM] (last visited Dec. 6, 2018) (choose "most valuable" from the "Query" drop-down menu in the upper left, and choose "1000" from the "Show" drop-down menu in the upper right).

43. Matthew Davis, *Will Asteroid Mining Be an Outer-Space Gold Rush?*, BIG THINK (Sept. 28, 2018), https://bigthink.com/technology-innovation/economic-impact-of-asteroid-mining?rebelltitem=1#rebelltitem1 [https://perma.cc/NUQ9-ZRJC].

44. Daily Mail Reporter, *Earth Is Worth £3,000 Trillion, According to Scientist's New Planet Valuing Formula*, DAILY MAIL (Feb. 28, 2011), https://www.dailymail.co.uk/sciencetech/article-1361145/Earth-worth-3-000-trillion-according-scientists-new-planet-valuing-formula.html?ITO=1490 [https://perma.cc/26MU-9LY3].

45. Tiffany Terrell, *Physicist Says Asteroid Mining Ventures Will Spawn First Trillionaire*, GLOBE NEWS WIRE (Jan. 30, 2018), https://globenewswire.com/news-release/2018/01/30/1314279/0/en/Physicist-Says-Asteroid-Mining-Ventures-Will-Spawn-First-Trillionaire.html [https://perma.cc/3HJ8-DCLR].

46. Carol Hively, *Space Foundation Report Reveals Global Space Economy of $383.5 Billion in 2017*, SPACE FOUNDATION (July 19, 2018), https://www.spacefoundation.org/2018/07/19/space-foundation-report-reveals-global-space-economy-at-383-5-billion-in-2017/ [https://perma.cc/Q86W-WVKF].

47. Foust, *supra* note 29.

the 2040s.[48] While public actors do influence the space economy, this market is overwhelmingly dominated by private actors. To demonstrate this, as of 2016, nearly fifty countries had governmental space budgets, with nine nations possessing a budget over $1 billion.[49] These budgets, however, represent only one quarter of the space economy: three quarters of the space economy are derived from commercial revenue.[50] The need for enforceable regulations on private actors, therefore, is a necessity as these actors maintain their stronghold over the space industry.

B. Development of the Five International Space Law Treaties

The foundation of international space law was born in the heat of the Space Race, with a heavy focus on the rights and obligations of state actors in relation to outer space activities.[51] Part I.B.1 provides an overview of the historic events that led to the creation of the five international space treaties. Part I.B.2 through I.B.6 summarize these treaties respectively, including the treaties' purpose, the treaties' relation to private actors, and the treaties' enforcement mechanisms.

1. The Historical Context Behind the Creation of the Space Treaties

As international space law is simply a branch of international law, its roots are derived from the orthodox international law doctrine that regards states as the primary—if not sole—actors in international law.[52] This view is reinforced by realism, the dominant perspective of international relations theory, which considers states to be the essential actors in international relations and diplomacy.[53] This state-centered view of international law is further reinforced by the fact that only states were active in outer space at the time that international space law

48. *Id.*

49. BRYCE SPACE & TECH., LLC, GLOBAL SPACE INDUSTRY DYNAMICS: RESEARCH PAPER FOR AUSTRALIAN GOVERNMENT, DEPARTMENT OF INDUSTRY, INNOVATION AND SCIENCE, https://www.industry.gov.au/sites/default/files/2019-03/global_space_industry_dynamics_-_research_paper.pdf [https://perma.cc/VK22-MPFT]. The nations with a budget over $1 billion are the United States, China, Europe (collectively), Russia, India, Japan, France, Germany, and Italy. *Id.*

50. *Id.*

51. Zhao, *supra* note 3.

52. JEFFERY L. DUNOFF ET AL., INTERNATIONAL LAW: NORMS, ACTORS, PROCESS: A PROBLEM-ORIENTED APPROACH 105 (4th ed. 2015).

53. *Id.*

was formed. Indeed, the state-centered conflicts of the Space Race were the events that instigated the formation of international space law.

After Sputnik launched into space in 1957, the need to set a framework for international space law became paramount.[54] In 1958, the United Nations implemented an ad hoc committee to oversee the peaceful uses of outer space and issued a U.N. General Assembly ("UNGA") Resolution regarding the same topic.[55] One year later, the United Nations formally and permanently established the United Nations Committee on the Peaceful Uses of Outer Space ("UNCOPUOS").[56] Its mission is, *inter alia*, "to review . . . the area of international co-operation" regarding outer space and to "study the nature of legal problems which may arise from the exploration of outer space."[57] UNCOPUOS was instrumental in laying the framework for international space law and remains the only intergovernmental committee that has continuously governed outer space activities since the treaty's enactment.[58] Before any major space treaties were signed, UNGA adopted a 1963 resolution entitled the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space ("Outer Space Declaration"), which formed the ground for the first international space law treaty.[59] This treaty is entitled the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies[60]—or colloquially, the "Outer Space Treaty."

54. Zhao, *supra* note 3.

55. *Id.*; G.A. Res. 1348 (XIII), ¶ 1 (Dec. 18, 1958).

56. G.A. Res. 1472 (XIV) (Dec. 12, 1959).

57. *Id.* at A, ¶ 1 (Dec. 12, 1959).

58. *The 50th Anniversary of the Outer Space Treaty: Global Governance for Space Activities*, ASTRONAUTICAL FEDERATION, http://www.iafastro.org/events/iac/iac-2017/global-networking-forum/the-50th-anniversary-of-the-outer-space-treaty-global-governance-for-space-activities/ [https://perma.cc/N5SS-TZ5B] (last visited Dec. 6, 2018).

59. Zhao, *supra* note 3.

60. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

2. The Outer Space Treaty

Entered into force in 1967,[61] the Outer Space Treaty is considered the "constitution" of international space law.[62] The treaty was negotiated in the midst of the Space Race between two space-faring, hostile nations with nuclear weapons at their disposal.[63] Compelled by fear of the militarization of outer space after Cold War tensions, the Outer Space Treaty requires that the exploration and use of outer space be "carried out for the benefit and in the interests of all countries" and that outer space shall be "the province of all mankind."[64] Further, the treaty stipulates that state activities must be "in the interest of maintaining international peace and security and promoting international co-operation and understanding."[65]

The internationalist perspective embedded within the Outer Space Treaty, as well as an absence of significant private activity in space at the time of the treaty's drafting, created a treaty that was highly state-focused.[66] The Outer Space Treaty does not explicitly mention private actors; however, it does mention state responsibility for "non-governmental entities." Specifically, Article VI states the following:

> States Parties . . . shall bear international responsibility for *national activities* in outer space, whether such activities are carried on by governmental agencies or by

61. *Id.* The treaty entered into force "after deposit of ratification by 5 Governments . . . . [F]or States whose instruments of ratification or accession are deposited subsequent to the entry into force of the Treaty, it shall enter into force on the date of deposit of their instruments of ratification or accession." *Id.* art. XIV(4).

62. Stanley B. Rosenfield, *Where Air Space Ends and Outer Space Begins*, 7 J. SPACE L. 137, 144 (1979).

63. *See Race to the Moon Timeline*, HIST. SHOTS INFO ART, http://historyshots.com/space/timeline.cfm [https://perma.cc/S64P-LZ27] (last visited Nov. 12, 2019) (outlining a timeline of the space race around the time the treaty was negotiated); *Nuclear Age-Mutual Assured Destruction*, SCI. ENCYCLOPEDIA, http://science.jrank.org/pages/10504/Nuclear-Age-Mutual-Assured-Destruction.html [https://perma.cc/W8DS-MCTN] (last visited Nov. 12, 2019).

64. Outer Space Treaty, *supra* note 60, art. I. For private actors, the Outer Space Treaty's "province of all mankind" principle may implicate a series of issues for private activities in outer space such as asteroid mining, because it may regulate the extent to which a private actor may extract celestial resources for commercial gain.

65. *Id.* arts. I–III.

66. Brian Beck, *The Next, Small, Step for Mankind: Fixing the Inadequacies of the International Space Law Treaty Regime to Accommodate the Modern Space Flight Industry*, 19 ALB. L.J. SCI. & TECH. 3, 11 (2009).

> *non-governmental entities* . . . The *activities of non-governmental entities* in outer space . . . shall require authorization and continuing supervision by the appropriate State Party to the Treaty.[67]

Essentially, Article VI provides derivative liability for the activities of non-governmental entities, as these entities are considered to be subject to the jurisdiction of their respective governments. Ambiguities in the definition of "national activities" and "non-governmental entities" may cause problems with the enforcement of private actors, which is discussed in Part II of this Note.

The Outer Space Treaty also establishes broad terms for the rescue of astronauts (Article V), liability concerns (Article VI), and registration of space objects (Article VIII).[68] These terms were drafted broadly to facilitate adoption of the treaty so supplemental agreements were left to elaborate upon the treaty's terms.[69] These supplemental agreements became the Agreement on the Rescue of Astronauts, Return of Astronauts and the Return of Objects Launched into Outer Space ("Rescue Agreement"), the Convention on International Liability for Damage Caused by Space Objects ("Liability Convention"), and the Convention on Registration of Objects Launched into Outer Space ("Registration Convention").[70]

3. The Rescue Agreement

The Rescue Agreement, entered into force in 1968, elaborates on Article V of the Outer Space Treaty and establishes the rights and duties of states relating to the rescue and assistance of persons and objects in space. Articles 1 through 4 of the Agreement outline the rights and obligations concerning the rescue of astronauts and Article 5 outlines the same for space objects.[71] The Agreement imposes three types of obligations on contracting parties: (1) the duty to assist astronauts in distress within their jurisdiction (or if in international waters, to provide assistance if the State Party is able); (2) the duty to return personnel who land in a contracting party's territory to agents of the launching party; and (3) the duty to recover and return space objects that land

67. Outer Space Treaty, *supra* note 60, art. VI (emphasis added).

68. *Id.* arts. V, VI, VIII.

69. Zhao, *supra* note 3.

70. *Id.*

71. Agreement on the Rescue of Astronauts, Return of Astronauts and the Return of Objects Launched into Outer Space arts. 1–5, U.S.-Gr. Brit.-U.S.S.R., Apr. 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S 119 [hereinafter Rescue Agreement].

within the contracting party's jurisdiction.[72] The Agreement prohibits justifications or defenses against breaching these duties and details a liability framework to provide compensation for these rescues.[73]

Similar to the Outer Space Treaty, the Rescue Agreement sets forth rights and obligations that are "*de lege* addressed to states," and "*de facto* only concern states."[74] When the Rescue Agreement was drafted, states were the only actors that possessed the rescue, recovery, and return operations necessary to assist astronauts in distress. In these situations, there was "little sense" in addressing duties and rights of private companies.[75] While the Agreement fails to provide a specific framework for private actors, it stipulates that the jurisdiction for space objects, including space objects owned by private actors, is retained by the state in which the space object was launched.[76] If private actors were implicated in the Agreement, however, private spaceflight companies should be aware that subtle distinctions in the text of the Agreement may leave space tourists without rescue. The Agreement provides contracting parties with assisting and rescuing "personnel of a spacecraft."[77] This may include "persons assigned to and accompanying the spacecraft," such as flight attendants on the space mission, but may exclude "regular passengers," such as tourists.[78] Also, the term "space object" may include any object which was designed to be launched into outer space or its component parts, such as a fuel tank. However, the definition of "space object" may exclude contents within the object that do not independently constitute space objects, such as food, clothing, or personal belongings.[79]

The Rescue Agreement has seen some success in its implementation. Since its ratification, the Agreement imposed duties that have been invoked during a number of instances of astronaut distress.[80] For

72. Beck, *supra* note 66, at 13.

73. *Id.*

74. Frans G. von der Dunk, *A Sleeping Beauty Awakens: The 1968 Rescue Agreement After Forty Years*, 34 J. SPACE L. 411, 425 (2008).

75. *Id.*

76. John Adolph, *The Recent Boom in Private Space Development and the Necessity of an International Framework Embracing Private Property Rights to Encourage Investment*, 40 INT'L L. 961, 966 (2006).

77. Stephen Gorove, *International Protection of Astronauts and Space Objects*, 20 DEPAUL L. REV. 597, 600 (1971).

78. *Id.*

79. *Id.* at 607–08.

80. Notable examples of astronaut distress include *Apollo 13* (where a manned flight

example, during the Apollo 13 crisis when an oxygen tank exploded in space with three American crew members onboard, the Soviet Union stopped broadcasting certain frequencies in order to expedite American rescue efforts.[81] Additionally, the Agreement inspired precautionary measures to aid distressed personnel in space, such as docking a spacecraft onboard the International Space Station and Mir (a former space station operated by the Soviet Union) to use for escape in case of an in-orbit emergency. Four cases arose from the Agreement, although these cases involved only state actors.[82]

4. The Liability Convention

The Liability Convention, entered into force in 1972, elaborates on Article VII of the Outer Space Treaty. It establishes that states are responsible for all space objects that are launched within their territory. The Convention devises two liability regimes for distinct situations: absolute liability "for damage caused by the space object on the surface of the Earth or to aircraft in flight,"[83] and fault liability for "damages being caused elsewhere than on the surface of the Earth."[84]

Liability for damage is imposed upon the "launching State," meaning "[a] State which launches or procures the launching of a space object," or "[a] State from whose territory or facility a space object is launched . . . ."[85] Thus, a private company's state "remains internationally responsible for [the actions of the private company] under the

sustained damage in flight which almost inhibited its return to Earth); *Soyuz 11* (where a manned flight lost all oxygen during preparations for reentry); *Challenger* (where the spaceship destroyed upon reentry); *Soyuz-FG* (where a U.S. astronaut and Russian cosmonaut crash-landed in Kazakhstan after rocket malfunctioned during trip to the International Space Station). von der Dunk, *supra* note 74, at 413 n.10; Andrew Griffin, *Astronauts crash land to Earth after major rocket malfunction on way to ISS*, INDEP. (Oct. 11, 2018), https://www.independent.co.uk/news/science/nasa-rocket-emergency-astronauts-iss-crash-latest-space-soyuz-launch-a8578611.html [https://perma.cc/3FSC-9URV].

81. NATHAN C. GOLDMAN, AMERICAN SPACE LAW: INTERNATIONAL AND DOMESTIC 77 (1st ed. 1988).

82. Ken Hodgkins, *Procedures for Return of Space Objects Under the Agreement on the Rescue of Astronauts, the Return of Astronauts & the Return of Objects Launched into Outer Space*, *in* PROC. OF THE UNITED NATIONS INT'L INST. OF AIR AND SPACE L. WORKSHOP ON CAPACITY BUILDING IN SPACE LAW, 59, 61–66 (2003).

83. Convention on International Liability for Damage Caused by Space Objects art. II, Mar. 29, 1972, 961 U.N.T.S. 187 [hereinafter Liability Convention].

84. *Id.* art. III.

85. *Id.* art. I. For launches by intergovernmental organizations, the treaty still imposes state liability on all states who jointly launch the space object. *Id.* All states that launch

Liability Convention."[86] This liability regime contrasts with those of maritime and aviation law, which impose liability on carriers rather than states.[87]

Of the five treaties, the Liability Convention provides for the only dispute resolution mechanism to resolve problems arising under the treaty: the Claims Commission.[88] So far, only one case has arisen from the Liability Convention: that of the Cosmos 954 incident.[89] In 1978, Cosmos 954, which was a Soviet satellite powered by nuclear materials, crashed and spewed nuclear debris over northern Canada.[90] Pursuant to the Liability Convention, Canada invoiced the Soviet Union over $6 million for debris clean-up costs it incurred, and the Soviet Union compensated Canada for $3 million in 1981.[91] While it is debatable whether the Liability Convention should have applied in this incident since the satellite did not harm people or property upon its fall,[92] Canada's success in retaining a remedy nonetheless seemed to confirm an international norm established through the Liability Convention: a state has the duty to compensate states that are harmed by its spacecraft.[93]

objects from their territories must also register those space objects with the United Nations. *See* Convention on Registration of Objects Launched into Outer Space art. II, U.S.-Russ.-U.K., Jan. 14, 1975, 28 U.S.T. 695, T.I.A.S. No. 8460 [hereinafter Registration Convention].

86. GERARDINE MEISHAN GOH, DISPUTE SETTLEMENT IN INTERNATIONAL SPACE LAW: A MULTI-DOOR COURTHOUSE FOR OUTER SPACE 165 (2007).

87. Beck, *supra* note 66, at 15.

88. Zhao, *supra* note 3. Claims Commission dispute resolution may be invoked only if no settlement of a claim is arrived at through diplomatic negotiations. *See* Camilo Guzman Gomez, *The Optional Rules of Arbitration of Disputes Relating to Outer Space Activities of the Permanent Court of Arbitration, A Real Option for the Solution of Conflicts in Space Matter?*, 55 PROC. ON THE INT'L INST. SPACE L. 756, 758 (2012).

89. Beck, *supra* note 66, at 15. One reason why the Liability Convention experiences so little application in damage-causing accidents is that many of these accidents are attributed to launch disasters which do not cross state borders. *Id.* at 16.

90. Alexander F. Cohen, *Cosmos 954 and the International Law of Satellite Accidents*, 10 YALE J. INT'L L. 78, 79 (1984).

91. *Id.* at 80.

92. *Id.* at 89 n.72; Peter P. C. Hannappel, *Some Observations on the Crash of Cosmos 954*, 6 J. SPACE L. 147, 148 (1978) (explaining that the Convention's narrow definition of "damage" did not cover Canada's search and cleanup costs).

93. *Id.* at 88–89.

5. The Registration Convention

The Registration Convention, which entered into force in 1976, elaborates on Article VIII of the Outer Space Treaty. It requires states to register with the United Nations specific details about, and to maintain a national registry of, each space object that has been launched into space from that state's territory.[94] This mandatory system for recording space objects allows the United Nations to "streamline the process set forth in the Liability Convention" and identify the actors to be held accountable for any damage caused by these objects.[95] The legal effect of registering a space object is that the state to which the object is registered now has jurisdiction and control over the object and any personnel of the object.[96]

The Registration Convention defines "launching state" similarly to how the Liability Convention defines it.[97] The Registration Convention thus affects private activity in outer space similarly to how the Liability Convention does: all private space objects must be registered through the state from which they launch.[98]

6. The Moon Agreement

The Moon Agreement establishes that the Moon and its natural resources "are the common heritage of mankind," and sets further restrictions on the use and exploitation of the Moon and its resources. The Moon Agreement has added to the prior treaties' guidance concerning commercial activity. In fact, this Agreement is "the only convention which [directly] acknowledges the possibility of commercialization."[99] While the Agreement does not explicitly reference commercial space activities, the context in which the Moon Agreement was drafted implies that *commercial exploitation* and *commercial use* were intended within the words, "exploitation" and "use"—two words used throughout the Agreement.[100] For instance, Article 11(3) allows

94. *See generally* Registration Convention, *supra* note 85, art. II.

95. Adolph, *supra* note 76, at 967.

96. Outer Space Treaty, *supra* note 60, art. VIII.

97. The Registration Convention defines the "launching state" as either "[a] State which launches or procures the launching of a space object" or "[a] State from whose territory or facility a space object is launched." Registration Convention, *supra* note 85, art. I.

98. *Id.*

99. Zhao, *supra* note 3.

100. Frans G. von der Dunk, *Back in Business? The Moon Agreement, Private Actors and Possible Commercial Exploitation of the Moon and Its Natural Resources*, *in* INTERNATIONAL

the extraction of natural resources from celestial bodies and Article 11(5) regulates the exploitation of natural resources on celestial bodies.[101] These provisions would undoubtedly apply to private actors in the business of mining asteroids or other celestial bodies.

The Moon Agreement may include private actors under its purview through two provisions. The first is in Article 14, which states that a State Party is responsible for national activities on the Moon that are carried on by non-governmental entities.[102] In this way, the Moon Agreement covers private actors in a similar way as how Article VI of the Outer Space Treaty covers private actors.[103] Additionally, Article 12 of the Moon Agreement provides that a State Party retains jurisdiction and control over its personnel, vehicles, equipment, facilities, stations and installations on the moon.[104] This article allows states to regulate certain private activities that fit within these categories, even without proper jurisdiction and territorial sovereignty.[105] Adopted in 1979, the Moon Agreement is the last international space treaty to be entered into force.

While these treaties seem to be on equal footing, the Outer Space Treaty is the only space treaty accepted as customary international law (meaning states not parties to the treaty would be bound to its laws).[106] With 105 ratifying states,[107] it is the only international space treaty that more than half of the world's countries have currently

AND INTERDISCIPLINARY WORKSHOP ON POLICY AND LAW RELATING TO OUTER SPACE RESOURCES: EXAMPLES OF THE MOON, MARS, AND OTHER CELESTIAL BODIES 244, 259 (2007), https://www.mcgill.ca/iasl/files/iasl/Moon-Proceedings-Part_5_2006.pdf [https://perma.cc/2MGU-2JTG].

101. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies art. 14, Dec. 18, 1979, 1363 UNTS 3, ATS 1986 No. 14, 18 ILM 1434 (entered into force July 11, 1984) [hereinafter Moon Agreement].

102. *Id.* art. 14.

103. Ambiguities of the terms "national activities" and "non-governmental entities" are discussed in Part II.

104. Moon Agreement, *supra* note 101, art. 12.

105. von der Dunk, *supra* note 100, at 258.

106. Michael Tse, *"One Giant Leap [Backwards] for Mankind": Limited Liability in Private Commercial Spaceflight*, 79 BROOK. L. REV. 291, 297 (2013).

107. The Outer Space Treaty is marked as successful, not only by the sheer number of ratifying states, but also by the fact that the ratifying states include all major space-faring nations such as the United States, China, Russia, Japan, the United Kingdom, Canada, and France.

ratified.[108]

As of 2017, successively fewer countries have ratified the other four treaties: the Rescue Agreement, 95; the Liability Convention, 94; the Registration Convention, 63; and the Moon Agreement, 17.[109] The Moon Agreement is considered a failed treaty not only because of its negligible number of ratifying countries, but also because none of the ratifying states are those which engage in manned space exploration (such as the United States, Russia, China, Japan, and the vast majority of the members of the European Space Agency).[110] Thus, this treaty is largely considered "dormant" and has little effect in the international space law arena.[111]

Together (although arguably excluding the Moon Agreement) these treaties create the framework of international space law. No treaties have been adopted since the ratification of the Moon Agreement, nor have any changes to these treaties been made.[112] However, it has already become apparent that this framework will need substantial amendments to successfully regulate this new era of space exploration led by the private sector.

II. PROBLEMS WITH ENFORCEMENT OF INTERNATIONAL SPACE LAW ON PRIVATE ACTORS

Despite this foundation of international space law, a plethora of issues within this framework allows private actors the ability to escape enforcement. Part II.A argues that ambiguities in the law allow private actors to avoid enforcement entirely. Part II.B contends that, even if private actors do fall under the purview of the law, international space law lacks the enforcement capabilities to actually serve any effective regulatory or adjudicative purpose for these private actors.

108. Comm. on the Peaceful Uses of Outer Space, Status of International Agreements Relating to Activities in Outer Space as at 1 January 2015, U.N. Doc. A/AC.105/C.2 /2015/CRP.8 (2015).

109. *Id.*

110. *Id.* The Moon Agreement was objected to by the space-faring states because it requires that extracted resources be shared with other states. The space-faring states contend that this sharing impedes the development of space industries. Michael Listner, *The Moon Treaty: Failed International Law or Waiting in the Shadows?*, SPACE REV. (Oct. 9, 2015), at 3–4, http://www.thespacereview.com/article/1954/1 [https://perma.cc/36RG-N6TP].

111. MATTHEW J. KLEINMEN ET AL., THE LAWS OF SPACEFLIGHT: A GUIDEBOOK FOR NEW SPACE LAWYERS xvii (2012).

112. Beck, *supra* note 66, at 17.

A. Ambiguities in the Law Allow Private Actors to Avoid Enforcement

As stated *supra*, the space treaties primarily address the rights and obligations of states, and thus they are heavily "state-oriented."[113] While the purview of the law may have also intended to extend to intergovernmental organizations as well,[114] private entities were mostly considered to have "no independent legal status in international space law."[115] Because the drafters of the five international space treaties did not primarily intend to elaborate on the rights and duties of private actors, regulation of private actors from these treaties has been ambiguous at best. Along with this state-centered approach to drafting this body of international space law, many provisions of these treaties, namely the Outer Space Treaty, were left broad for elaboration by future treaties.[116] The general manner in which these provisions were drafted has left loopholes for private parties to potentially exploit to avoid enforcement. This section reviews three such ambiguous terms: "national activities," "non-governmental entities," and "damage."

1. "National Activities"

The term "national activities" is mentioned multiple times in the Outer Space Treaty and the Moon Agreement but is not defined. This leaves open to interpretation whether the activities conducted by private actors in outer space are included in the Outer Space Treaty. Specifically, Article VI of the Outer Space Treaty states that "State Parties . . . shall bear international responsibility for *national activities* in outer space, whether such activities are carried on by governmental agencies or by non-governmental entities."[117] Article 14 of the Moon Agreement states that "State Parties . . . shall bear international responsibility for *national activities* on the Moon, whether such activities are carried on by governmental agencies or by non-governmental entities . . . ."[118]

113. U.N. OFFICE FOR OUTER SPACE AFFAIRS, MEETING INTERNATIONAL RESPONSIBILITIES AND ADDRESSING DOMESTIC NEEDS, at 262, U.N. Doc. ST/SPACE/32, U.N. Sales No. E.06.I.11 (2006).

114. GOH, *supra* note 86, at 162.

115. *Id.*

116. Zhao, *supra* note 3.

117. Outer Space Treaty, *supra* note 60, art. VI (emphasis added).

118. Moon Agreement, *supra* note 101, art.14 (emphasis added).

At least two different interpretations of "national activities" exist, each allowing avenues for non-enforcement for private actors. The first interpretation is that "national activities" relate only to *state* activities and thus exclude private and commercial activities entirely.[119] Another interpretation of "national activities" refers to space activity *within the country*.[120] This ambiguous definition of "national activities" may present regulatory gaps over commercial activities in outer space.[121]

Even if international activities were included under the purview of the treaty, there lies the issue of which state is responsible for the activity. Article VII states that non-governmental entities "require authorization and continuing supervision by the appropriate State Party to the Treaty," but never elaborates on what state is deemed "appropriate."[122] One scholar contends that the "appropriate State" includes "both the State whose nationality the [space object] has and the State or States on whose territory its activities are done."[123] This standard still implicates at least two states, which may make enforcement of international activities difficult. Uncertainty relating to the definition of "national activities" may "lead to uncertainty as to which state should regulate which private activities" in outer space,[124] and has allowed States Parties to "define [national activities] as they see fit and to act accordingly."[125] A more concrete definition of "national activities" is required to provide more clarity on the exact activities that would be covered under these treaties.

2. "Non-governmental entities"

Similar to the lack of definition for "national activities," neither the Outer Space Treaty nor the Moon Agreement define "non-governmental entities." Because the treaty does not explicitly mention private

119. Frans G. von der Dunk, *Fundamental Provisions of National Space Laws*, SPACE, CYBER, & TELECOMM. L. PROGRAM FAC. PUBLICATIONS 91, 93–94 (2006). *See supra* note 6 for a discussion on the distinction between private activity and commercial activity.

120. *See* von der Dunk, *supra* note 119, at 94.

121. *See* von der Dunk, *supra* note 100, at 262 (noting that the definition may not cover private activity on the moon).

122. *Id.* at 593 n.85.

123. Tatsuzawa, *supra* note 6.

124. von der Dunk, *supra* note 100, at 262.

125. Meredith Blasingame, *Nurturing the United States Commercial Space Industry in an International World: Conflicting State, Federal, and International Law*, 80 MISS. L. J. 741, 744 (2010).

actors, Article VI's discussion of "non-governmental entities" provides the most plausible argument that private actors are covered under the treaty. It is entirely possible that the drafters of the treaty intended "non-governmental entities" to only include *inter-governmental* organizations, since "sovereign states and inter-governmental organizations have been the exclusive subjects of international space law."[126] Another interpretation is that "non-governmental entities" was intentionally kept broad to cover other entities and individuals, including private entities.

In summary, because the Outer Space Treaty and the Moon Agreement "do[] not offer detailed provisions on the involvement of private entities in space activities,"[127] the treaties may cover private entities only to the extent that such an interpretation can be implicated, and such implications are ambiguous at best. These ambiguities alone may allow private entities or the activities of private entities to avoid enforcement under the Outer Space Treaty and the Moon Agreement.

3. "Damage"

Interpretations differ as to what damages are actually covered under the Liability Convention. The Convention defines "damage" to mean "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations . . . ."[128] This definition, however, is restricted by Article II, which explicitly mentions that the damage must be "caused by its space object."[129] This causation component calls into question whether only direct or physical damage is considered sufficient to seek remedy for absolute liability, or whether indirect, consequential, or economic damages may also be implicated.[130] In congressional reports relating to the ratification of the Liability Convention, the United States has declared it does not consider the Liability Convention to cover indirect damages.[131] This issue of the extent of damages was brought to the forefront in the 1978 malfunction of the Soviet Union's

126. GOH, *supra* note 86, at 162.

127. von der Dunk, *supra* note 100, at 254.

128. Liability Convention, *supra* note 83, art. I.

129. *Id.* art. II. Article II pertains to situations in which absolute liability occurs.

130. *See* Kevin K. Spradling, *The International Liability Ramifications of the U.S. NAVSTAR Global Positioning System*, 33 PROC. ON THE L. OF OUTER SPACE 93, 97 (1990).

131. *Id.*

COSMOS 954 satellite that spread radioactive debris and caused electronic interference over Canada.[132] The Soviet Union adopted the United States' position and argued that the Liability Convention did not include "indirect damages" for "electronic interference."[133] Since the Soviet Union and Canada settled the dispute diplomatically,[134] the issue remains as to whether indirect damages are covered under the Convention. Under the United States' and Soviet Union's interpretation, private entities may skirt enforcement if their actions implicate only indirect damages.

The drafters of the Outer Space Treaty intended to make terms broad to facilitate the treaty's adoption and left it to subsequent treaties to flesh out the terms. However, these subsequent treaties still left ambiguities in their terminology that allow for debate as to whether or not private entities may be covered in a variety of scenarios, including when an aggrieved party wishes to seek remedy from them.

B. Lack of Enforcement Mechanisms in International Space Law

Even if private actors did fall under the purview of international space law, international space law has inadequate enforcement mechanisms to actually implement these laws. Much like how the treaties generally were intended to outline a framework for the rights and obligations of States Parties specifically, the enforcement mechanisms of these treaties also intend that states be the only entities allowed to submit or defend claims. The five international space treaties for the most part lack any sort of dispute resolution organ at all. The two treaties that do have these organs are riddled with inadequacies that allow private actors to avoid being subject to these dispute resolution frameworks.

Part B.1 discusses the dispute resolution framework within the international space law treaties themselves. Part B.2 analyzes the regulatory enforcement mechanisms established outside the treaties, with a focus on UNCOPUOS and other key intergovernmental organizations. Part B.3 evaluates the adjudicative and arbitral enforcement mechanisms that exist outside of the treaties, with a particular focus on the Permanent Court of Arbitration and the adjudicative capabilities of key intergovernmental organizations. Finally, Part B.4 focuses on domestic space law and its enforcement capabilities upon private actors.

132. Carl Q. Christol, *International Liability for Damage Caused by Space Objects*, 74 AM. J. INT'L L. 346, 361–64 (1980).

133. *Id.*

134. Cohen, *supra* note 90, at 80.

1. Enforcement Infrastructure within the Space Treaties

Only two of the five treaties explicitly list enforcement authorities provided for by the treaty: the Liability Convention and the Registration Convention. The remaining three treaties (the Outer Space Treaty, the Rescue Convention, and the Moon Agreement) provide that states retain legal authority over persons and objects launched into space from their territory and provide jurisdiction to the respective states.[135] It is the responsibility of the states to provide courts or tribunals to adjudicate any matters that arise from violations of these treaties. The Liability Convention and the Registration Convention's enforcement capabilities, or their lack thereof, are described in turn below.

a. The Liability Convention's Claims Commission

The Liability Convention's Claims Commission provides for the only outer-space specific means of alternative dispute resolution.[136] Articles IX through XX establish the dispute settlement system. The system mandates a diplomatic stage before providing for an arbitration stage before the Claims Commission, which is the body that makes decisions regarding the merits of the claim and the compensation awarded.[137] Since the Convention entered into force in 1972, this conflict resolution procedure has only been invoked once (in the Soviet Cosmos 954 crash, explained *supra*). This case was resolved in the mandatory diplomatic phase, so the Claims Commission has yet to preside over any conflicts.[138]

However, even if the Claims Commission does have the opportunity to hear claims, the conflict resolution system is inhibited by major shortcomings. First, the Convention does not provide the Claims

135. Blake Gilson, *Defending Your Client's Property Rights in Space: A Practical Guide for the Lunar Litigator*, 80 FORDHAM L. REV. 1367, 1381, 1397 (2011); Outer Space Treaty, *supra* note 60, art. VIII; Rescue Convention, *supra* note 71, arts. I–II; Moon Agreement, *supra* note 101, arts. XII, XIV.

136. Michael Listner, *A New Paradigm for Arbitrating Disputes in Outer Space*, SPACE REV. (Jan. 9, 2012), http://www.thespacereview.com/article/2002/1 [https://perma.cc/SF5S-RHFS].

137. Gomez, *supra* note 88, at 757–58. In brief, the "diplomatic stage" takes place as follows: the demandant state notifies the launching state about its claim for compensation; diplomats from the demandant state engage with diplomats from the launching state in an attempt to reach a resolution; the claim must be resolved within one year following the notification of the claim; if the claim is not resolved, the parties enter arbitration. *Id.*

138. Listner, *supra* note 136.

Commission with the same authority of a judicial court.[139] One effect of this quasi-judicial structure is that the Commission's decisions are not binding unless both parties have agreed otherwise.[140] Without such an agreement, the decision is only advisory.[141] This allows the launching state that is hostile to the victim state a simple way to avoid repercussions for injuries caused by its space object.[142] Second, the dispute resolution system provided in the Convention only allows for the participation of states.[143] Consequently, the dispute resolution framework has been "highly criticized and rendered useless"[144] as it provides no direct enforcement authority over private actors.

b. The Registration Convention's International Registry

The Registration Convention does provide some international involvement in enforcement, but it is not nearly as robust as in the Liability Convention. The Registration Convention requires that "[t]he Secretary-General of the United Nations . . . maintain[s] a Register in which the information furnished [by the launching States] shall be recorded."[145] However, this register is compiled based on records provided by states, so state involvement in enforcement is crucial to this international registry. The ability to enforce the provisions of the Registration Convention on a private actor is therefore only as strong as the enforcement efforts of the state that holds jurisdiction over that private actor. Even if these state enforcement efforts were strong, only sixty-four states have ratified the Registration Convention (as of December 2017), making it the second least ratified treaty of the space treaties.[146] Because this Convention has not solidified its regulations

139. Gomez, *supra* note 88, at 758.

140. Liability Convention, *supra* note 83, art. XIX, para. (2). "The decision of the commission shall be final and binding if the parties have so agreed; otherwise the Commission shall render a final and recommendatory award, which the parties shall consider in good faith. The Commission shall state the reasons for its decision or award." *Id.*

141. *See, e.g.*, GOH, *supra* note 86, at 165; Frans G. von der Dunk, *Too-Close Encounters of the Third-Party Kind: Will the Liability Convention Stand the Test of the Cosmos 2251-Iridium 33 Collision?*, 28 SPACE, CYBER & TELECOMM. L. PROGRAM FAC. PUBL'NS 199, 200, 205–06 (2010).

142. *See* Trevor Kehrer, *Closing the Liability Loophole: The Liability Convention and the Future of Conflict in Space*, 20 CHI. J. INT'L L. 178, 187 (2019).

143. Gomez, *supra* note 88, at 757; *see also* Listner, *supra* note 136.

144. Gomez, *supra* note 88, at 756.

145. Registration Convention, *supra* note 85, art. III, ¶ 1.

146. *See* SECURE WORLD FOUND., HANDBOOK FOR NEW ACTORS IN SPACE 7 (2007),

into customary international law, its lack of widespread ratification undoubtedly reduces the ability to enforce its provisions even if it had the requisite enforcement mechanisms.

Looking at all of the international space treaties collectively, there is a notable absence of regulatory and licensing provisions that states must follow to enforce law domestically. As the Outer Space Treaty requires that states retain responsibility over all activity launched from their state, it is peculiar that the treaty does not explicitly designate how states should authorize and supervise these activities.[147] Allowing states to take complete control over the manner in which they authorize and supervise the launch of space activities has allowed a wide range of enforcement levels between states. For instance, some states issue a single license for all space activities while other states issue a single license for only specific space activities.[148] National laws regarding the scope of jurisdiction have also varied across states. Some states assert jurisdiction over where an object is launched, while other states assert jurisdiction over the nationality of the private actor that launched the space object.[149] This lack of uniformity in national space law may incentivize private actors to choose a state to launch their space objects from based on the enforcement policies that are most beneficial to it.

2. Regulatory Enforcement Capabilities of UNCOPUOS and Other Intergovernmental Bodies

Outside of the flawed enforcement mechanisms drafted in the Liability Convention and the Registration Convention, the U.N. intergovernmental body that oversees them, UNCOPUOS, may be seen to bring private actors in conformity with international space law. However, UNCOPUOS lacks true enforcement abilities, described in Part II.B.2.a below. Also, other international organizations that are involved in the regulation of space activities, namely the World Trade

https://swfound.org/media/205710/handbook_for_new_actors_in_space_2017_web2.pdf [https://perma.cc/J9J2-WSB8]; Michael Simpson & Christopher D. Johnson, *Transparency and Security Assurances for Commercial NewSpace On-Orbit Servicing* (Secure World Found., 2015), https://swfound.org/media/205365/transparency-and-security-assurances-for-commercial-newspace-onorbit-servicing_m_simpson_c_johnson.pdf [https://perma.cc/A8YC-QM9J].

147. Paul Stephen Dempsey, *National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement*, 36 NW. J. INT'L L. & BUS. 1, 14–15 (2016).

148. *Id.* at 15.

149. *Id.*

Organization ("WTO"), the International Telecommunication Union ("ITU"), the World Intellectual Property Organization ("WIPO"), the U.N. Educational, Scientific and Cultural Organization ("UNESCO"), and the International Institute for the Unification of Private Law ("UNIDROIT"), provide only marginally stronger enforcement over specific space activity matters and provide little assistance in regulating private actors specifically.[150]

a. UNCOPUOS

Since its establishment in 1959, UNCOPUOS remains the only committee of the General Assembly that deals exclusively with "international cooperation in the peaceful uses of outer space" and with "monitor[ing] . . . developments related to the exploration of outer space."[151] The Committee has ninety-two members, making it one of the largest Committees in the United Nations.[152] It consists of two subcommittees: the Scientific and Technical Subcommittee ("STSC") and the Legal Subcommittee.[153] The STSC meets every year for two weeks to discuss issues concerning the scientific and technical aspects of space activities.[154] The Legal Subcommittee also meets every year for two weeks, but to discuss legal issues concerning the same topic.[155] UNCOPUOS is overseen by a bureau that consists of five offices: Chair, Vice-Chair, Rapporteur, Chair of the STSC, and Chair of the Legal Subcommittee.[156]

While this infrastructure may be seen as robust, it has little legal effect. UNCOPUOS works to (1) encourage more countries to accede to the five space treaties and (2) encourage more members of the

150. INGO BAUMANN, SPACE LAW: CURRENT PROBLEMS AND PERSPECTIVES FOR FUTURE REGULATION: DIVERSIFICATION OF SPACE LAW 49, 50, 52, 62 (Marietta Benkö et al. eds., 2005).

151. *Committee on the Peaceful Uses of Outer Space and Its Subcommittees*, U.N. OFFICE FOR OUTER SPACE AFF., http://www.unoosa.org/oosa/en/ourwork/copuos/comm-subcomms.html [https://perma.cc/EMX9-LLMH] (last visited Dec. 6, 2019).

152. *Members of the Committee on the Peaceful Uses of Outer Space*, U.N. OFFICE FOR OUTER SPACE AFF., http://www.unoosa.org/oosa/en/members/index.html [https://perma.cc/3VWZ-PAQ8] (last visited Dec. 6, 2019).

153. *Committee on the Peaceful Uses of Outer Space and Its Subcommittees*, *supra* note 151.

154. *Id.*

155. *Id.*

156. *Id.* The chairs are held for a period of two years and rotate among five regional groups: African Group, Asia-Pacific States, Eastern European States, Latin American and Caribbean States, and Western European and other States. *Id.*

five treaties to implement the treaties' obligations through national space law. As such, the only way in which UNCOPUOS can enforce the provisions of space treaties that do not possess internal enforcement authorities is to conduct "diplomatic maneuvering."[157] To encourage more countries to accede to the treaties, UNCOPUOS formed a working group in 2012 that established a report to strengthen international mechanisms for cooperation with international space law.[158] To encourage national legislation that complies with the international space treaties, UNCOPUOS consulted with UNGA for it to adopt a resolution concerning recommendations on national legislation.[159] However, it is the prerogative of the states to follow through with these recommendations to actually create enforceable law.

Even UNCOPUOS's strongest enforcement capability, diplomatic maneuvering, is inhibited by a number of factors. First, UNCOPUOS is governed by strict procedural rules that stunt its ability to produce resolutions.[160] Resolutions require unanimous approving or abstaining votes from all voting members in order to pass.[161] In some instances, this vote by consensus has taken UNCOPUOS almost a decade to pass resolutions on crucial issues.[162] For instance, UNCOPUOS took nearly ten years to settle principles concerning direct broadcasting and remote sensing[163]—an obstructive delay for the rapidly developing industry. Second, UNCOPUOS is further constrained by the political motives of its voting members, who have voted against credible proposals simply because they were introduced by a political rival.[164] These factors serve as impediments for the only committee on international cooperation relating to outer space to implement real legal change.

b. Other Intergovernmental Organizations that Regulate Space Activities

Besides UNCOPUOS, four main intergovernmental organizations are involved in regulating space activities: the ITU, WTO,

157. Listner, *supra* note 136.

158. Zhao, *supra* note 3.

159. G.A. Res. 68/74 (Dec. 11, 2013).

160. Christopher D. Williams, *Space: The Cluttered Frontier*, 60 J. AIR L. & COM. 1139, 1180 n.218 (1995).

161. *Id.* at 1180, n.218.

162. *Id.* at 1180.

163. *Id.* at 1180 n.222.

164. *Id.* at 1180.

WIPO, UNESCO, and UNIDRIOT.[165] Unlike UNCOPUOS, which oversees space activities generally, these intergovernmental organizations provide oversight over specific issues regarding space activities.[166] These intergovernmental organizations do serve to increase regulatory oversight over commercial space activities.[167] Some of them are even equipped with dispute resolution mechanisms.[168] However, these organizations are scattered in their oversight capabilities as they only provide increased protection over specific issues. Therefore, private actors who engage in activities that do not fall within the jurisdiction of these issue-specific intergovernmental organizations may go about these activities with little regulation.

3. Adjudicative and Arbitral Capabilities of International Courts and Tribunals over Private Space Actors

Since UNCOPUOS lacks any adjudicative and arbitral capabilities, an aggrieved party who wishes to seek retribution against private actors for space activities may turn to other intergovernmental organizations, courts, or tribunals. The dispute resolution systems established by the Permanent Court of Arbitration, the WTO, the ITU, and domestic courts are discussed in turn below.

165. Ingo Baumann, *Diversification of Space Law*, *in* SPACE LAW: CURRENT PROBLEMS AND PERSPECTIVES FOR FUTURE REGULATION 47, 49 (Marietta Benkö et al. eds., 2005).

166. The ITU, deemed "the second international regulator of space activities," oversees all aspects of space communication involving international cooperation. The WTO oversees space activities that relate to the trade of space-related goods and services. WIPO, while it has yet to serve as an important regulator of space activities currently, is expected to take on regulatory functions regarding inventions made in space. UNESCO promotes spaceborne technologies and examines the ethics of space policies. UNIDROIT facilitates commercial transactions concerning space assets. *Id.* at 52; Henry R. Herzfeld, *International Organizations in Civil Space Affairs*, *in* THE POLITICS OF SPACE: A SURVEY: INTERNATIONAL ORGANIZATIONS IN CIVIL SPACE AFFAIRS 129, 134 (Eligar Sadeh ed., 2011).

167. For instance, the ITU's Constitution and Convention provides specific regulatory rights imposed on States Parties to oversee private actors, such as "the right to stop the transmission of any private telegram which may appear dangerous to the security of the State or contrary to its laws." *See* Constitution and Convention of the International Telecommunication Union art. 34, Dec. 22, 1992, 1825 U.N.T.S. 331 [hereinafter ITU Constitution and Convention].

168. The ITU and the WTO have such dispute resolution mechanisms. *See infra* Part II, Section 3, and accompanying text.

a. Permanent Court of Arbitration

The Permanent Court of Arbitration specifically allows for private actors to be a party to a claim concerning space activities.[169] To address the flaws in the conflict resolution framework stipulated within the Liability Convention, the Permanent Court of Arbitration ("PAC") established the Optional Rules of Arbitration of Disputes Relating to Outer Space Activities in December 2011.[170] The Optional Protocol provides an avenue for obtaining remedy for aggrieved parties—this time allowing private actors who perform activities in outer space to be liable. Specifically, the Optional Rules were implemented partly to "reflect the particular characteristics of disputes having an outer space component involving the use of outer space by States, international organizations and private entities . . . ."[171] While the Optional Rules do expressly cover "private entities," the Optional Rules are just that: optional. The scope of the application only extends to parties that have agreed to submit to the optional rules, so the ability for private actors to be subject to this arbitral body is constrained.

b. WTO's Dispute Resolution Body and Appellate Body

The WTO established a dispute resolution system of its own, which may implicate oversight over private actors. The WTO's "Dispute Settlement System" ("DSS") functions by requiring WTO member states to agree to the Understanding on Rules and Procedures Governing the Settlement of Disputes or Dispute Settlement Understanding before the DSS may hold jurisdiction over the claim. The member states first must engage in consultations to settle trade disputes that pertain to any "covered agreements," and if these negotiations fail, the parties may present their case before the WTO panel.[172] However, the WTO only accepts claims brought or defended by states.[173] Many corporations have nonetheless succeeded in having

169. Michael Listner, *A New Paradigm for Arbitrating Disputes in Outer Space*, SPACE REV. (Jan. 9, 2012); Gomez, *supra* note 88, at 758; Zhao, *supra* note 3.

170. Zhao, *supra* note 3.

171. *Id.*

172. *WTO Analytical Index*, WORLD TRADE ORG., https://www.wto.org/english/res_e/publications_e/ai17_e/ai17_e.htm. [https://perma.cc/B5GK-JC3S] (last visited Dec. 2018).

173. Francisco Orrego Vicuña, *Individuals and Non-State Entities before International Courts and Tribunals*, 5 KLUWER L. INT'L 53, 63 (2001) ("Although formally the WTO is an

their interests represented in this system by being sponsored by their governments.[174] But these private actors face steep limitations in their representation. First, they must actually get a state to sponsor their claim, which is not guaranteed.[175] Second, the dispute brought before the WTO needs to fall under one of the WTO's covered agreements.[176] These restrictions impede space-faring private actors from engaging effectively in the WTO's dispute resolution process.

c. The International Telecommunication Union

The ITU may hold jurisdiction over private actors that engage in certain types of commercial space activity. Namely, the ITU may oversee space-related activities that concern information and communication technologies, such as satellites. The Constitution and Convention of the International Telecommunication Union, along with its Optional Protocol on the Compulsory Settlement of Disputes, provide a mechanism for resolving disputes as well as enforcing the decisions, resolutions, recommendations, and general rules of conferences and other meetings of the Union.[177] However, the ITU is similar to the WTO in that the only parties bound to the ITU Constitution and Convention and Optional Protocol are states. Thus, the ITU does not have "any effective enforcement power" to oversee that any violations against private actors are actually remedied.[178] Additionally, the international dispute resolution mechanisms within the Optional Protocol are not mandatory and rely on voluntary compliance from States Parties.[179]

d. Domestic Courts

An aggrieved party's best tribunal to bring legal action against

inter-state dispute settlement system, in practice many of the cases brought to it have involved the interest of individuals and corporations who have been sponsored by their governments.").

174. *Id.*

175. *Id.* at 64 (suggesting that the dispute resolution system screens only services private claims with "genuine merit and interests").

176. *See* Eng Teong See, *Commercialization of Space Activities—The Laws and Implications*, 82 J. AIR L. & COM. 145, 167 (2017); *see generally WTO Analytical Index*, *supra* note 172.

177. ITU Constitution and Convention, *supra* note 167.

178. See, *supra* note 176, at 152.

179. Ram S. Jakhu, *Dispute Resolution Under the ITU Agreements*, INST. AIR & SPACE L. 5 (2010), https://swfound.org/media/48115/jakhu-dispute%20resolution%20under%20the%20itu%20agreements.pdf [https://perma.cc/LP2J-UC73].

a private entity, and receive enforceable remedy, is through domestic courts. As of 2006, the only disputes relating to space activities that have been submitted to legal settlement processes have been on the domestic level.[180] However, the courts have shortcomings as well, particularly in regard to jurisdiction.

In relation to the United States, its federalist-structured court system presents jurisdictional problems that concern whether the space law matter should be heard by the state or federal court system. In many instances, Congress has limited the ability of states to pass legislation in certain areas of space law activity while simultaneously granting state courts the ability to apply federal space law.[181] For instance, the Federal Aviation Act prohibits states from making laws that relate to commercial air travel, but state courts and federal courts alike may interpret the Federal Aviation Act.[182] Also, the Commercial Space Launch Act requires that only the federal system receive licensing authority for space launches. However, states may "regulate space launch activities within their jurisdictions, or that affect their jurisdictions . . . ."[183] Despite shortcomings in domestic courts, aggrieved parties that wish to sue a private entity will most likely be better off by skirting these international courts and tribunals and bringing their claims within the relevant domestic courts.

The lack of a uniform regulatory body—fully equipped with regulatory, adjudicative, and arbitral authority—allows private actors to evade international space law.

4. Efficacy of Domestic Law in Fulfilling Space Treaty Obligations

The space treaties rely extensively on the cooperation of States Parties to implement the treaties' provisions so they may have legal effect within those respective states. For instance, the Registration Convention relies on States Parties to report all space objects launched from that state and notify the UN Secretary-General of each registry.[184] "However, ambiguities in the requirements and poor feedback and

180. GOH, *supra* note 86, at 2.

181. U.S. CONG., OFFICE OF TECH. ASSESSMENT, OTA-BP-ISC-41, SPACE STATIONS AND THE LAW: SELECTED LEGAL ISSUES-BACKGROUND PAPER 29 (1986).

182. *Id.*

183. *Id.*

184. Simpson & Johnson, *supra* note 146, at 8.

quality control in the system have led to significant flaws in the registry . . . ."[185] One report found that, as of 2017, seventeen unregistered satellites seem to be missing from the international satellite registry due to "probable deliberate omission," while an additional seventy-one appear to be missing due to "accidental omission."[186] This lack of transparency has inspired a "new trend in commercial secrecy" that has only bred further instances of concealment of private space launches.[187] Inadequate reporting standards and substandard quality control have allowed states to fill the void with their own domestic laws and have provided states with operational power over the private space object.[188] As a result, the Registration Convention applies to private actors only to the extent that the private actors' state is willing to cooperate with the U.N. and regulate registration requirements domestically.[189]

Even if states *have* successfully enacted the space treaties' provisions into its domestic law, the uneven regulation between states allows private actors to simply launch a space object from a state with more lenient regulations. This scenario occurred in January 2018, when a satellite start-up company, Swarm Technologies, sought to fly their experimental satellites.[190] The company first requested that the U.S. satellite regulatory authority, the Federal Communications Commission ("FCC"), approve its satellites for launch from the United States into outer space. The FCC denied the company's request, as the launch did not meet the FCC's safety standards.[191] Despite the FCC's prohibition, Swarm purchased space on one of India's space agency rockets and its satellites were ultimately launched into orbit—without any regulatory approval.[192] The fact that the United States government

185. Ram S. Jakhu et al., *Critical Issues Related to Registration of Space Objects and Transparency of Space Activities*, 143 ACTA ASTRONAUTICA 406, 417 (2018).

186. *Id.* at 410.

187. Tim Fernholz, *An Unauthorized Satellite Launch in India Threatens US Regulatory Reform in Space*, QUARTZ (Mar. 13, 2018), https://qz.com/1226962/an-unauthorized-satellite-launch-in-india-threatens-us-regulatory-reform-in-space/ [https://perma.cc/RM8G-MDRM]. Some instances include the launch of a private Canadian company's experimental satellite on a Chinese rocket that went unacknowledged until a week afterward and the launch of "DemoSat-2," whose operator was not publicly named until over one month after launch. *Id.*

188. Simpson & Johnson, *supra* note 146, at 7.

189. *Id.* at 8–9.

190. Fernholz, *supra* note 187.

191. *Id.* The FCC denied the request because it was concerned that the unusually small satellites would be difficult to detect with the radar system currently available to detect orbiting space objects, which may increase the likelihood of collision with other space objects.

192. *Id.*

was unable to stop the company from launching the satellite elsewhere without regulatory oversight, and the fact that the Indian government actually launched it, demonstrates that effective regulation upon private actors is lacking.[193] Further, the ability for private actors to shop for the most favorable jurisdiction to launch space objects might lead to a "race to the bottom," where states compete to provide the loosest regulations for space-faring companies.[194]

Private actors, therefore, have multiple avenues to avoid international space law. They can argue ambiguities in the text of the space treaties. Alternatively, they can exploit the inadequacies of enforcement mechanisms from UNCOPUOS, the treaties themselves, external tribunals and arbitral courts, and domestic regulatory schemes. This problem is exacerbated by the fact that the private sector currently dominates the space economy.[195] Further, as technological advances make access to space significantly less expensive, private actors will likely continue to solidify their stronghold over outer space activities. If humanity is truly embarking on a new commercial frontier in outer space, proper enforcement must follow.

III. POTENTIAL SOLUTIONS TO INCREASE ENFORCEMENT ON PRIVATE ACTORS

As described above, international space law suffers from inadequacies in its enforcement mechanisms, particularly as they relate to private actors. However, this problem has more than one solution to strengthen compliance with international space law. While UNCOPUOS does not have the regulatory, adjudicative, or arbitral authority necessary to compel private actors to comply with the space law treaties, it may be expanded to do so. Alternatively, a separate legal entity that has such authority may be created. Additionally, domestic laws may be strengthened and standardized across states to further facilitate compliance with international space law.

A. Empower UNCOPUOS or a New International Enforcement Body with Increased Authority over Private Actors

The space industry will likely benefit from a centralized en-

193. *Id.*

194. *Id.*

195. BRYCE SPACE AND TECHNOLOGY, LLC, *supra* note 49, at 3.

forcement authority that has actual regulatory, adjudicative, and arbitral powers.[196] In fact, Article XI of the Moon Agreement arguably calls for such an organization to create and enforce laws related to commercial activity.[197] Additionally, several countries have already advocated for a permanent specialized United Nations agency to oversee outer space activities, which some have deemed the "World Space Organization" ("WSO").[198] However, UNCOPUOS has yet to seriously consider a new overseeing body.[199] Nonetheless, UNCOPUOS and the international space law community should either (1) create a separate U.N. body that enforces international space law on public and private actors, or (2) enhance the authority of UNCOPUOS to do the same.

One particular structure that the WSO can follow is that which is already established by other U.N. specialized agencies: it may hold an Assembly, a Council, and a Secretariat.[200] The Assembly may create policy, adopt amendments to international agreements, and ratify regulations and standards for commercial space activities. The Council may serve as an executive body that promotes cooperation among member states and international organizations.[201] Commercial space interests may be adequately represented on this Council by allowing

196. See, *supra* note 176, at 167 (arguing that international space law needs "an international space body with both technical and economic regulatory oversight"). Some have also argued that, instead of creating one umbrella organization, the international space law community should "extend the role and functions of the existing organizations by establishing a coordination mechanism among them." ISABELLA H. PH. DIEDERIKS-VERSCHOOR & VLADMÍR KOPAL, AN INTRODUCTION TO SPACE LAW 14 (3d ed. 2008).

197. *See* Edwin W. Paxson, III, Note, *Sharing the Benefits of Outer Space Exploration: Space Law and Economic Development*, 14 MICH. J. INT'L L. 487, 509 (1993) ("Article 11(5) . . . prescribes the establishment of 'an international regime, including appropriate procedures.'").

198. See, *supra* note 176, at 166 (noting previous calls for a "WSO" in some form as far back as 1961); E. Kamenetskaya, *On the Establishment of World Space Organisation: Some Considerations and Remarks*, 32 PROC. ON L. OUTER SPACE 358 (1989) (advocating for a WSO that mutual aid in exploring the cosmos will benefit all humanity); Simon Courteix, *Is It Necessary to Establish a World Space Organisation?*, 36 PROC. ON L. OUTER SPACE 20 (1993) (explaining that the end of the Cold War and the need to manage resources supports forming a WSO); Carl Q. Christol, *Space Stations: Political, Practical and Legal Considerations*, 7 HASTINGS INT'L & COMP. L. REV. 521, 539 (1984) (describing a French push for a UN-backed "International Satellite Monitoring Agency").

199. Bruce Stockfish, *Space Transportation and the Need for New International Legal and Institutional Regime*, 17 ANNALS AIR & SPACE L. 323, 354 (1992).

200. *Id.* at 359.

201. *Id.*

representation for all space-faring state members.[202] Also, representation from state members that are not the primary producers of commercial space activity, but serve as geographic hotspots for launching space activities, should be adequately represented on this board as well.[203] Finally, the Secretariat may facilitate administrative support for WSO's undertakings.[204]

Additionally, the WSO should incorporate a dispute resolution organ that can hold accountable the actions of private actors through their respective member states. It should have the maximum enforcement capacity, such as by requiring that all state members adhere to the tribunal's rulings. It should grant itself jurisdiction over private actors and allow these actors to bring a claim before the judicial organ as well, so long as the member states recognize the competence of the tribunal to consider the matter. Allowing cases concerning individual and private actors has already been established by many international courts and tribunals, such as the Permanent Court of Arbitration and various international human rights courts.[205] As commercial space activity only continues to grow, the WSO should provide an adequate means for adjudicating claims resulting from these activities.

Problems will undoubtedly arise from creating the WSO. Developing countries or states without a strong presence in outer space may contend that this framework will be inconsistent with the object and purpose of the Outer Space Treaty, which declares that outer space is to be the "province of *all* mankind."[206] Therefore, assurances must be made that developing countries or non-space faring nations will benefit from this organization.[207] For instance, the organization may

202. *Id.* These commercial space interests may also be offered direct participation in the institutional design of the WSO. Some international organizations or treaties allow direct participation from commercial interests. For instance, the North American Free Trade Agreement, a regional economic agreement between Canada, Mexico, and the United States, allows corporations to sue these states directly instead of requiring the corporations' respective states to sue on their behalf. *See* North American Free Trade Agreement, Can.-Mex.-U.S., ch. 11, Dec. 17, 1992, 32 I.L.M. 289 (1993).

203. Stockfish, *supra* note 199, at 359.

204. *Id.*

205. *See, e.g.*, Convention for the Protection of Human Rights and Fundamental Freedoms, art. 34, Nov. 4, 1950, 213 U.N.T.S. 221, E.T.S. 5 ("The Court may receive applications from any person, non-governmental organization or group of individuals claiming to be the victim of a violation by one of the High Contracting Parties. . . .").

206. Outer Space Treaty, *supra* note 60, art. I (emphasis added).

207. Similar assurances are made in other international agreements. For instance, WIPO and WTO implemented the Agreement on Trade Related Aspects of Intellectual Property

help facilitate commercial space activities that would benefit these countries by providing greater technology and services. Technological advances in satellite imagery may help these countries mitigate environmental damage and warn them of impending natural disasters.[208]

Another issue to address is how to establish an equitable cost allocation plan for this new organization. One idea is to allocate contributions based on the amount of tonnage launched per year by U.N. Member States.[209] Another idea is to emulate the cost allocation structure already established by the U.N. General Budget.[210] Regardless of the cost allocation structure provided, it should equitably reflect the contributions that space-faring nations make and ensure that they front the bulk of the costs.[211]

As an alternative to going through the process of creating a new legal entity, UNCOPUOS could use its own established regulatory framework and expand its own powers to create a similar regulatory framework as described above. This seems like an intuitive step for a U.N. Committee that is already among the largest committees of the United Nations[212] and is currently the "only intergovernmental platform for fostering global governance of outer space activities."[213] However, problems associated with expanding UNCOPUOS's role would undoubtedly arise. In particular, there is actually no natural progression in transforming a U.N. General Assembly committee into an enforcement body since the General Assembly does not have enforcement authority under the U.N. Charter. The U.N. Charter may need to be amended to provide the General Assembly with such enforcement authority if expanding UNCOPUOS's role were to actually be realized. Nonetheless, these barriers to greater enforcement are sur-

(TRIPS), which ensures the availability of legal-technical assistance and technical cooperation to qualifying developing countries. *See Agreement Between the World Intellectual Property Organization and the World Trade Organization*, art. 4 (Dec. 22, 1995), https://www.wto.org/english/tratop_e/trips_e/wtowip_e.htm [https://perma.cc/N4J2-JLRS].

208. Jesse B. Ashe, III, *Space Station Alpha: International Shining Star or Legal Black Hole?*, 9 TEMP. INT'L & COMP. L.J. 333 (1995).

209. *See id.* at 361; Stockfish, *supra* note 199, at 359. However, this suggestion, written in the early 1990s, predates the exponential rise of private space activities. A further analysis on the efficacy of this proposal nearly three decades later should be conducted to vet the efficacy of Stockfish's proposal.

210. Ashe, III, *supra* note 208, at 361.

211. *Id.*

212. *Members of the Committee on the Peaceful Uses of Outer Space*, *supra* note 152.

213. *The 50th Anniversary of the Outer Space Treaty*, *supra* note 58.

mountable, assuming that the member states can defy the complex political tensions that exist within the U.N.[214] Creating the WSO or increasing UNCOPUOS's powers will provide a forum for member states and private actors alike to facilitate space programs and should be reconsidered by UNCOPUOS.

B. Promote Firmer and More Uniform Standards Among Domestic Laws

To some extent, all five international space treaties rely on states to implement their own domestic laws to fulfill the treaties' obligations. The strength of enforcement lies strongly with the strength of domestic space law to enforce itself upon private actors. National space law should particularly focus on (1) creating firmer and more uniform standards for the national registration requirements of space objects and (2) broadening avenues of recourse when private space activity causes harm. However, individual states may lack the incentive to increase regulation, as it may reduce space activity launching from that particular state.[215] Time will tell whether these space-faring nations will overcome this collective action problem by placing the need for the safe use of outer space before individual state interests.

While the Outer Space Treaty and the Registration Convention imparted an obligation on States Parties to implement registration requirements for space objects within their domestic law, they failed to "identify the contours of any particular licensing regime."[216] This has caused an unevenness in registration requirements that have led to confusion and the failure to report space objects in outer space, as described *infra*. Additionally, this lack of conformity in national law has allowed private actors to travel to more lenient states to launch their objects into space, also as described *infra*. For states to authorize space activities and provide greater supervision over them, all space-faring nations should establish a uniform licensing and regulatory regime with adequate enforcement measures within them.[217]

214. Williams, *supra* note 160, at 1180.

215. *See* Fernholz, *supra* note 187 (stating that allowing companies to shop for jurisdiction "might lead to race to the bottom akin to international financial regulations, where countries compete to offer the laxest regulation to major companies. It could also push space regulation in the opposite direction, toward further restrictions based on more coordinated international space cooperation").

216. Dempsey, *supra* note 147, at 114.

217. *Id.*

To create uniformity among domestic registration requirements for space objects, the International Law Association ("ILA") issued a model law for national space legislation.[218] Notably, ILA's model national law suggests that all national registrations should include certain information, such as the registration number of the space object, date and location of the launch, orbital parameters, and the function of the space object.[219] ILA's model national law also lists extensive requirements for authorizing the space activity, including that the space activity be compatible with public safety standards, foreign policy, national security, and other standards.[220] This would prevent the situation created by Swarm, where it took advantage of India's lenient safety standards to launch its hard-to-detect satellites.[221] Creating uniform standards for registration, including safety standards, would mitigate the risk of private actors forum shopping for the most lenient states from which to launch their space objects.

States should also implement stronger enforcement mechanisms to motivate compliance with their respective national space laws and to harmonize their laws with other states. States' enforcement mechanism schemes vary from sanctions such as license suspension or revocation, to fines and imprisonment. As for license suspension and revocation, the reasons for license suspension or revocation vary significantly. For instance, in the United Kingdom, the Netherlands, South Korea, China, and many other major space-faring nations, a license may be revoked if the licensee conducts actions that endanger national security.[222] Meanwhile, South Korea's additional rule, that a license may be suspended if a launch has been delayed for greater than one year without cause, is not as widely adopted.[223] South Korea also imposes heavy fines (up to ₩50 million , or approximately U.S. $44,387) and long sentences (up to five years in prison) for an individual who launches without a license. In contrast, France does not impose any sentence for launching a space object without authorization, but does impose a fine of up to €200,000 (or approximately U.S.

218. Comm. on the Peaceful Uses of Outer Space, Information on the Activities of International Intergovernmental and Non-governmental Organizations Relating to Space Law, U.N. Doc. A/AC.105/C.2/2013CRP.6 (Mar. 26, 2013).

219. *Id.* art. 10.

220. *Id.* art. 4.

221. *See* Fernholz, *supra* note 187.

222. Dempsey, *supra* note 147, at 39–40.

223. *Id.*

$257,000).[224] Some states (such as India and Switzerland)[225] have failed to enact any legislation concerning compliance to any safety and registration standards. In these cases, perhaps states with comprehensive compliance schemes (such as the United States and Australia)[226] may diplomatically pressure less regulated states to impose basic safety and registration regulations. At a minimum, all states should institute a regulatory agency that holds the jurisdiction to license space activities and enforce licensing and safety protocols.[227]

In addition to standardizing registration requirements and compliance mechanisms, more states should provide adequate liability mechanisms for private actors when the private actors' space activity causes harm. Currently, the Liability Convention puts total fault on a State Party for all harm caused by objects launched from that state. To hold private actors accountable for their actions, and to mitigate the risks of a "tremendous public payout" for private actions in space,[228] governments should implement comprehensive domestic regulations of "safety and financial responsibility for private activities in space."[229] Some states have already done so, but this liability framework is not universal.[230] All states should place liability on the operator of the spacecraft, as is suggested by ILA's model national law.[231]

In relation to imposing liability on the operator of the spacecraft, all states should require a certain level of insurance and indemnification to allow victims to be adequately compensated. While imposing insurance and indemnification standards may seem like a natural progression in imposing liability standards, this requirement is currently missing from many state's domestic space law.[232] In crafting insurance and indemnification laws on private space-faring actors, however, states should be careful not to create such a high liability risk

224. *Id.* at 40–41.

225. *Id.* at 43.

226. *Id.*

227. *Id.*

228. Adolph, *supra* note 76, at 966.

229. Henry R. Hertzfeld & Frans G. von der Dunk, *Bringing Space Law into the Commercial World: Property Rights without Sovereignty*, 6 CHI. J. INT'L L. 81, 85 (2005).

230. *Id.*

231. Comm. on the Peaceful Uses of Outer Space, *supra* note 218, art. 11 ("[T]he Government is entitled to recourse against the operator.").

232. Dempsey, *supra* note 147, at 43.

to these actors that it would threaten the development of space innovation in this relatively nascent era of space commercialization.[233] Thus, liability arising out of space activities should be limited.[234]

While domestic laws are not "the perfect solution" for fixing gaps in enforcement, "they are easier to enact and more enforceable than any comparable international space law."[235] Increasing the strength of national space law as well as the uniformity among different states' national space legal regimes would undoubtedly result in greater enforcement upon private actors. Additionally, increased domestic regulation may in turn inspire the further development of customary and conventional international space law.[236]

CONCLUSION

As the commercialization of space continues, international space law must strengthen its enforcement authority and efforts to ensure that outer space is truly kept as "the province of all mankind." This may be facilitated by creating a single enforcement authority, either through UNCOPUOS or through an independent international organization, which has the full regulatory and adjudicative capacity to hold private actors accountable for their actions in space. Additionally, efforts to strengthen and unify domestic laws to conform with international space law standards would promote the regulation of private actors in space. Without changes like these to the international space law enforcement framework, unregulated private actors may potentially destroy celestial bodies and the space environment. The need for regulatory enforcement on these actors is crucial if humanity is to safely and responsibly secure its place among the stars.

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233. *Id.*

234. *See* Justin Silver, Note, *Houston, We Have a (Liability) Problem*, 112 MICH. L. REV. 833, 857 (2014).

235. *See* Frank J. Balsamello, *When You Wish upon a Falling Billboard: Advertising in an Age of Space Tourism*, 98 GEO. L.J. 1769 (2010).

236. Dempsey, *supra* note 147, at 44.

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