NOT BECAUSE IT IS EASY: EXPLORING NATIONAL INCENTIVES FOR COMMERCIAL SPACE EXPLORATION THROUGH A GEOPOLITICAL LENS

Brian Bozzo[*]

ABSTRACT

The United Nations Office for Outer Space Affairs defines "space law" as the international body of law governing space-related activities, comprising "international agreements, treaties, conventions, and United Nations General Assembly resolutions as well as [the] rules and regulations of international organizations."[1] *The concept has developed beyond its origins as an academic theory, prematurely enshrined in the provisions of a treaty intended to address the geopolitical concerns presented by the Cold War. Space law, however, has yet to evolve into a well-defined regulatory scheme required to protect the modern economic interests of private space companies in the United States.*

Inspired by the limitless potential of a new frontier, a revolutionary commercial industry has emerged in the United States, despite the uncertain legal landscape. This industry has produced the world's first reusable rocket, an innovative new engine domestically produced for deep space flight, and is focused on mining mineral-rich asteroids. The federal government has facilitated such accomplishments in a reduced role, and for the first time in history, the fiscal and logistical challenges that have limited our access to space may finally be resolved by the private sector. Unfortunately, the provisions of the nascent international agreements governing space exploration inhibit such progress.

---

* J.D., 2018, Drexel University Thomas R. Kline School of Law; Member of the Pennsylvania Bar, 2018; Registered Patent Attorney at the Webb Law Firm of Pittsburgh; B.S. Mechanical Engineering, Villanova University; M.S. Mechanical Engineering, Columbia University; M.B.A., Drexel University. Many thanks to Professor Amy Montemarano and the entire membership of the Drexel Law Review for their advice and assistance throughout the writing process. I am especially grateful to my family, particularly my beautiful wife and daughter, for their steadfast support and encouragement.

1. *Space Law*, UNITED NATIONS OFF. OUTER SPACE AFF., http://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html (last visited Apr. 16, 2019).

This administration asserts to prioritize the United States' status as the world's preeminent space exploring nation. Yet to fully unlock the resources awaiting us in space, this government needs to enable a transition from federally sponsored exploration to incentivized, commercial development. Additionally, the detriments of nationalism and private appropriation must be responsibly addressed both domestically and abroad.

This Note argues that such a strategy must involve a strategic extension of civil missions, a legislative overhaul to elucidate the obligations imposed by archaic treaties, and a series of regulatory revisions that eliminate barriers of entry for small entities while enhancing the safety of citizens. Furthermore, by reinventing the National Space Council, we can fortify our policies with bipartisan and international support to mitigate the risks of "space conquest." This solution leverages the United States' free-market economy to capitalize on the competitive advantage of space, while preserving the idealistic policy that its wonder remains "for all mankind."

TABLE OF CONTENTS

INTRODUCTION

On September 12, 1962, on the prairies destined to host Johnson Space Center, President John F. Kennedy boldly proclaimed that America was choosing to go to the moon, not because it was easy, but because it was hard.[2] The country's motivation for investing over $25 billion in the Apollo missions was clear.[3] President Kennedy was challenging the nation to confront what President Eisenhower described as the "three stark truths of Sputnik."[4] The first was that the Union of Soviet Socialist Republics (USSR) had achieved a scientific superiority in outer space, the second was the threat that superiority posed to the reputation of the United States and its influence on the global stage, and the third was the threat a USSR military advantage in outer space could pose to the interests of the free world.[5]

2. President John F. Kennedy, Address at Rice University (Sept. 12, 1962) (transcript available at https://er.jsc.nasa.gov/seh/ricetalk.htm).

3. *See* Wallace Fowler, *Anniversary Shows Us that NASA and Space Exploration Are Worth Their Costs*, UT NEWS (July 21, 2014), https://news.utexas.edu/2014/07/21/anniversary-shows-us-that-nasa-and-space-exploration-are-worth-their-costs/.

4. Columba Peoples, *Sputnik and 'Skill Thinking' Revisited: Technological Determinism in American Responses to the Soviet Missile Threat*, 8 COLD WAR HIST. 55, 59–60 (2008).

5. *Id.*

In response to the perceived threat of a rising Soviet power, President Kennedy launched one of the United States' most ambitious technical accomplishments.[6] The nation rose to this challenge even though funding for the Apollo missions hung like an ominous cloud over the federal budget in 1962.[7] The ultimate bill was staggering. Each Saturn V rocket used to propel American astronauts beyond low-Earth orbit cost $375 million to launch in 1969, over $2.5 billion per launch when adjusted for inflation.[8] By 1973, taxpayers had paid the 2018 equivalent of about $200 billion in exchange for six successful moon landings[9] and proof of "the superiority of a democracy."[10]

Less than fifty years later, outer space is no longer the exclusive domain of sovereign nations. A new class of entrepreneurs has arisen, intent on disrupting the formerly cost-prohibitive industry.[11] On November 11, 2018, Rocket Lab launched its first fully commercial mission to low-Earth orbit on the "It's Business Time" rocket.[12] The launch cost the company a mere $5 million.[13] Similarly, the powerful Falcon Heavy rocket—

6. *Id.*

7. *See* Alexis C. Madrigal, *Moondoggle: The Forgotten Opposition to the Apollo Program*, ATLANTIC (Sept. 12, 2012), https://www.theatlantic.com/technology/archive/2012/09/moondoggle-the-forgotten-opposition-to-the-apollo-program/262254/.

8. Sebastian Anthony, *The Apollo 11 Moon Landing, 45 Years on: Looking Back at Mankind's Giant Leap*, EXTREME TECH (July 21, 2014, 9:32 AM), https://www.extremetech.com/extreme/186600-apollo-11-moon-landing-45-years-looking-back-at-mankinds-giant-leap.

9. *Id.* Only Apollo 11, 12, 14, 15, 16, and 17 achieved the objective of landing astronauts on the lunar surface, although this was the ultimate goal of the overall program, and not the specific target of all of the seventeen missions. *See, e.g.*, Sarah Loff, *The Apollo Missions*, NASA, https://www.nasa.gov/mission_pages/apollo/missions/index.html (last updated Feb. 1, 2019).

10. *See* Dave Clark, *Apollo 11: A Giant Leap for Mankind and Cold War Rivalry*, PHYS.ORG (Aug. 26, 2012), https://phys.org/news/2012-08-apollo-giant-mankind-cold-war.html (noting that this sentiment was first expressed by Andrei Sakharov, a Russian physicist, Nobel Peace Prize recipient and advocate for political reform and human rights).

11. Monica Grady, *Private Companies Are Launching a New Space Race – Here's What to Expect*, CONVERSATION (Oct. 3, 2017, 6:53 AM), https://theconversation.com/private-companies-are-launching-a-new-space-race-heres-what-to-expect-80697.

12. Jonathan O'Callaghan, *Rocket Lab Just Launched Its First Commercial Rocket into Orbit*, FORBES (Nov. 11, 2018, 5:15 AM), https://www.forbes.com/sites/jonathanocallaghan/2018/11/11/rocket-lab-just-launched-its-first-commercial-rocket-into-orbit/#382ea4d1e91d.

13. *See id.* Although "It's Business Time" was designed to carry small satellites into low-Earth orbit—a modest task compared to the heavy lifting required of the Saturn V—it was privately funded and cost less than 1% of the expense necessary to launch a Saturn V. *Id.*

privately designed and owned by SpaceX—has launched Elon Musk's personal Tesla Roadster into Martian orbit.[14] SpaceX hopes to use the Falcon Heavy to once again carry humans beyond low-Earth orbit for a fraction of the cost to launch a Saturn V.[15]

These capabilities come at a critical time, as America is currently dependent on Russia to transport its astronauts to and from the International Space Station for approximately $80 million per astronaut.[16] And the benefits provided by companies like Rocket Lab and SpaceX are not exclusively economic. For the average American citizen, access to outer space increases as the average cost per launch decreases. Notably, Rocket Lab delivered a payload of experiments designed by a team of high school students into low-Earth orbit aboard "It's Business Time."[17]

Although the commercialization of space exploration continues to improve affordable access to space, the existing body of space law has become outdated and no longer meets the regulatory needs of the modern private sector.[18] The fifty-year-old Outer Space Treaty—designed to limit the utilization and appropriation of space—explicitly states that "[t]he exploration and use of outer space . . . shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province

14. Robin Seemangal, *SpaceX Successfully Launches the Falcon Heavy—and Elon Musk's Roadster*, WIRED (Feb. 6, 2018, 4:21 PM), https://www.wired.com/story/spacex-successfully-launches-the-falcon-heavyand-elon-musks-roadster/.

15. David Szondy, *Falcon Heavy vs. the Classic Saturn V*, NEW ATLAS (Jan. 24, 2018), https://newatlas.com/falcon-heavy-saturn-v/53090/ (stating that the Falcon Heavy costs approximately $90 million per launch, compared to the approximate $1.16 billion it costs to launch each Saturn V for similar missions).

16. *See* Dave Mosher & Skye Gould, *NASA Is Paying Russia More than $70 Million to Bring an Astronaut Home in this Spaceship Tonight*, BUS. INSIDER (Sept. 6, 2016, 3:36 PM), https://www.businessinsider.com/space-travel-per-seat-cost-soyuz-2016-9.

17. Karen Graham, *'It's Business Time' for Rocket Lab Launch on Saturday*, DIGITAL J. (Nov. 9, 2018), http://www.digitaljournal.com/tech-and-science/science/it-s-business-time-for-rocket-lab-launch-on-saturday/article/536555.

18. *See* Helen Vu, *How Private Spaceflight May Collide with Space Law*, RICH. J.L. TECH.: BLOG (Mar. 15, 2018), https://jolt.richmond.edu/2018/03/15/how-private-spaceflight-may-collide-with-space-law/.

of all mankind."[19] On its face, this is antithetical to America's recent commercialization of space, as risk-averse companies are not likely to invest in space initiatives simply "because they are hard," as President Kennedy once declared.[20] Meanwhile, countries around the world are launching commercial ventures into space with the intention of mining resources, claiming property rights over celestial bodies and their resources, and monetizing by becoming the first market entrants.[21] If the United States hopes to nurture and leverage its nascent new industry, it will have to carefully reconcile the policies, legislation, and governing regulations affecting commercial space with its international obligations. The resulting tension between national and international law creates legal uncertainty and threatens the United States' posture as the primary beneficiary of what has been described as the fourth industrial revolution.[22]

This Note proposes new legislation, a revised regulatory scheme enforced by a single federal agency, and a new construct for the National Space Council. Crafting a new international space agreement would be time-consuming and difficult. Thus, the best strategy is to provide clarifying guidance,

19. 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].

20. President John F. Kennedy, Address at Rice University, *supra* note 2; *see also* Dr. Frans G. von der Dunk, *Passing the Buck to Rogers: International Liability Issues in Private Spaceflight*, 86 NEB. L. REV. 400, 409 (2007) (discussing the difficulties and costs associated with space travel).

21. *See, e.g.*, Lily Hay Newman, *Luxembourg Bets Big on Space Mining for Some Reason*, SLATE (June 7, 2016, 2:06 PM), https://slate.com/technology/2016/06/luxembourg-invests-in-space-mining-research.html (stating that Luxembourg has invested $227 million in the hopes of becoming the first economy to benefit from natural resources mined from asteroids). Similarly, India recently launched thirty-one small satellites designed by fifteen different nations, positioning itself as a legitimate source for low-cost space endeavors. Daniel Nathan, *Is America Falling Behind in the High-Tech Race?*, WHARTON PUB. POL'Y INITIATIVE (July 25, 2017), https://publicpolicy.wharton.upenn.edu/live/news/2001-is-america-falling-behind-in-the-high-tech-race.

22. *See* Chris Tully, *How Can Space Support the Fourth Industrial Revolution?*, SPACENEWS, https://spacenews.com/sponsored/industrial-revolution/ (last visited Feb. 14, 2019). The first, second, and third industrial revolutions are used to describe the exponential economic growth that resulted from steam power, electricity and mass production, as well as electronics and computer processing, respectively. *See id.* Space is forecasted to connect artificial intelligence, bio-technology and the internet of things, independently distinct innovations in need of integration. *See id.*

interpreting the current treaty for both domestic and international space actors. Part I provides an overview of the Outer Space Treaty and assesses whether certain key articles are self-executing or require legislation to be enforceable. Part II discusses the evolution of the commercial space industry and addresses its increasing importance to the prosperity of the United States. Part III analyzes ground-based legal analogues to propose legislative and regulatory actions that will prioritize and assist the development of commercial space in the United States. It posits that there is a new opportunity to resolve the ambiguity that has hindered the United States in advancing the role of the commercial sector in space.[23]

I. THE OUTER SPACE TREATY OF 1967

The Outer Space Treaty of 1967 is the preeminent treaty governing international activity in space, and generally outlines the international obligations that the United States must reconcile with the interests of its private sector.[24] Specifically, parties to the treaty pledge to prevent "'a new form of colonial competition' and the possible damage that self-seeking exploitation might cause."[25] Although the treaty explicitly bans the sovereign use of outer space for military purposes, its restrictions on private ventures are ambiguous, resulting in different international interpretations and applications of its provisions.[26]

---

23. *See* Press Release, Robert Lightfoot, Adm'r, NASA, NASA Statement on National Space Council Policy for Future American Leadership in Space (Oct. 5, 2017), https://www.nasa.gov/press-release/nasa-statement-on-national-space-council-policy-for-future-american-leadership-in.

24. *See* Outer Space Treaty, *supra* note 19, art. VI.

25. Bureau of Arms Control, Verification and Compliance, Narrative on *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, U.S. DEP'T ST., https://www.state.gov/t/isn/5181.htm#narrative (last visited Apr. 16, 2019) [hereinafter Narrative on Outer Space Treaty].

26. Outer Space Treaty, *supra* note 19, art. IV. According to experts, the pact addresses broadly generalized concerns, in which modern commercial ventures can be categorized. For example, where it is silent on mining, it explicitly discusses the "'national appropriation' of celestial bodies . . . which arguably applies to resource extraction." *See, e.g.*, Karla Lant, *Ambiguous Laws Could Prevent Us from Taking Full Advantage of Celestial Resources*, FUTURISM (Aug. 31, 2017), https://futurism.com/ambiguous-laws-could-prevent-us-from-taking-full-advantage-of-celestial-resources (quoting Outer Space Treaty, *supra* note 19, art. II). Thus, an

Therefore, to fully appreciate the extent and effect of the Outer Space Treaty, it is important to understand the historical issues it was designed to address and the articles relevant to America's emerging commercial space industry.

A. *Origins and Motivations of the Outer Space Treaty of 1967*

The Outer Space Treaty resulted from the culmination of a decade-long tension between the United States and the Soviet Union after World War II.[27] Although the two superpowers fought as allies during the war, their historical, economic, and political differences resulted in a mutual enmity between the two nations.[28] This pressure came to a head when Joseph Stalin, the leader of the Soviet Union, began to consolidate his Eastern European influence.[29] In response to the expanding Soviet presence, President Truman began the Cold War, pledging financial and military aid to anti-communist entities.[30] This war never got "hot" because the two nations engaged one another in the political sphere, fighting each other by proxy in global venues such as the Middle East and Vietnam.[31] In 1955, the Cold War underwent an extraterrestrial expansion when the United States announced its intention to launch the world's first artificial satellite.[32] A battle for spaceflight supremacy emerged as the Soviet Union pledged to beat the United States to low-Earth orbit.

In 1957, prior to the Soviet launch of Sputnik—the first man-made, Earth-orbiting satellite—the United States sensed it was

---

international divide exists, with Belgium, Brazil, and Russia interpreting the treaty as preventing commercial asteroid-mining, and the United States and Luxembourg interpreting the treaty as establishing a "global commons" akin to the world's oceans. *Id.* The global commons theory allows party nations to fish in international waters but prohibits them from claiming sovereign ownership over the oceans themselves. *See id.*

27. *See* Kerry Kolbe, *Space Race Timeline: When the US and USSR Squared Up*, TELEGRAPH (Feb. 3, 2017, 11:45 AM), http://www.telegraph.co.uk/films/hidden-figures/space-race-events-timeline/.

28. *See id.*

29. *See id.*

30. *Id.*

31. *Id.*

32. *Id.*

falling behind in the "space race" and championed a Western proposal to facilitate the disarmament of space-based weaponry.[33] The Soviet Union rejected this proposal, cognizant of its advantage in space and motivated by its pursuit of an intercontinental ballistic missile.[34] Soviet superiority culminated when Yuri Gagarin—a Soviet cosmonaut—became the first human being launched into orbit in 1961.[35] When President Kennedy began increasing NASA's funding, the United States began chipping away at the Soviet Union's prominence in space, motivating the Soviet Union to exchange a series of proposals that resulted in the Outer Space Treaty of 1967.[36] The Treaty opens with a spirited declaration, establishing that its parties are "[i]nspired by the great prospects opening up before mankind as a result of man[']s entry into outer space."[37] Under this agreement, the United States and Soviet Union promised to demilitarize their space efforts and commenced a collaboration in space exploration that continues to this day.[38]

Nevertheless, the existing provisions of the Outer Space Treaty—enacted to address international concerns arising during the Cold War—are substantially outdated and increasingly inapplicable to the modern commercialization of space. Given the evolution of the industry and geopolitical environment, it is unrealistic to expect a treaty established to address Cold War era concerns to maintain its relevance. The Council on Foreign Relations has humorously characterized the treaty as undergoing a "midlife funk."[39] Although the Outer Space Treaty was effective at preserving peace during the Cold War, it was executed at a time when military communications

33. *Id.*; Narrative on Outer Space Treaty, *supra* note 25.

34. *See Russia Tests an Intercontinental Ballistic Missile*, HISTORY (Nov. 13, 2009), https://www.history.com/this-day-in-history/russia-tests-an-intercontinental-ballistic-missile.

35. Kolbe, *supra* note 27.

36. *See id.*; *see also* Narrative on Outer Space Treaty, *supra* note 25.

37. Outer Space Treaty, *supra* note 19.

38. *See* Narrative on Outer Space Treaty, *supra* note 25.

39. Kyle Evanoff, *The Outer Space Treaty's Midlife Funk*, COUNCIL ON FOREIGN REL. (Oct. 10, 2017), https://www.cfr.org/blog/outer-space-treatys-midlife-funk.

were ground-based, and the private sector was incapable of independently pursuing extraterrestrial business ventures.

Modern geopolitical concerns, including economic and defense interests, have inspired many to call for either revisions to the existing treaty or a new international regulatory scheme to take its place.[40] Senator Ted Cruz, chairman of the Senate Commerce Committee's Subcommittee on Space, Science, and Competitiveness, has challenged Congress to evaluate how a treaty enacted fifty years ago "will impact new and innovative activity within space."[41] Still, it is necessary to interpret and use the existing treaty, since technical innovation advances much faster than international law.[42] The Outer Space Treaty—like all treaties—must be analyzed to understand its effect on the United States' domestic policies, including efforts to leverage its private sector—a critical asset of innovation—and retain its status as the preeminent leader in space exploration.

B. *Articles Relevant to the Development of Commercial Space*

The success of the Outer Space Treaty can be attributed to seventeen articles constructed to effectively address the international concerns of the Cold War.[43] The primary arms control provisions are contained in Article IV, which prevents party nations from placing nuclear weapons into orbit and otherwise installing them on any celestial body, and prohibits the installation of military bases and conducting military exercises on any

40. *See, e.g.*, Stephen Bainbridge, *Revising the Outer Space Treaty*, PROFESSORBAINBRIDGE.COM (July 20, 2009), https://www.professorbainbridge.com/professorbainbridgecom/2009/07/revising-the-outer-space-treaty.html (suggesting a revision to the treaty that would facilitate private property rights); Jeff Foust, *Is It Time to Update the Outer Space Treaty?*, SPACE REV. (June 5, 2017), http://www.thespacereview.com/article/3256/1 (explaining that Senator Ted Cruz, chairman of the Senate Commerce Committee's subcommittee on space, has praised the treaty for preserving the peaceful exploration of space but has suggested it may now need revision); Steven Freeland, *Peaceful Purposes? Governing the Military Uses of Outer Space*, 18 EUR. J.L. REFORM 35, 37–38 (2016) (advocating for a new regulatory regime that will address evolving militaristic concerns in space).

41. Foust, *supra* note 40.

42. Bainbridge, *supra* note 40.

43. Outer Space Treaty, *supra* note 19, arts. I–XVII.

celestial body.[44] Several articles, however, pose a patent threat to America's developing market for commercial space. Article II denounces appropriation of and claims of sovereignty to celestial bodies.[45] Article VI declares the party nations' responsibility for national activities in outer space.[46] Finally, Article VIII establishes a party nation's jurisdiction and control over the objects that it launches into outer space.[47] As effective as the treaty was at demilitarizing outer space during the Cold War, it now stands as an obstacle to private investments in commercial space.

1. *Article II*

Article II of the Outer Space Treaty addresses property rights relating to resources discovered through space exploration.[48] It states that "[o]uter space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[49] Literally interpreted, the Article stands to ensure that "[s]pace is free for all nations to explore," thereby preventing sovereign claims of ownership.[50] In other words, "[s]pace activities must be for the benefit of all nations and humans," such that no country can claim ownership of the moon, Mars, or any other celestial body.[51] Article II is silent, however, on limitations regarding the private appropriation of property rights in outer space.[52] As written, this ambiguity may ultimately deter private entities by insinuating a potential rescission of extraterrestrial property rights and complicating

44. *Id.* art. IV.

45. *Id.* art. II.

46. *Id.* art. VI.

47. *Id.* art. VIII.

48. *Id.* art. II.

49. *Id.*

50. Elizabeth Howell, *Who Owns the Moon? Space Law and Outer Space Treaties*, SPACE.COM (Oct. 27, 2017), https://www.space.com/33440-space-law.html.

51. *Id.*

52. *See* Cody Knipfer, *Revisiting "Non-Interference Zones" in Outer Space*, SPACE REV. (Jan. 29, 2018), http://www.thespacereview.com/article/3418/1.

any justification of risks or expenditures necessary to acquire them.[53]

For example, if a private company establishes a mining operation on an asteroid, or founds a lunar colony, can these resources be protected from foreign competition or intrusion?[54] This uncertainty alone could cause the private sector to question its investment—and subsequently reevaluate its risk posture—in commercial space ventures.[55] These are critical concerns for any business entity, and investors are not likely to wager on such gambles in the future if Article II is enacted to its fullest possible extent.

2. *Article VI*

Article VI of the Outer Space Treaty establishes governmental responsibility for the activities of its "non-governmental entities."[56] It reads:

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.[57]

On its face, the article appears to assign liability to party nations for infringing behavior of private entities. Article VI,

53. *See* Lant, *supra* note 26.

54. *See* Knipfer, *supra* note 52.

55. *See id.*; *see also* Lant, *supra* note 26.

56. Outer Space Treaty, *supra* note 19, art. VI.

57. *Id.*

however, actually imbues party nations with the authority and discretion to allow private space activities through legislation, while imposing on nations the duty to supervise such activities not as fundamental rights, but as a private interest subject to government oversight.[58] Because the right to explore space is not fundamental in the constitutional context, the government is free to regulate in compliance with Article VI.[59] The operative legal term in Article VI is "shall," which—as used in Article VI—"creates a mandatory legal duty for the State to authorize and continually supervise private space activities."[60] Yet the appropriate degree and method of implementing such interstellar regulation has eluded the United States, resulting in legal liabilities that are difficult to ascertain. In February of 2018, Joanne Gabrynowicz, editor-in-chief-emerita of the *Journal of Space Law*, observed that "it's still not clear how authorization and supervision will happen for activities that occur completely on-orbit or on another celestial body."[61] Representative Lamar Smith resonated with this concern, arguing that "[t]his uncertainty has cramped capital formation and innovation, and has driven American companies overseas."[62]

58. Michael J. Listner, *A Reality Check on Article VI and Private Space Activities*, SPACENEWS (June 6, 2017), https://spacenews.com/a-reality-check-on-article-vi-and-private-space-activities/.

59. *See id.* The ability to explore outer space is not considered amongst the fundamental rights recognized by the Supreme Court as requiring a high degree of protection from government encroachment, either specifically identified in the Constitution, or found under due process. Laws encroaching on a fundamental right generally must pass strict scrutiny to be upheld as constitutional. Contrarily, Article VI guarantees that party states will have the ability to regulate private space exploration as they deem appropriate, while holding them accountable. *See id.*

60. *Id.*

61. Alex Moersen, *A Lawmaker's Guide to the Galaxy*, INNOVATION & TECH. TODAY (Feb. 5, 2018), https://innotechtoday.com/outer-space-law/.

62. Jeff Foust, *House Passes Commercial Space Regulatory Bill*, SPACENEWS (Apr. 25, 2018), https://spacenews.com/house-passes-commercial-space-regulatory-bill/.

3. *Article VIII*

Article VIII of the Outer Space Treaty discusses both the ownership of and jurisdiction over objects and personnel launched into outer space.[63] It reads:

> A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return.[64]

According to Article VIII, nations retain jurisdiction over—and responsibility for—the objects and people they launch into outer space.[65] Specifically, this provision establishes national liability for any damage caused by objects launched into outer space—echoing modern concerns regarding space debris.[66]

Article VIII is indicative of the treaty's distinction between property rights vested in objects discovered in outer space and those vested in objects built in outer space. In contrast to Article II, which denies national claims of sovereignty, Article VIII alludes to and preserves principles of ownership. For example,

63. Outer Space Treaty, *supra* note 19, art. VIII.

64. *Id.*

65. *Id.*

66. *See* Saadia Pekkanen, *The Hidden Danger of Cleaning Up Our Space Junk*, DAILY BEAST (Nov. 30, 2018, 9:50 PM), https://www.thedailybeast.com/the-hidden-danger-of-cleaning-up-our-space-junk.

the treaty would enable national sovereignty—and liability—over the equipment a Martian colony is composed of, and the people it houses, but not the land on which it is established, or the minerals it discovers. Additionally, Article VIII has been construed as establishing a jurisdictional framework for enforcing laws in space.[67] For example, if someone commits a crime on the International Space Station, both the United States and Russia can claim jurisdiction in enacting justice, because of their contributions to the Station's construction and launch.[68]

C. *Non-Self-Executing Treaties and the Role of Legislation*

Although the aforementioned articles of the Outer Space Treaty can be construed as applicable to the emergence of the private space sector, not all treaties are enforceable upon mere ratification.[69] The Supremacy Clause of Article VI of the U.S. Constitution specifies that "all treaties made . . . under the authority of the United States, shall be the supreme law of the land."[70] A tremendous amount of complexity has been read into this seemingly simple line.[71] Just because the United States is a party nation to an international treaty, its provisions do not necessarily become effective law.[72] Legal scholars have long suggested that only self-executing treaties—treaties that become judicially enforceable upon ratification—qualify for Article VI supremacy.[73] Still, not all treaties are self-executing, and such a distinction can be equally confusing and contro-

67. *See* Robert Frost, *Here's What Happens if You Commit a Crime in Outer Space*, BUS. INSIDER (Jan. 7, 2014, 11:45 AM), https://www.businessinsider.com/heres-what-happens-if-you-commit-a-crime-in-outer-space-2014-1.

68. *See id.*; *see also* Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station art. V, Jan. 29, 1998, T.I.A.S. 12927 [hereinafter ISS Agreement].

69. *See* Carlos Manuel Vazquez, *The Four Doctrines of Self-Executing Treaties*, 89 AM. J. INT'L L. 695, 695 (1995).

70. U.S. CONST. art. VI, cl. 2.

71. *See* Vazquez, *supra* note 69, at 699.

72. *See id.*

73. *See id.*

versial.[74] Generally, a self-executing treaty may be enforced in the courts without prior legislation by Congress, as opposed to those that are not self-executing and require such legislation.[75] Thus, at the core of this distinction—which ultimately defines the international obligations of the United States—exists a domestic allocation-of-powers issue, balancing the powers of the legislative branch against those of the judiciary.[76]

The distinction between self-executing and non-self-executing treaties was first introduced in *Foster v. Neilson*, where Chief Justice John Marshall assessed the effect of a treaty ceding land from Spain to France.[77] The Court differentiated the United States' perception of international treaties from the perspective of the rest of the nineteenth-century international community.[78] Whereas the international community believed that a treaty—by its nature—was a contract between two nations and "not a legislative act," the Court found that the Supremacy Clause distinguished the United States' approach to such agreements.[79] Because the Constitution declares a treaty to be the law of the land, it is regarded by courts as the equivalent of legislation.[80] If a treaty, however, merely stipulates a contract—or a promise—it addresses the "political, not the judicial department," and legislation is required for it to have an effect.[81] Thus, the Court held that determining whether a treaty is self-executing requires a textual analysis of the four corners of the document itself.[82] This constitutes the dominant contemporary interpretation of non-self-execution.[83]

The Supreme Court recently attenuated this approach to treaty interpretation by introducing an intent inquiry. In

74. *See id.* at 696.

75. *Id.* at 704.

76. *Id.* at 696.

77. 27 U.S. 253, 299 (1829).

78. *See id.*

79. *Id.* at 313–14.

80. *Id.*

81. *Id.*

82. *Id.*

83. David L. Sloss, *Executing* Foster v. Neilson*: The Two-Step Approach to Analyzing Self-Executing Treaties*, 53 HARV. INT'L L.J. 135, 153 (2012).

Medellín v. Texas, the Supreme Court held that while a treaty's text must be analyzed to determine whether it is self-executing, other indicia of intent may also be considered.[84] Still, the Court maintained the general approach and conclusions outlined in *Foster*, emphasizing that a non-self-executing treaty "addresses itself to the political, not the judicial department," and that legislation is still required to execute the contract.[85]

D. *Not All Provisions of the Outer Space Treaty Are Self-Executing and Thus, Require Legislation to Take Effect*

Many legal scholars have called for a new regulatory scheme before private industry assumes a larger role in the United States' space exploration, claiming that the Outer Space Treaty is ambiguous and that the Cold War policies underlying its articles have become outdated.[86] A new international agreement to supplant it may be unrealistic, however, given the recent surge of nationalism and differing opinions on whether space should remain a "global commons."[87] Fortunately, the United States need not wait for a new international agreement because not all provisions of the Outer Space Treaty are self-executing, thereby affording Congress the opportunity to supplement the treaty and clarify any ambiguities that may be detrimental to private space exploration through domestic legislation. Based on a textual analysis of each specific provision, federal circuit

84. 552 U.S. 491, 505 (2008).

85. *Id.* at 516 (quoting *Foster*, 27 U.S. at 314).

86. *See* Claudia Pastorius, *Law and Policy in the Global Space Industry's Lift-Off*, 19 BARRY L. REV. 201, 247 (2013).

87. *See* Dennis O'Brien, *Space Law 2018: Nationalists Versus Internationalists*, SPACE REV. (Apr. 30, 2018), http://www.thespacereview.com/article/3482/1. Countries such as the United States and Luxembourg believe that the moon and asteroids are a "global commons," meaning countries cannot claim sovereign rights but may allow private entrepreneurs to extract what they can and monetize the resources. Contrarily, Russia, Brazil, and Belgium feel that celestial bodies belong to humanity as a whole, and that commercial exploitation should somehow be applied to the benefit of humanity as a whole—or at least should be subjected to a highly regimented international regulatory scheme. *See* Lant, *supra* note 26; *see also supra* note 26 and accompanying text.

courts have held that some articles of a treaty may be self-executing, where others may be non-self-executing.[88]

Specifically, Article VI of the Outer Space Treaty requires party states' authorization of non-governmental activities in outer space.[89] Although this provision seemingly places a restriction on the activities of non-governmental—or private—actors, it actually imposes an obligation on the party states.[90] Article VI is similar to the treaties analyzed by the Supreme Court in *Foster*[91] and *Medellín*,[92] in that it merely promises that its signatories shall carry out the agreement.[93] Specifically, in *Foster*, use of the word "shall" was interpreted to indicate future government action.[94] Since Article VI inherently requires governmental action to have a legal, national effect, its provisions do not currently restrict companies such as SpaceX or Blue Origin. The same is true for Article VIII, which merely declares that party nations "shall" retain jurisdiction and liability over objects they launch into outer space.[95]

The United States therefore has flexibility under Articles VI and VIII to decide which activities it wants to regulate and which it chooses to ignore.[96] Additionally, Article II's discussion

88. *See, e.g.*, Renkel v. United States, 456 F.3d 640, 643 (6th Cir. 2006) (noting "self-executing" treaty provisions are enforceable by courts without separate legislation, while "non-self-executing" treaties do require domestic legislation to have the force of law).

89. Outer Space Treaty, *supra* note 19, art. VI.

90. *See* Laura Montgomery, *US Regulators May Not Prevent Private Space Activity on the Basis of Article VI of the Outer Space Treaty*, MERCATUS CTR. (Mar. 28, 2018), https://www.mercatus.org/publications/regulating-private-space-activity-outer-space-treaty.

91. 27 U.S. 253 (1829).

92. 552 U.S. 491 (2008).

93. *See* Outer Space Treaty, *supra* note 19, art. VI.

94. *Foster*, 27 U.S. at 314–15. Article VI states that party nations "shall bear international responsibility" for, among other things, "assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty." Outer Space Treaty, *supra* note 19, art. VI; *see also* Laura Montgomery, *Article VI of the Outer Space Treaty Is Not Self-Executing and Should Not Be Treated as an Obstacle to Private Space Activity*, GROUND BASED SPACE MATTERS (Oct. 14, 2016), http://groundbasedspacematters.com/index.php/2016/10/14/article-vi-is-not-self-executing-and-should-not-be-treated-as-an-obstacle-to-private-space-activity/.

95. *See* Outer Space Treaty, *supra* note 19, art. VIII.

96. Outer Space Treaty, *supra* note 19, art. IX. Likewise, Congress may also choose to address Article IX's prohibition on interference by a country's nationals and enact implementing legislation to carry that out. Article IX requires party nations who have reason to believe their

of sovereign appropriation and Article VI's description of "continuing supervision" impose ambiguous burdens on the United States, leaving additional freedom for the United States and other signatories to the Outer Space Treaty to determine the nature and degree of their oversight. Under *Medellín*, a nation party's reaction to the provisions of a treaty can be indicative of the intent and effect of the treaty itself.[97] Therefore, Congress has the opportunity to create certainty in the commercial space industry by amending the U.S. Code to define the activities in space that are worth regulating.[98] Although the United States is accountable to the obligations established by the Outer Space Treaty and may be held liable by the United Nations, its prominence as an industry leader will grant it leeway and the opportunity to influence future global agreements.[99]

II. THE IMPORTANCE OF COMMERCIAL SPACE

Private investments in outer space and the progressive technologies they have produced deserve an unambiguous legislative scheme that will provide market certainty and facilitate future growth. The United States is undeniably on the cusp of an extraterrestrial renaissance that will yield unprecedented innovation and extend the national economy far beyond the Earth's gravitational pull.[100] For example, more than fifty years of private-public partnerships have resulted in the development of innovative new launch vehicles that the government will use to explore new worlds.[101] Unfortunately, if Congress is not proactive, the uncertainty posed by the Outer Space Treaty will threaten this exciting new vision of the American economy.

---

nationals may be launching ventures that will interfere with the activities of another party nation to "undertake appropriate international consultations." *Id.*

97. 552 U.S. at 505.

98. *See* Montgomery, *supra* note 94.

99. *See id.*

100. *See* Doris Elin Salazar, *How Will Private Space Travel Transform NASA's Next 60 Years?*, SPACE.COM (Oct. 12, 2018), https://www.space.com/42113-nasa-future-private-spaceflight.html.

101. *See id.*

A. *The Development of Commerce in Space*

Since its establishment in 1958 under President Eisenhower, the National Aeronautics and Space Administration (NASA) has been managed by the administrations of twelve different presidents.[102] Each has had its own vision for the agency, impacting our national presence in space and contributing to the evolution of the space exploration industry.[103] The executive branch maintains exclusive control over NASA's agenda, but requires legislative approval to enact its proposed initiatives.[104] Congress, however, has historically limited itself to only minor revisions to a president's proposals, so the executive has retained significant influence over NASA's programs.[105] The rise of commercial space flight is challenging this fifty-year-old dynamic, in view of the Outer Space Treaty.[106] Today, as the private sector emerges as a principal protagonist in the geopolitical space opera, the government should first focus on legislation, and then prioritize regulation. Before proposing legislative and regulatory policies that will enable private action, it is important to understand how the federal government has historically influenced the space industry.

In 1990, the Launch Services Purchase Act virtually ordered NASA to procure launch services from commercial entities, legislatively mandating such acquisitions "to the maximum extent possible."[107] This legislation emphasized space as an

---

102. *See* Nell Greenfieldboyce, *President Trump Is Sending NASA Back to the Moon*, NAT'L PUB. RADIO (Dec. 11, 2017, 3:19 PM), https://www.npr.org/sections/thetwo-way/2017/12/11/569936446/president-trump-is-sending-nasa-back-to-the-moon; John M. Logsdon, *Ten Presidents and NASA*, NASA, https://www.nasa.gov/50th/50th_magazine/10presidents.html (last updated May 28, 2008); Mike Wall, *President Obama's Space Legacy: Mars, Private Spaceflight and More*, SPACE.COM (Jan. 20, 2017), https://www.space.com/35394-president-obama-spaceflight-exploration-legacy.html.

103. *See* Greenfieldboyce, *supra* note 102; Logsdon, *supra* note 102; Wall, *supra* note 102.

104. Logsdon, *supra* note 102.

105. *Id.*

106. *See How New Business Models Will Disrupt Old Space Industry*, NOOSPHERE VENTURES (Sept. 27, 2018), https://noosphereventures.com/how-new-business-models-will-disrupt-old-space-industry/; *see also* Outer Space Treaty, *supra* note 19.

107. *See* 51 U.S.C. § 20112(a)(4) (2012); *see also* National Aeronautics and Space Act of 1958, Pub. L. No. 101-611, § 107, 104 Stat. 3188, 3197 (1990).

arena for commercial activities and heralded NASA's Office of Commercial Programs, which increased agency efforts to find private-sector uses for NASA-developed technology.[108] This office essentially "assist[ed] those who saw profit-making potential in various forms of space activities."[109]

Unfortunately, the 1986 explosion of the Challenger space shuttle provided the private sector with a stark reminder of the inherent risks accompanying the endless potential of outer space.[110] In the wake of the tragedy, President Reagan spoke on behalf of the nation: "We're still pioneers. The Challenger crew were pulling us into the future, and we'll continue to follow them . . . . We'll continue our quest in space. There will be more shuttle flights and more shuttle crews and, yes, more volunteers, more civilians, more teachers in space. Nothing ends here."[111] After the Challenger accident, the space shuttle was prohibited from launching commercial communication satellites, a significant departure from the progress championed by the Commercial Space Launch Act.[112]

Under President Reagan, an American space station was inadequately funded and dubbed Freedom.[113] Progress continued to slow during the Clinton administration as NASA's budget was decreased while other areas of the government benefited from the booming economy.[114] Subsequently, NASA

108. *See* JUDY A. RUMERMAN, NASA SPACE APPLICATIONS, AERONAUTICS AND SPACE RESEARCH AND TECHNOLOGY, TRACKING AND DATA ACQUISITION/SUPPORT OPERATIONS, COMMERCIAL PROGRAMS, AND RESOURCES, 1979-1988, 355–59 (1999), https://history.nasa.gov/SP-4012/vol6/ch5.pdf (discussing Office of Commercial Program's involvement in encouraging private-sector uses).

109. *See* Logsdon, *supra* note 102.

110. *See generally* Leonard Sloane, *The Shuttle Explosion; Cost of Insurance in Space May Rise*, N.Y. TIMES (Jan. 29, 1986), http://www.nytimes.com/1986/01/29/us/the-shuttle-explosion-cost-of-insurance-in-space-may-rise.html (explaining the costs of insurance for space crafts and space-related instruments could rise because of the risks and that insurance is becoming increasingly hard to obtain).

111. *See* Logsdon, *supra* note 102.

112. *See id.*

113. *See* Marcus Lindroos, *Space Station Freedom*, ASTRONAUTIX, http://www.astronautix.com/s/spacestationfreedom.html (last visited Apr. 16, 2019).

114. *See* Logsdon, *supra* note 102.

struggled to carry out its assigned missions.[115] In a cost-cutting effort, however, President Clinton approved the redesign of the space station Freedom to combine U.S.- and Russian-built elements.[116] The new effort was renamed the International Space Station and received additional support from Europe, Japan, and Canada.[117] In November 2000, a Russian-American crew began living on the International Space Station, and people have been aboard the Station for almost twenty years.[118]

Despite its initial success as a symbolic "foreign policy asset," the International Space Station suffered from budgetary and management problems.[119] In 2003, as newly appointed NASA administrator Sean O'Keefe attempted to restore managerial control over the space station's operation, the space shuttle Columbia ignited upon reentry, killing seven astronauts.[120] In a report commissioned by President Bush, the inability to replace the aging space shuttle prior to the tragedy was deemed a failure of national leadership, with commentators criticizing the absence of a strategic vision to guide civilian activities in space.[121] Mr. O'Keefe filed a report on the incident that served as a catalyst for President Bush and his advisers to debut the Constellation program in 2004.[122] The program was founded with the intention of returning humans to the moon by 2020, in preparation for human exploration of Mars, and required the procurement of an entirely new fleet of vehicles with the inno-

115. *Id.*

116. *Id.*

117. *Id.*

118. *See generally International Space Station Crews*, SPACEFLIGHT 101, http://spaceflight101.com/iss/iss-crews-and-expeditions/ (last updated Jan. 19, 2018) (detailing a list of international space station crews and respective durations from 2000 to 2018).

119. *See* Logsdon, *supra* note 102.

120. *See id.*; David E. Sanger, *Loss of the Shuttle: The Overview; Shuttle Breaks Up, 7 Dead*, N.Y. TIMES (Feb. 2, 2003), http://www.nytimes.com/2003/02/02/us/loss-of-the-shuttle-the-overview-shuttle-breaks-up-7-dead.html.

121. *See* Brian Berger, *Columbia Report Faults NASA Culture, Government Oversight*, SPACE.COM (Jan. 29, 2013), https://www.space.com/19476-space-shuttle-columbia-disaster-oversight.html.

122. *See generally* W. Henry Lambright, *Leadership and Change at NASA: Sean O'Keefe as Administrator*, 68 PUB. ADMIN. REV. 230 (2008) (describing O'Keefe's leadership of NASA and participation in the Columbia Accident Investigation Board).

vative capabilities necessary to achieve such unprecedented accomplishments.[123]

While the Constellation project envisioned using the moon as a stepping stone to Mars, the program lacked sufficient detail. In May 2009, newly-elected President Obama "ordered an independent review of [NASA's] human-spaceflight plans," known as the Augustine Commission.[124] The final report condemned the Constellation program as significantly over budget and behind schedule, a problem that historically hindered both the space station and shuttle.[125] Consequently, President Obama cancelled the program, redirecting NASA's efforts to target landing on a near-Earth asteroid by 2025 and pursuing the vicinity of Mars by the mid-2030s.[126] NASA retained the commercial development of the Orion Crew Exploration Vehicle, a crew capsule, and the Space Launch System, a powerful new rocket.[127]

Under President Obama, more money was funneled into science and technology development—areas where corporations have less incentive to invest.[128] President Obama encouraged NASA's expansion of the existing commercial spaceflight program, and increased "seed money to smaller, private companies building more cost-effective rockets and spacecraft."[129] "NASA then planned to buy transportation services from those companies to fill America's International Space Station access gap" after the space shuttle was retired.[130] This

123. *See* JOHN F. CONNOLLY, CONSTELLATION PROGRAM OFFICE, CONSTELLATION PROGRAM OVERVIEW 2 (2006), https://www.nasa.gov/pdf/163092main_constellation_program_overview.pdf.

124. Wall, *supra* note 102.

125. REVIEW OF U.S. HUMAN SPACEFLIGHT PLANS COMMITTEE, SEEKING A HUMAN SPACEFLIGHT PROGRAM WORTHY OF A GREAT NATION 58–59 (2009), https://www.nasa.gov/pdf/396093main_HSF_Cmte_FinalReport.pdf.

126. Wall, *supra* note 102.

127. *Id.*

128. *See* Jason Davis, *Space in Transition: How Obama's White House Charted a New Course for NASA*, PLANETARY SOC'Y (Aug. 22, 2016), http://www.planetary.org/blogs/jason-davis/2016/20160822-horizon-goal-part-3.html.

129. *Id.*

130. *Id.*

represented a departure from the traditional acquisition model of paying large aerospace companies to build the government its own fleet of vehicles.[131]

Commercial spaceflight not only took off during the Obama presidency, but it has been said that President Obama's true legacy in space was the establishment of a commercial industry that "has ended the government's monopoly on space."[132] When the Atlantis touched down on July 21, 2011—marking the end of the space shuttle program—a vacuum was left in the United States' access to space.[133] Additionally, political tensions between the United States and Russia once again came to a head. Under the antagonistic regime of Russian President Vladimir Putin, Russia annexed Crimea, resulting in sanctions by the United States.[134] These sanctions instigated a Russian pledge to consider participation in the International Space Station by 2020, and to refuse to transport American astronauts to and from space.[135] After analyzing the sanctions, Russian Deputy Prime Minister Dmitry Rogozin tweeted: "I suggest to the USA to bring their astronauts to the International Space Station using a trampoline."[136] These sanctions, and the subsequent Russian response, served as the catalysts for American industries to design an alternate rocket engine that would relieve the United States' dependence on the Russian space program.[137]

---

131. *Id.*

132. Christian Davenport, *How Obama Brought Capitalism to Outer Space*, WASH. POST (Oct. 11, 2016), https://www.washingtonpost.com/news/the-switch/wp/2016/10/11/how-obama-brought-capitalism-to-outer-space/.

133. Elizabeth Howell, *Atlantis: Last Space Shuttle Launch*, SPACE.COM (Nov. 30, 2017), https://www.space.com/18162-space-shuttle-atlantis.html.

134. Ralph Vartabedian & W.J. Hennigan, *U.S.-Russia Tension Could Affect Space Station, Satellites*, L.A. TIMES (May 16, 2014, 6:00 PM), http://www.latimes.com/science/la-na-space-station-dispute-20140517-story.html.

135. *Id.*; Pete Spotts, *International Space Station: How Serious Are Russia's Threats?*, CHRISTIAN SCI. MONITOR, (May 14, 2014), https://www.csmonitor.com/Science/2014/0514/International-Space-Station-How-serious-are-Russia-s-threats.

136. P.J. O'Rourke, *Why Does the USA Depend on Russian Rockets to Get Us into Space?*, DAILY BEAST (June 22, 2014, 6:45 AM), https://www.thedailybeast.com/why-does-the-usa-depend-on-russian-rockets-to-get-us-into-space.

137. Loren Thompson, *Ripples from Crimea in Space: US Seeks to End Reliance on Russian Engines for Satellite Launches*, FORBES (Apr. 7, 2014, 1:36 PM), https://www.forbes.com/sites/loren

Fortunately, President Obama had already tapped the commercial sector to transport astronauts to the International Space Station and fertilized the industry with billions of dollars in government contracts.[138] The industry had blossomed, reinvigorating the public's interest in space with dramatic rocket landings, promises of lunar tourism, and other unprecedented feats.[139] Private aerospace companies SpaceX and Orbital ATK began to fly un-crewed resupply missions to the International Space Station for NASA.[140] Thus, President Obama not only continued but nurtured the public-private cooperation of the Commercial Orbital Transportation Services program initiated by President Bush.[141]

After Russia's abandonment of the program, President Obama signed the Commercial Space Launch Competitiveness Act in 2015, which extended the United States' support of the International Space Station through 2024 and created fiscal incentives for increased privatization in space, including the development of future commercial space stations.[142] Since then, "[t]here [has been] a widening divide between 'old space'—the [exclusive] domain of government agencies [and contractors]—and 'new space,'" where private entrepreneurs invest to capitalize on seemingly limitless potential.[143]

It is somewhat ironic that the expansion of the private sector's role in our national space program occurred during the regime of a president often accused by his critics of being a socialist.[144] It is undeniable, however, that the policies initiated by President George W. Bush and developed by President Obama enabled the current environment of capitalistic opportunity.

---

thompson/2014/04/07/new-rocket-engine-needed-to-rescue-americas-faltering-role-in-space/.

138. *See* Davenport, *supra* note 132.

139. *Id.*

140. *See* Wall, *supra* note 102.

141. *Id.*

142. *See id.*

143. Sanjana Varghese, *One Small Step for Private Companies: How the Future of Space Travel Is Being Redefined*, NEW STATESMAN AM. (Jan. 9, 2018), https://www.newstatesman.com/science-tech/space/2018/01/one-small-step-private-companies-how-future-space-travel-being-redefined.

144. *See* Davenport, *supra* note 132.

Although private spaceflight was already on the rise, the Obama administration capitalized on tensions created by a renewed sense of Russian nationalism to nurture the domestic growth of an industry that promises to reinvent the United States' approach in outer space. Today, the United States must build on this momentum, by understanding its obligations under international law and leveraging the expertise of the scientific and industrial communities as well as our international allies in space to establish a foundational framework that will ensure long-term, sustainable progress.

B. *Realizing the Limitless Economic Potential of Outer Space*

Future administrations will face the challenge of cultivating the success of privatized space—which gained momentum under Presidents Bush and Obama—while simultaneously creating a new legal framework that will address the Outer Space Treaty.[145] If achieved, such a legal framework would reinvigorate and influence the American and the global economies.

The new space marketplace will attract the interest of the world's wealthiest individuals.[146] Advanced satellite services will revolutionize the way we communicate, while disrupting other existing industries, such as energy, mining, transportation, construction, and hospitality.[147] A microgravity environment presents enticing potential for experimental science.[148] Extraterrestrial mineral resources tempt entrepreneurs to invest their fortunes in deep space transportation, with the promise of

145. Outer Space Treaty, *supra* note 19.

146. *See, e.g.*, Richard Hollingham, *Six Reasons Why Space Tourism Matters*, BBC (Apr. 8, 2014), http://www.bbc.com/future/story/20140408-six-reasons-space-tourism-matters.

147. *See* Joe Landon & Etienne Schneider, *These 5 Industries Will Be First to Do Business in Space*, WORLD ECON. F. (Nov. 24, 2017), https://www.weforum.org/agenda/2017/11/industries-will-make-money-in-space/.

148. *See, e.g.*, Eric Hamilton, *Zero Gravity Plant Growth Experiments Delivered to Space Station*, PHYS.ORG (Dec. 18, 2017), https://phys.org/news/2017-12-gravity-growth-space-station.html#jCphttps://phys.org/news/2017-12-gravity-growth-space-station.html.

limitless mining opportunities.[149] In a global economy anchored in information services and manufacturing, the privatization of outer space promises to revolutionize the world in a variety of unprecedented ways.

Space tourism, specifically, has evolved from a dream of the world's wealthiest individuals into a realistic possibility for citizens of the twenty-first century.[150] Billionaire Dennis Tito's successful flight to the International Space Station in 2001 served as a mere prelude to the current influx of private companies intent on catering to as many tourists as possible.[151] Notably, Virgin Galactic recently made its first successful test flight of SpaceShipTwo, a "spaceliner" designed to transport multiple tourists into low-Earth orbit.[152] Moreover, the success of reusable rockets topped with unmanned passenger capsules, launched by SpaceX and Blue Origin, indicates that the number of humans capable of making the trip to space is about to increase exponentially.[153] The importance of this new industry cannot be overstated. The rise of space tourism liberates mankind from accessing space only at the expense of taxpayers or the whims of the acting administration.[154] Access to a new frontier will undoubtedly inspire a new generation of engineers, and revolutionize transportation technologies.[155] Most importantly, it will increase the number of launch service providers, thereby increasing the societal tolerance for failures

149. *See* Andrew Wong, *Space Mining Could Become a Real Thing—and It Could Be Worth Trillions*, CNBC (May 15, 2018, 12:39 AM), https://www.cnbc.com/2018/05/15/mining-asteroids-could-be-worth-trillions-of-dollars.html.

150. *See* Valerie Stimac, *A Definitive History of Space Tourism & Human Spaceflight*, SPACE TOURISM GUIDE (Apr. 11, 2018), https://spacetourismguide.com/history-of-space-tourism/.

151. *See* Jim Clash, *Wilshire Associates Founder Dennis Tito Reflects on His Rare Spaceflight*, FORBES (Mar. 27, 2017, 9:59 AM), https://www.forbes.com/sites/jimclash/2017/03/27/wilshire-associates-founder-dennis-tito-reflects-on-his-rare-spaceflight/.

152. Mike Wall, *Virgin Galactic's SpaceShipTwo Reaches Space for 1st Time in Historic Test Flight!*, SPACE.COM (Dec. 13, 2018), https://www.space.com/42716-virgin-galactic-spaceshiptwo-unity-reaches-space.html.

153. *See* Gillian Rich, *Here's How New Stratolaunch Rockets Compare to SpaceX, Blue Origin*, INV. BUS. DAILY (Aug. 21, 2018), https://www.investors.com/news/space-companies-rockets-stratolaunch-spacex-blue-origin-ula/.

154. *See* Hollingham, *supra* note 146.

155. *See id.*

and loss of human life, which have historically crippled our progress in space.[156]

Furthermore, the zero-gravity environment in space provides the perfect environment for manufacturing and material science.[157] Microgravity alters many physical phenomena, including surface tension, heat transfer, solidification, combustion, gene alterations, and the aggregation of cells into tissue-like architectures.[158] As the cost to launch decreases, the value of manufacturing in space will substantially increase.[159] Companies such as Made In Space, Inc. appreciate this potential and seek to innovate the manufacture of goods by relocating production to space.[160] Andrew Rush, president and chief executive officer of Made In Space, recognizes that all products are made "by subjecting them to a different environment."[161] Thus, space presents an unparalleled setting and, consequently, an unmatched opportunity to innovate the ways in which we create.[162]

Unique manufacturing environments will also require new manufacturing technologies. For example, Japan's Electrostatic Levitation Furnace is exactly the type of transformative technology that will result from the private sector's involvement in outer space.[163] The Furnace is designed to "melt and solidify materials while levitating them in place using electrodes."[164] And the applications are not purely industrial.[165] NASA has issued a vascular tissue challenge to the private sector, offering

156. *See id.*

157. JAMES PATTON DOWNEY, NAT'L AERONAUTICS & SPACE ADMIN., A RESEARCHER'S GUIDE TO: INTERNATIONAL SPACE STATION: MICROGRAVITY MATERIALS RESEARCH 5 (2015), https://www.nasa.gov/sites/default/files/atoms/files/np-2015-09-030-jsc_microgravity_materials-iss-mini-book-508c2.pdf.

158. *Id.*

159. *See* Sarah Lewin, *Making Stuff in Space: Off-Earth Manufacturing Is Just Getting Started*, SPACE.COM (May 11, 2018), https://www.space.com/40552-space-based-manufacturing-just-getting-started.html.

160. *See id.*

161. *Id.*

162. *See id.*

163. *See id.*

164. *Id.*

165. *See id.*

incentives for researchers to develop space-based technologies capable of growing vascularized heart, lung, kidney, liver, and muscle tissues capable of independently surviving for thirty days—a feat currently impossible on Earth.[166]

Additionally, the satellites currently being produced are shockingly small in size, opening the door for new and exciting applications.[167] Satellite technologies have historically been used for telecommunications,[168] remote sensing,[169] and navigation.[170] The private sector, however, has recently launched satellites to track maritime data, inform commuters exactly how many cars are on the road, and map the lunar surface.[171] Although the International Telecommunications Satellite Organization (INTELSAT) was the first commercial global satellite communications system in 1965,[172] modern companies are producing comparable communication plat-forms at a fractional scale, commonly known as small satellites.[173] Small satellites, which require less fuel to launch, result in lower expenses.[174] Companies such as Planet Labs and Spire are producing satellites that neatly package unprecedented functionality into a ten-centimeter cube.[175] Similar to drone technology,

166. *See About the Challenge*, NASA, https://www.nasa.gov/directorates/spacetech/centennial_challenges/vascular_tissue/about.html (last updated Feb. 1, 2019) (explaining vascular tissue challenge).

167. *Commercial Use of Small Satellites Is the New Space Race*, ELECTRONICS WKLY. (Oct. 18, 2017), https://www.electronicsweekly.com/news/new-space-race-2017-10/.

168. *See Timeline: 50 Years of Spaceflight*, SPACE.COM (Sept. 28, 2012), https://www.space.com/4422-timeline-50-years-spaceflight.html.

169. Steve Graham, *Remote Sensing*, EARTH OBSERVATORY (Sept. 17, 1999), https://earthobservatory.nasa.gov/features/RemoteSensing.

170. Megan Garber, *8 Tools We Used to Navigate the World Around Us Before GPS and Smartphones*, CITYLAB (Apr. 15, 2013), https://www.citylab.com/life/2013/04/7-examples-how-we-used-navigate-world-around-us/5286/.

171. *See* Kevin J. Ryan, *4 Startups Using Satellites in Really Cool Ways*, INC. (Aug. 12, 2016), https://www.inc.com/kevin-j-ryan/4-startups-using-satellites-in-really-cool-ways.html.

172. *Intelsat History*, INTELSTAT, http://www.intelsat.com/about-us/history/ (last visited Mar. 16, 2019).

173. *See* Tim Bowler, *The Low-Cost Mini Satellites Bringing Mobile to the World*, BBC (Feb. 23, 2018), https://www.bbc.com/news/business-43090226.

174. *See id.*

175. *7 Small-Satellite Startups Bringing Space Down to Earth*, CBINSIGHTS (Nov. 28, 2017), https://www.cbinsights.com/research/small-satellite-startups/.

it is increasingly apparent that personal satellites will soon reach the American consumer.[176] Thus, more competition will inevitably be drawn to a market traditionally dominated by a few monopolistic entities, promising improved products and services and lower prices for consumers.[177]

Space mining is one of the more lucrative markets that entrepreneurs have targeted as the private sector increases its capabilities in space.[178] Specifically, an asteroid belt between Mars and Jupiter is estimated to hold mineral wealth equivalent to approximately $100 billion for every individual on Earth.[179] Economists and astrophysicists alike have claimed that the future space mining industry will result in the world's first trillionaire.[180] Inspired by this potential, Planetary Resources, a private company that hopes to take advantage of this opportunity, has lobbied Congress to recognize the right of U.S. citizens to own asteroid resources and has partnered with Luxembourg to advance the space resources industry.[181]

Finally, the privatization of outer space is producing revolutionary new transportation technologies. For example, NASA's Commercial Crew Program is funding the private development of several spacecrafts built by SpaceX and Boeing, each capable of transporting astronauts to and from the International Space Station.[182] The success of these companies is

176. Elizabeth Garbee & Andrew Maynard, *The Future of Personal Satellite Technology Is Here—Are We Ready for It?*, CONVERSATION (May 25, 2016, 9:24 PM), https://theconversation.com/the-future-of-personal-satellite-technology-is-here-are-we-ready-for-it-58478.

177. David Cay Johnston, *Bad Connections*, N.Y. TIMES (Nov. 27, 2012), https://www.nytimes.com/2012/11/28/opinion/break-up-the-telecom-cartels.html.

178. *See* Wong, *supra* note 149.

179. *Id.*

180. *Id.* Notably, Neil deGrasse Tyson has claimed as much, while lamenting the lack of clarity as to whether or not claiming ownership over space-based resources will be legal under international law. *Id.*

181. *See* Andrew Zaleski, *How the Space Mining Industry Came Down to Earth*, FORTUNE (Nov. 24, 2018), http://fortune.com/2018/11/24/asteroid-mining-space-planetary-resources/. Planetary Resources is also backed by some prominent business and cultural icons, such as Larry Page of Google and film director James Cameron. *Id.*

182. Loren Grush, *NASA Is Saving Big Bucks by Partnering with Commercial Companies like SpaceX*, VERGE (Nov. 10, 2017, 10:50 AM), https://www.theverge.com/2017/11/10/16623752/nasa-commercial-cargo-crew-spacex-orbital-atk-boeing-orion. NASA has awarded both SpaceX and Boeing multibillion dollars contracts for the development of innovative transport capsules

critical because it will alleviate America's dependence on Russia to send and retrieve its astronauts from low-Earth orbit, which is increasingly expensive.[183] Meanwhile, spaceports are being built across the United States and are preparing to launch groundbreaking new technologies to Mars and beyond.[184] Undoubtedly, theses spaceports will launch vehicles outfitted with ion electric propulsion engines, a new technology being developed by companies like Accion Systems, which promises to supplant the bulkier and more expensive chemical engines commonly used.[185] These spaceports will also be used to launch tenants who plan to occupy commercial space stations and are on track to deploy as early as 2021.[186]

C. *The Urgent Need for Legislative Action*

Indeed, a bold new future awaits those nations prepared to nurture and incentivize the burgeoning entrepreneurial interest in space. Of course, the privatization of space is progressing much faster than expected and the advancement of technology

---

designed to enter low-Earth orbit, titled the Dragon and CST-100 Starliner, respectively. Manned missions are tentatively scheduled to begin in 2019. *Id.*

183. *See* O'Rourke, *supra* note 136. Since the retirement of the Space Shuttle in 2011, the United States has paid Russia exorbitant fees so that its astronauts can hitch rides to the International Space Station in the Soyuz spacecraft.

184. *See* Sarah Scoles, *America's Spaceport Boom Is Outpacing the Need to Go to Space*, WIRED.COM (Sept. 5, 2018, 8:00 AM), https://www.wired.com/story/americas-spaceport-boom-is-outpacing-the-need-to-go-to-space/. Colorado Governor John Hickenlooper cheekily noted that "the first mile is free" upon the Federal Aviation Administration's approval of the latest American spaceport, joining existing launch pads in Texas, Florida, California, Alaska, Virginia, Oklahoma, and New Mexico. *Id.*

185. Meghan Bartels, *Accion's 1st Space Thrusters Could Launch on a Cubesat This Weekend*, SPACE.COM (Nov. 9, 2018), https://www.space.com/42383-accion-ion-propulsion-natalya-bailey.html. Natalya Bailey was inspired to develop next generational propulsion technologies while studying propulsion at her university, and co-founded Accion Systems in 2014 to improve the technology once and for all. *Id.* Her technology was leveraged by the team of high school students from Irvine, California and launched on "It's Business Time" on November 11, 2018. Jeff Foust, *Rock Lab Performs First Commercial Launch*, SPACENEWS (Nov. 10, 2018), https://spacenews.com/rocket-lab-performs-first-commercial-launch/. Accion received a substantial investment from Boeing in Fall of 2018. Alan Boyle, *Boeing Leads $3M Round to Boost Accion Systems' Electric Space Propulsion System*, YAHOO (Oct. 10, 2018), https://www.yahoo.com /news/boeing-leads-3m-round-boost-164652713.html.

186. Tim Fernholz, *Room for Rent: Two Private Space Stations Need Tenants to Launch in 2021*, QUARTZ (Feb. 20, 2018), https://qz.com/1211327/room-for-rent-two-private-space-stations-need-tenants-to-launch-in-2021/.

continues to outpace the law.[187] Tech pundits have bluntly characterized this stagnation in political action as "killing innovation."[188] Worse, the international community duly recognizes the limitless economic potential of space, is unwilling to wait for the modernization of the Outer Space Treaty, and is apparently unfazed by the notion of violating its provisions.[189] Since the commercialization of outer space appears increasingly inevitable, the United States would be remiss to delay political action, thereby surrendering the economic benefits afforded to the first country to enable its private sector to pursue space. The challenge lies in responsibly reconciling such action with the relevant articles of the Outer Space Treaty.[190]

In fairness to the Outer Space Treaty, it was authored and ratified at a time when having a commercial desire to access outer space was unfathomable, as was the ability to launch private satellites and personnel.[191] Nonetheless, Article VI imposes liability on the federal government for the behavior of

187. Lyon Brad King, *Space Tech Has Outpaced Space Law, and We're at Risk of Killing Innovation*, TECHCRUNCH (July 11, 2018), https://techcrunch.com/2018/07/11/space-tech-has-outpaced-space-law-and-were-at-risk-of-killing-innovation/.

188. *Id.* It is worth noting that Dr. King is also a professor of Mechanical Engineering at Michigan Technological University, and the chief executive officer of Orbion Space Technology, Inc. focused on bringing electric propulsion to small satellites. *Lyon Brad King*, TECHCRUNCH, https://techcrunch.com/author/lyon-brad-king/ (last visited Apr. 16, 2019).

189. *See* Jill Stuart, *The Outer Space Treaty Has Been Remarkably Successful—But Is It Fit for the Modern Age*, CONVERSATION (Jan. 12, 2017, 11:59 AM), http://theconversation.com/the-outer-space-treaty-has-been-remarkably-successful-but-is-it-fit-for-the-modern-age-71381 (noting that Luxembourg enacted laws enabling the appropriation of space resources in 2017); *see also* Aliya Ram, *US and Luxembourg Frame Laws for New Space Race*, FIN. TIMES (Oct. 19, 2017), https://www.ft.com/content/af15f0e4-707a-11e7-93ff-99f383b09ff9. For example, in a move that was perceived as an aggressive display of force, China violated the treaty in 2007 when it shot down a weather satellite with a "ground-based medium-range ballistic missile." Stuart, *supra* note 189.

190. Although first mover advantages have been criticized and are context dependent, the physical distance and obstacles to economic development in outer space means that any competitive gap has the potential of becoming insurmountable. Thus, first movers will likely realize benefits such as ownership over essential intellectual properties, control of resources and buyer-switching costs for an indefinite period of time. *See* Chuck Cohn, *When to Be a First-Mover and When to Wait*, FORBES (Oct. 21, 2015, 3:04 PM), https://www.forbes.com/sites/chuckcohn/2015/10/21/when-to-be-a-first-mover-and-when-to-wait/#3b11aaed78ce.

191. *See supra* Part II. The Outer Space Treaty was a proactive document, envisioning a worse case sovereign utilization. *See* Outer Space Treaty, *supra* note 19.

its private actors.[192] This simple fact raises questions regarding which activities the government deems worthy of legislation, and which it will indemnify. If the United States is serious about cultivating a distinguished space economy, however, the government must take it a step further and establish an optimal balance between the two.

The federal government must be aware of what the private sector is launching in order to properly regulate private space activities. Currently, it accomplishes this via participation from the Federal Communications Commission (FCC)—a most unlikely and largely unqualified agency to regulate such activities—justified exclusively by the fact that satellites communicate using radio frequency signals.[193] Start-up companies are forced to appear before the FCC to apply for a permit to launch, which commences a lengthy and arduous bureaucratic process.[194] Although this may have been tolerable for the slow-moving, large government contractors that once dominated the field, it is unrealistic to expect the "new space" commercial sector, championed by Silicon Valley's most successful—and impatient—executives, to exhibit such tolerance.[195]

This process affords little contextual consideration and does not assess the value of each individual technology. Instead, companies apply for licenses via a series of checkboxes without the opportunity to explain their intentions or appeal.[196] The FCC's obvious lack of technical expertise and its prioritization of process over policy has already proven detrimental to the rising commercial space market.[197] For example, when Swarm Technologies applied for a license to launch its SpaceBee

192. *See supra* Section I.B.2.

193. *See* FCC, Guidance on Obtaining Experimental Authorizations for Commercial Space Launch Activities, 28 FCC Rcd. 2560 (2013).

194. *Id.*

195. *See* King, *supra* note 187.

196. *Id.*

197. *See* Mark Harris, *The FCC's Big Problem with Small Satellites*, IEEE SPECTRUM (Apr. 10, 2018), https://spectrum.ieee.org/tech-talk/aerospace/satellites/the-fccs-big-problem-with-small-satellites (explaining that the FCC has been inconsistent in the standards used to approve satellite applications).

satellites to improve common "[i]nternet of [t]hings" products, they were denied on space debris grounds claiming the satellites were too small to track—otherwise a compliment for a tech company continually attempting to shrink their products.[198] One month later, Spaceflight Industries—an American launch services provider that was unaware of the FCC dismissal—facilitated Swarm's ride on an Indian rocket.[199] Without a U.S. license to activate, Swarm's SpaceBees remain airborn, but are only operable through February 2019.[200] Worse, Swarm Technologies was fined and is trying to avoid a potential dissolution.[201]

Yet, it is extremely difficult to fund a successful space startup company. Profits are "elusive," and most entrepreneurs in the field depend on successful seed funding rounds, which starts the clock to prove their technology or go out of business.[202] Unless a company opts to push the envelope by launching from another country, rather than serving the American market without a license, there are few alternatives.[203] Sooner than go

198. *See* Michael Sheetz, *Former Google Engineer's Start-up Slammed by FCC for Unauthorized Satellite Launch*, CNBC (Mar. 9, 2018, 6:25 PM), https://www.cnbc.com/2018/03/09/swarm-technologies-slammed-by-fcc-for-unauthorized-satellite-launch.html. Technically, no agency has been officially vested with the authority to regulate space debris. There is an ongoing debate between the FCC and the Department of Commerce as to whom should be taking action to prevent and reduce space debris. *See* Marcia Smith, *Senate Committee Approves Space Frontier Act*, SPACE POL'Y ONLINE (Aug. 1, 2018, 11:16 PM), https://spacepolicyonline.com/news/senate-committee-approves-space-frontier-act/; *see also* Caleb Henry, *FCC Commissioner Questions Regulator's Omission from National Space Council*, SPACENEWS (Apr. 17, 2018), https://spacenews.com/fcc-commissioner-questions-regulators-omission-from-national-space-council/. Recently, the FCC has proposed a rule on the regulation of space debris, however. Mitigation of Orbital Debris in the New Space Age Mitigation of Orbital Debris, 84 Fed. Reg. 4742 (proposed Feb. 19, 2019) (to be codified at 47 C.F.R. pts. 5, 25, 97).

199. *See* Sheetz, *supra* note 198.

200. Marina Koren, *Launching Rogue Satellites into Space Was a 'Mistake,'* ATLANTIC (Sept. 7, 2018), https://www.theatlantic.com/technology/archive/2018/09/spacebees-swarm-unauthorized-satellite-launch/569395/.

201. Caleb Henry, *FCC Fines Swarm $900,000 for Unauthorized Smallsat Launch*, SPACENEWS (Dec. 20, 2018), https://spacenews.com/fcc-fines-swarm-900000-for-unauthorized-smallsat-launch/.

202. *See* Neal Ungerleider, *How to Launch a Space Startup*, FAST CO. (Jan. 23, 2018), https://www.fastcompany.com/40507858/space-startups-record-investment-rocket-labs-interorbital-phase-four.

203. *See, e.g.*, King, *supra* note 187 (noting that operating without a license was obviously the strategy employed by Swarm Technologies, and although the effects of the imposed penalties

out of business, American companies may launch abroad and exclusively serve markets in countries savvy enough to recognize the value of commercial space.[204] Clearly, a body of federal law that leads American companies to exclusively benefit foreign economies does not constitute a well-developed national space policy and contradicts the momentum established by the Bush and Obama administrations.

III. A SPACE POLICY TO PROMOTE COMMERCIAL INTERESTS

In view of the non-self-executing articles of the Outer Space Treaty and the dramatic need for regulatory reform, America's current space policy stands to inhibit the private sector from fully taking the reins.[205] Future administrations will have to work alongside Congress to leverage and enable the commercialization of space.[206] Simply relying on executive orders will likely prove insufficient.[207] Comprehensive, bipartisan legislative measures are necessary to bring the Outer Space Treaty into effect, provide certainty to the private sector, and lay a steady foundation upon which a new American space age may be constructed.

---

are not yet fully understood, it is safe to assume that risk-averse investors will not support such strategies moving forward).

204. *See* Mosher & Gould, *supra* note 16. This also assumes that companies are willing to withstand the United States' satellite exportation laws, which are no easier to navigate than obtaining a license to launch. *See* King, *supra* note 187.

205. *See* Phil Plait, *Politics Is Poisoning NASA's Ability to Do What It Needs to Do*, SLATE (Mar. 16, 2015, 7:00 AM), https://slate.com/technology/2015/03/nasa-and-congress-we-must-get-politics-out-of-nasa.html.

206. *See id.*

207. *See generally* Danny Cevallos, *No, Mr. President, an Executive Order Can't Change the Constitution. Here's Why.*, NBC NEWS (Nov. 1, 2018, 12:26 PM), https://www.nbcnews.com/politics/donald-trump/no-mr-president-executive-order-can-t-change-constitution-here-n929806 (challenging a president's ability to execute an executive order amid congressional safeguards). Checks and balances make it difficult to unilaterally effect sustainable governmental change. For example, Congress has the ability to legislatively overturn an executive order because statutes have constitutional supremacy. Furthermore, the judicial branch has the power to review the constitutionality of an executive order. President Trump has used executive orders liberally throughout his first two years in office to communicate his agenda, but the longevity of these actions might be short-lived given the shifting majority in the House. *See id.*

Fortunately, a legislative and regulatory framework for enabling private space exploration already exists.[208] Dr. Jerry Hendrix and Adam Routh of the Center for a New American Security have recently proposed an analogue for private sector involvement in space exploration: the exploration of the Louisiana Territory and the settlement of the American West.[209] In 1803, the U.S. government commissioned a civil expedition to explore the new territory purchased from Napoleon.[210] The early uncertainties posed by the new territory negated any fiscal incentives for commercial entities to invest in the West, designating this exploratory expedition as the exclusive realm of the federal government.[211] Lewis and Clark, scouts of the federal government sent to explore the new territory, successfully reached the Pacific Ocean and returned with samples of wildlife and resources they had encountered along the way.[212] The federal exploration of this new territory roused public excitement and signaled greater stability amongst the public, inspiring private development such as the construction of commercial, intercontinental railroads.[213] Finally, the government passed legislation and established regulatory agencies to govern the newly populated frontier.[214]

Similarly, the principle motto of any administration that adequately understands and appreciates the importance of American space exploration should be, "Where the govern-

208. *See generally* JERRY HENDRIX & ADAM ROUTH, CTR. FOR A NEW AM. SEC., A SPACE POLICY FOR THE TRUMP ADMINISTRATION (2017), https://s3.amazonaws.com/files.cnas.org/documents/Space-Policy-for-the-Trump-Administration.pdf?mtime=20171023110127 (offering a detailed assessment of defense strategies and space regulations). If future administrations are looking for a playbook for how we might successfully explore and industrialize a new frontier, they should look to the government's approach to exploration following the Louisiana Purchase. *See id*. at 3.

209. *Id.*

210. Jay H. Buckley, *Lewis and Clark Expedition*, ENCYCLOPEDIA BRITANNICA, https://www.britannica.com/event/Lewis-and-Clark-Expedition (last updated Feb. 22, 2019).

211. *See* HENDRIX & ROUTH, *supra* note 208, at 3.

212. *See* Buckley, *supra* note 210.

213. *See* HENDRIX & ROUTH, *supra* note 208, at 3–4. *See generally* Paul H. Cootner, *The Role of the Railroads in United States Economic Growth*, 23 J. ECON. HIST. 477 (1963) (detailing railroad's impact on the U.S. economy).

214. *See* HENDRIX & ROUTH, *supra* note 208, at 4.

ment leads, the commercial sector can follow." Following the general policy framework used to successfully develop the frontier, the government should first increase federal investment in civil missions. Second, it must clarify restrictions on sovereignty and appropriation through legislation. Finally, the government should reassess and streamline its existing regulatory scheme to simplify the administrative landscape for private entities.

A. *Prioritize Federal Investments in Civil Space*

If the United States is serious about developing a space policy that will leverage its private sector, future presidents need to prioritize federal investments in civil missions. Historically, the term "civil space" has been used to distinguish exploratory and commercial missions from militaristic applications of space-based technologies.[215] In this context, the term specifically refers to missions focused on exploration and pioneering—expensive programs that push the limits of existing science, but lack a proximate financial incentive.[216] Here, civil space is a modern analogue for the dangerous scouting missions led by Lewis and Clark, who led a federally-funded mission to explore the frontier and reported back on what the government—and future settlers—could expect from the undeveloped west.[217] A notable contemporary example of a comparable civil mission is NASA's New Horizons spacecraft, which entered orbit around Pluto in 2015, and is forecasted to arrive at an asteroid deeper in the Kuiper Belt sometime in 2019.[218] There is little incentive for the private sector to wager on such a mission because the risk is disproportionate to the benefits.

---

215. JAMES CLAY MOLTZ, CROWDED ORBITS: CONFLICT AND COOPERATION IN SPACE 60 (2014).

216. *See* Stephen J. Dubner, *Is Space Exploration Worth the Cost? A Freakonomics Quorum*, FREAKONOMICS (Jan. 11, 2008, 11:19 AM), http://freakonomics.com/2008/01/11/is-space-exploration-worth-the-cost-a-freakonomics-quorum/.

217. *See* Buckley, *supra* note 210.

218. Elizabeth Howell, *New Horizons: Exploring Pluto and Beyond*, SPACE.COM (Mar. 1, 2018), https://www.space.com/18377-new-horizons.html (explaining that the New Horizons spacecraft traveled almost three billion miles away from Earth and was "only the fifth [spacecraft] to venture so far from [Earth]").

The government should continue to redefine its role to exclusively pursue civil enterprises in space, leaving the more accessible areas of space exploration to the private sector. Thus, the more intimidating aspects of space exploration will be managed under a more risk-tolerant and resilient scheme of funding, from which the private sector will indirectly benefit. The success that NASA achieves today will inspire future generations of entrepreneurs to push even further into outer space, thereby instigating further economic growth.[219] Under this proposal, NASA would continue pursuing programs like the InSight Martian rover—which will advance our knowledge of the Martian surface en route to a human landing[220]—and the Transiting Exoplanet Survey Satellite—which promises to locate more than three thousand planets beyond our solar system in the search for Earth-like worlds.[221] Conversely, NASA would outsource more common aspects of spaceflight—such as low-Earth orbit activities—to the private sector.[222] Here, commercial space companies could refine their capabilities in NASA's wake, developing the frontiers that government has already forged on their behalf.[223]

On December 11, 2017, President Trump authorized Robert M. Lightfoot Jr.—then acting NASA administrator—to lead a "new" space exploration program to send American astronauts back to the moon, Mars, and beyond.[224] Facially, this appears to

---

219. *See, e.g.*, Salazar, *supra* note 100.

220. *See* Sarah Lewin, *What's the Weather on Mars? How NASA's Insight Lander Will Find Out*, SPACE.COM (Dec. 17, 2018), https://www.space.com/42738-insight-mars-lander-weather-station-starting-work.html.

221. *See* Ashley Strickland, *NASA's Planet-Hunting Satellite TESS Launches*, CNN, https://www.cnn.com/2018/04/18/us/nasa-tess-satellite-launch/index.html (last updated Apr. 18, 2018, 7:04 PM).

222. *See, e.g.*, David Masci, *SpaceX Launch Illustrates NASA's Growing Use of Private Companies*, PEW RES. CTR. (Apr. 14, 2014), http://www.pewresearch.org/fact-tank/2014/04/14/launch-of-space-x-rocket-illustrates-nasas-growing-use-of-private-companies/; *see also* Salazar, *supra* note 100.

223. *See id.*

224. Dana Dovey, *Trump Signs NASA Act to Send Astronauts to Moon 'and Eventually Mars' for First Time Since 1972*, NEWSWEEK (Dec. 12, 2017, 7:57 AM), https://www.newsweek.com/nasa

harken back to the intrepid civil missions chartered by Presidents Kennedy[225] and George W. Bush.[226] Under President Trump, however, NASA has received its smallest historical percentage of the federal budget, continuing a concerning trend that began around 1997 and has been perpetuated by two Democratic and two Republican presidential administrations.[227] The cancellations of the Europa Lander—which would have explored a moon of Jupiter in search of water[228]—and the Asteroid Redirect Mission—a bold mission with obvious relevance to the private sector's ambitions of extraterrestrial mining[229]—are even more concerning.[230] It appears the Trump administration is not funding NASA, and the missions it is funding do not propose to charter new territories as much as they hope to replicate past successes.

Recall that President Obama replaced President Bush's return mission to the moon with the Asteroid Redirect Mission, which President Trump has now supplanted with a return mission to the moon.[231] Unfortunately, it appears that the United States is not only consistently investing less in NASA, but it remains intent on funding a lunar mission that was first accomplished in 1969. Since private companies like SpaceX have already

-space-exploration-moon-mars-mission-744920; *see also* Don Reisinger, *New White House Aide Memoir Reveals Trump Wanted to Send NASA to Mars During First Term*, FORTUNE (Jan. 23, 2019), http://fortune.com/2019/01/23/trump-mars-first-term-nasa-trip/.

225. *See supra* Introduction.

226. *See supra* Section II.A.

227. *See* Philip Bump, *NASA's Piece of the Budget Has Declined by Half Since the Pluto Mission Was Broached*, WASH. POST (July 14, 2015), https://www.washingtonpost.com/news/the-fix/wp/2015/07/14/it-took-4-percent-of-the-federal-budget-to-get-to-the-moon-pluto-is-much-cheaper/?utm_term=.77696c390fbf. *See generally* Loren Grush, *Trump's Biggest Budget Cuts to NASA: Ranked*, VERGE (Mar. 17, 2017, 11:05 AM), https://www.theverge.com/2017/3/17/14947444/trump-budget-plan-cuts-nasa-asteroid-mission-europa (discussing the various cuts to NASA's budget under the Trump administration).

228. Jonathan O'Callaghan, *Trump Cancels Europa Lander, Asteroid Mission, Earth Science Satellites in First Budget*, IFLSCIENCE! (Mar. 16, 2017), https://www.iflscience.com/space/trump-cancels-europa-lander-asteroid-mission-earth-science-first-budget/.

229. Tariq Malik, *Trump's 2018 NASA Budget Request Would Scrap Asteroid Redirect Mission*, SPACE.COM (Mar. 16, 2017), https://www.space.com/36090-trump-2018-nasa-budget-request.html.

230. *See* Grush, *supra* note 227.

231. *See supra* Section II.A.

announced their intention to spearhead similar lunar missions,[232] and have exhibited an agility and efficiency surpassing that of the federal government,[233] it would be prudent to fund a project that the private sector is less likely to champion on its own, like the Asteroid Redirect Mission. If the federal government is committed to the private space sector, it must not only increase NASA's budget, but fund trailblazer missions chartered to develop the technologies and explore the worlds that will ultimately be leveraged by the private sector.

If the United States increases its investments in new civil space missions, the government will pave the way for an impressively capable private sector to develop the new worlds and technologies by mitigating the inherent risks of investing in the unknown. This behavioral pattern is a result of the public-private synergy that is not limited to space-based applications.[234] Not only is investing in innovative space missions necessary to sustain the United States' status as a technical leader on the global stage, but the positive effect it will have on the private sector will both strengthen the economy and deepen humankind's understanding of the universe and our place within it.

B. *The United States Needs to Clearly Define Its Commercial Regulation*

Article VI of the Outer Space Treaty charges its party nations with the responsibility to authorize and supervise "non-governmental entities in outer space" in compliance with the treaty's terms.[235] Laura Montgomery recently testified that Article VI leaves it to each country to decide which particular

232. *See, e.g.*, Mike Wall, *SpaceX Will Fly a Private Passenger Around the Moon on Its Giant BFR Rocket*, SPACE.COM (Sept. 14, 2018), https://www.space.com/41822-spacex-bfr-rocket-moon-passenger-flight.html.

233. *See supra* Part II.

234. *See generally* Nathan E. Busch & Austen D. Givens, *Public-Private Partnerships in Homeland Security: Opportunities and Challenges*, HOMELAND SECURITY AFF. (Oct. 2012), https://www.hsaj.org/articles/233 (discussing the many benefits of collaboration between public agencies and private-sector business).

235. Outer Space Treaty, *supra* note 19.

activities require regulation, how that regulation will be carried out, and with how much supervision."[236] This is certainly the approach taken by Luxembourg and the United Arab Emirates, who have established new national space laws that allow commercial entities operating within their borders to claim ownership of ores and other resources mined or gathered in outer space.[237] The United States needs to follow suit, so industry can clearly understand and distinguish the limitations imposed by the Outer Space Treaty while also identifying viable opportunities worthy of investment.[238] Further, the legislature must operate with discretion and precision to avoid over-regulation that might intimidate the emerging commercial space industry.[239]

1. *Pass legislation granting regulatory authority over specific space activities*

The private sector deserves to know which activities are legal, and which are in violation of the United States' obligations under the Outer Space Treaty. Since Article VI is not self-executing, it is unenforceable in the absence of clarifying legislation.[240] In the United States, the Senate Commerce Subcommittee on Space, Science, and Competitiveness is responsible for holding hearings on legislative and regulatory issues

236. *Regulating Space: Innovation, Liberty, and International Obligations: Hearing Before the Subcomm. on Space of the H. Comm. on Sci., Space, & Tech.*, 155th Cong. 20 (2017) (statement of Laura Montgomery, Attorney and Sole Proprietor, Ground Based Space Matters, LLC) [hereinafter *Regulating Space*].

237. *See* Press Release, Lux. Ministry of the Econ., Luxembourg and the United Arab Emirates to Cooperate on Space Activities with Particular Focus on the Exploration and Utilization of Space Resources (Oct. 10, 2017), https://spaceresources.public.lu/dam-assets/press-release/2017/2017-10-10-press-release-mou-space.pdf; *see also* Paolo Totaro, *Luxembourg Pioneers Property Rights Laws for Planets and Asteroids*, REUTERS (July 14, 2017, 10:02 AM), https://www.reuters.com/article/us-luxembourg-space/luxembourg-pioneers-property-rights-laws-for-planets-and-asteroids-idUSKBN19Z1JD.

238. *See* Amir Siraj, *Why Congress Must Act Quickly to Reform U.S. Space Law*, HARV. POL. REV. (Sept. 28, 2017), http://harvardpolitics.com/united-states/the-dangers-of-stagnancy-and-the-need-for-norms-in-u-s-space-law/.

239. *See id.*

240. *See supra* Section I.D.

involving commercial space.[241] It is not atypical for industry executives to attend such hearings, where they advocate for advantageous legal strategies that will streamline processes and eliminate the red tape currently plaguing commercial space.[242] Unfortunately, discord between the Senate, the House of Representatives, and the executive branch is delaying the passage of a comprehensive legislative scheme that will address the justified concerns of the private sector.[243]

Article VI imposes two obligations on party nations.[244] First, it requires the authorization of commercial activities in outer space.[245] Second, it requires the continued supervision of such activities.[246] Thus, Congress must construct, and agree upon, legislation that will address both obligations, which the president must then sign into law. Establishing a regulatory scheme that will responsibly authorize commercial space flights is a manageable issue of identifying the correct agency and outfitting it with the appropriate resources and processes.[247] As discussed, the FCC has been authorizing commercial launches in the interim.[248] Addressing a supervisory obligation, however, poses a more difficult legislative challenge.[249]

Notably, both houses of Congress have recently passed bills that independently attempt to fill the legislative vacuum

---

241. *See* Cody Knipfer, *Congress and Commerce in the Final Frontier*, SPACE REV. (Dec. 17, 2018), http://www.thespacereview.com/article/3625/1.

242. *See* Jeff Foust, *Cruz to Hold Hearing on Updating the Outer Space Treaty*, SPACENEWS (May 17, 2017), https://spacenews.com/cruz-to-hold-hearing-on-updating-the-outer-space-treaty/.

243. *See* Smith, *supra* note 198. The American Space Commerce Free Enterprise Act, passed by the House of Representatives in April 2018, proposes a different legislative scheme than the Space Frontier Act, passed by the Senate four months later. *Id.*

244. *See supra* Section I.B.2.

245. *See supra* Section I.B.2.

246. *See supra* Section I.B.2.

247. *See supra* Section II.C. Subject matter experts consider the task of authorizing commercial space activities far more realistic than supervising them. *See, e.g.*, Laura Montgomery, *The Space Frontier Act: The Outer Space Treaty, Streamlining Regulation, and Oversight of Foreign Activity*, GROUND BASED SPACE MATTERS (Aug. 1, 2018), https://groundbasedspacematters.com/index.php/2018/08/01/the-space-frontier-act-the-outer-space-treaty-streamlining-regulation-and-oversight-of-foreign-activity/.

248. *See supra* Section II.C.

249. *See supra* Section II.C.

created by the Outer Space Treaty.[250] In April 2018, the House of Representatives passed the American Space Commerce Free Enterprise Act, which grants the Office of Space Commerce—within the Department of Commerce—the regulatory authority to approve commercial space activities.[251] It further proposes limited supervisory authority over "non-traditional" commercial space activities, specifically identifying asteroid mining, the launch and maintenance of commercial space stations, and the servicing of satellites as "non-traditional" commercial space activities.[252] This bill is not likely to pass the Senate, however, as the Senate Commerce Committee approved the radically different Space Frontier Act—championed by Senator Ted Cruz—just four months after the House passed its bill.[253] The Space Frontier Act essentially affirms the status quo, granting the Federal Aviation Administration (FAA)—which currently shares licensure authority with the FCC—the authority to grant licenses authorizing non-governmental space activities.[254] The existing process is vague, however, and not clearly defined.[255] The Space Frontier Act is also silent on the second obligation imposed by Article VI, offering no practical guidance to private industry as to which commercial space activities will be supervised.[256] Further complicating matters, the National Space Council—led by Vice President Mike Pence—issued recommendations for commercial space regulation, offering insight into what this administration is expecting to cross President Trump's desk.[257] While these recommendations resemble the House bill, proposing the consolidation of authorization and supervisory powers under the Department of Commerce, they

250. *See supra* Section II.C.

251. *See* Foust, *supra* note 62.

252. *Id.*

253. *See* Jeff Foust, *Senate Passes Commercial Space Bill*, SPACENEWS (Dec. 21, 2018), https://spacenews.com/senate-passes-commercial-space-bill-2/.

254. Space Frontier Act of 2019, S.3277 § 60123(a), 115th Congress (2019); *see* Smith, *supra* note 198; *see also* Montgomery, *supra* note 247.

255. *See Regulating Space*, *supra* note 236, at 20–21.

256. *Id.*

257. *See* Foust, *supra* note 62.

also embrace executive influence and empower the agency to independently enact these changes.[258]

Yet, as the various branches of government struggle to agree upon a solution, they collectively overlook a fundamental truth: it is neither currently possible, nor necessary, for any regulatory agency to effectively supervise all actions taken by commercial space companies in outer space. Congress should focus less on listing the specific activities worthy of regulation, and instead define the detrimental characteristics or effects of those activities it intends on regulating. For example, existing laws already authorize the government to waive a commercial space licensing requirement if it "decides that the waiver is in the public interest and will not jeopardize the public health and safety, safety of property, and national security and foreign policy interests of the United States."[259] Neither the House nor Senate bills address the specific requirements for licenses and waivers, which the government can issue under current law.[260] Congress could merely amend the existing body of law to require the waiver of a licensure requirement under certain conditions, instead of granting the government discretion under such circumstances.[261]

If the government was to amend the existing statutes, creating an affirmative duty to grant a licensure waiver for commercial space ventures under clearly defined circumstances, it would provide the private sector with more certainty. Had the FCC properly defined the requirements and specifications of spacecraft that are capable of being tracked via radar, and communicated that criteria to the private sector, it might have prevented the fiasco that nearly forced Swarm Technologies—a company earnestly trying to bring the American public

258. *Id.*

259. 51 U.S.C. § 50905(b)(3) (2012).

260. *See id.*

261. For example, Congress can amend a portion of the particular statute which currently reads, "The Secretary *may* waive a requirement," *id.* (emphasis added), to read, "The Secretary *must* waive a requirement," thereby eliminating the discretion that has been widely criticized in the wake of the Swarm Technologies controversy.

innovative new technologies—out of business.[262] Additionally, such an amendment would afford Congress the opportunity to align the intentions of both houses with the expectations of the National Space Council. Thus, it would produce more certainty in the short-term, while affording itself more time to better serve the private sector by passing well-designed legislation addressing both obligations of Article VI.

2. *Reconcile existing legislation with the international prohibition of sovereign rights*

Additionally, Congress must clarify the ambiguity inherent in Article II and pass legislation that distinguishes the private appropriation of resources from the national appropriation prohibited by the Outer Space Treaty. This would resolve a tension that exists between Article II of the Outer Space Treaty and the United States' controversial Commercial Space Launch Competitiveness Act of 2015, also known as the SPACE Act.[263] Article II explicitly states that "celestial bodies[are] not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[264] Yet the SPACE Act confers a right to engage in the commercial exploitation of outer space minerals on citizens of the United States.[265] Critics argue that this legislation violates the Outer Space Treaty by creating laws that allow personal claims of ownership over celestial resources, analogous to claims of sovereignty and national appropriation.[266] The United States has rejected these claims, arguing it was simply the first party nation to pass such

262. *See supra* Section II.C.

263. 51 U.S.C. § 51302. *See generally* Peter B. de Selding, *New U.S. Space Mining Law's Treaty Compliance May Depend on Implementation*, SPACENEWS (Dec. 9, 2015), https://spacenews.com/u-s-commercial-space-acts-treaty-compliance-may-depend-on-implementation/ (exploring the controversy surrounding the SPACE Act and its possible conflicts with international law).

264. Outer Space Treaty, *supra* note 19; *see supra* Section I.B.1.

265. 51 U.S.C. § 51302(a)(3). Under the Act, Congress requires the President to "promote the right of United States citizens to engage in commercial exploration for and commercial recovery of space resources free from harmful interference, in accordance with the international obligations of the United States and subject to authorization and continuing supervision by the Federal Government." *Id.*

266. *See* de Selding, *supra* note 263.

legislation and thus clarify that a distinction exists between national appropriation and private claims of property rights.[267]

Indeed, Article II is ambiguous.[268] Such ambiguity, however, should not preclude legislative action. It is commonly recognized that, as party nations navigate the ambiguous content of a non-self-executing international treaty, the actions of party nations can be indicative of the metes and bounds of the obligations imposed by that treaty.[269] This is consistent with the "intent" considerations in contemporary treaty analysis, as stated in *Medellín*.[270] In other words, how party nations behave in the wake of an international treaty can be indicative of both the intent and the effect of the treaty itself.[271] Luxembourg's recent investments in space mining initiatives are further evidence that more party nations agree with the congressional interpretation and implementation of Article II.[272]

Further, a literal interpretation of the terms and conditions of the SPACE Act reveals that Congress merely instructed the President to pursue a certain outcome, promoting the right of U.S. citizens to commercially recover space resources.[273] Congress purposefully qualified this charge, specifying that the means used to accomplish this objective must be "in accordance with the international obligations of the United States."[274] This qualification is important, because the SPACE Act, at least partially, aligns with the policies promoted in another international treaty, ratified in 1979, twelve years after the Outer Space Treaty.[275] The United Nations' Moon Agreement permits nations to use outer space resources in appropriate quantities to

267. *See id.*

268. P.J. Blount & Christian J. Robinson, *One Small Step: The Impact of the U.S. Commercial Space Launch Competitiveness Act of 2015 on the Exploitation of Resources in Outer Space*, 18 N.C. J.L. & TECH. 160, 163 (2016).

269. *Id.* at 177–80.

270. 552 U.S. 491, 505 (2008); *see supra* Section I.C.

271. *Medellín*, 552 U.S. at 505; *see supra* Section I.D.

272. *See* Newman, *supra* note 21.

273. 51 U.S.C. § 51302(a)(3) (2012); *see supra* note 263 (highlighting explicit statutory language expressing this congressional directive).

274. 51 U.S.C. § 51302(a)(3).

275. *See* de Selding, *supra* note 263.

sustain their exploration of outer space.[276] Although the United States is not a party to this treaty, it may serve as a basis for the SPACE Act, and future legislation that responsibly authorizes commercial activity while addressing the initial motivations of the Outer Space Treaty. This is particularly relevant to the emerging space mining industry, as one of its primary purposes is to produce fuel for deep space exploration.[277] The theory is that interstellar mining operations can be used to establish fueling stations on celestial bodies to sustain future space exploration ventures by propelling them deeper into the solar system.[278]

Congress should pass legislation formalizing the allowances afforded by the Moon Agreement. Because Article II is not self-executing, federal agencies are not required to adopt restrictive protocols that deny private claims of ownership.[279] Therefore, Congress could revise the SPACE Act in accordance with the terms of the Moon Agreement, with the confidence that it will not interfere with Article II. Such legislation should establish a buffer zone around space colonies and mining operations, ensuring that civilian astronauts can carry out specific activities without interference, and perhaps establish rights to the resources within those zones. This scheme aligns with the Moon Agreement's allowance of sustaining future space ventures, and evokes the theory of the "global commons," universally recognized by the international community in the oceanic context.[280] At a subcommittee hearing in May 2017, Robert Bigelow of Bigelow Aerospace confirmed the private sector's approval of such a legislative solution: "It's very difficult to not

276. *Id.*; Outer Space Treaty, *supra* note 19.

277. *See* Dan Boyce, *Space Mining—Learning How to Fuel an Interplanetary Gas Station*, NPR (Sept. 25, 2018, 5:03 AM), https://www.npr.org/2018/09/25/648917308/space-mining-learning-how-to-fuel-an-interplanetary-gas-station.

278. *See id.*

279. *See supra* Section I.D.

280. *See* O'Brien, *supra* note 87. The theory of the global commons grants private entities the right to extract individual resources without staking a broad claim of ownership over the entire asset. *Id.*

want that if you're a company that is promoting mining."[281] He continued, "You're not asking for ownership of the regolith but ownership of what you extract."[282] Still, the burden is on Congress to amend the Act, further reconcile the national space policy with international obligations, and protect the interests of its new economy.

C. *The United States Should Streamline the Current Regulation and Agencies*

In 2016, the electorate exhibited an interest in the deregulation of the private sector.[283] When the fall edition of the twice-yearly Regulatory Plan and Unified Agenda of Federal Regulatory and Deregulatory Actions was released in 2017, it proved that the Trump administration had taken a clear step toward fulfilling its "promises to cut red tape."[284] "Of the 579 [total] actions listed [in this release of] the United Agenda as deregulatory or regulatory, 448 were deregulatory while 131 are regulatory," well exceeding the President's commitment to remove two regulations for every one that is newly adopted.[285] NASA and the commercial space sector, however, have somehow remained immune to such deregulation. Regarding the exploration and development of space, this regulatory scheme actually builds upon an already thick layer of regulations imposed on private space contractors, including the management of risk, the insertion of civil penalties, management of orbital debris, compliance to specific procedures and

281. Jeff Foust, *Commercial Space's Policy Wish List*, SPACE REV. (May 1, 2017), http://www.thespacereview.com/article/3230/1.

282. *Id.*

283. *See* Manuela Tobias & Allison Colburn, *Trump Quick to Pursue Deregulation in First Year*, POLITIFACT (Jan. 16, 2018), http://www.politifact.com/trumpometer-year-one/deregulation-environmental-promises/.

284. Clyde Wayne Crews Jr., *Trump's New 2018 Deregulatory Agenda*, FORBES (Dec. 18, 2017, 8:30 PM), https://www.forbes.com/sites/waynecrews/2017/12/18/trumps-new-deregulatory-agenda/#637121b92f60.

285. *See* Dan Bosch & Dan Goldbeck, *Regulatory Agenda Confirms Commitment to Deregulation*, AM. ACTION F. (Dec. 21, 2017), https://www.americanactionforum.org/insight/fall-regulatory-agenda-confirms-commitment-deregulation/.

processes, adoption of safety resolutions, and special airspace restrictions.[286]

Three regulatory agencies oversee space activities, exacerbating the regulatory fog private space companies must navigate in order to do business. The FAA authorizes and regulates the launch and reentry of private spacecraft, the National Oceanic and Atmospheric Association regulates commercial remote sensing satellites, and the FCC assigns radio frequencies and geostationary orbital slots.[287] Of the three, only the FAA's Office of Commercial Space Transportation saw minor reductions in the numerous regulations it imposes on privately-owned space companies.[288]

The National Space Council should work with Congress to streamline the cumbersome and often duplicative regulatory authorities enforced against privately-owned space companies. Commercial rockets currently launch from federal ranges, such as Cape Canaveral, Vandenberg, and Wallops. [289] Each base is co-operated by the Air Force, the Army, and NASA, and each range has its own safety requirements and launch procedures governing the use of its facilities and services.[290] This duplication should be addressed by an administration committed to reducing regulations and unencumbering the free market.[291]

---

286. *See id.* Some of these regulations are imposed by the FAA, categorized under the Department of Transportation. *Id. See generally* Loren Grush, *Private Space Companies Avoid FAA Oversight Again, with Congress' Blessing*, VERGE (Nov. 16, 2015, 2:27 PM), https://www.theverge.com/2015/11/16/9744298/private-space-government-regulation-spacex-asteroid-mining (discussing legislative attempts to develop safer protocols for space exploration).

287. Marcia Smith, *Companies Agree FAA Best Agency to Regulate Non-Traditional Space Activities*, SPACEPOLICYONLINE.COM (Nov. 15, 2017, 7:14 AM), https://spacepolicyonline.com/news/companies-agree-faa-best-agency-to-regulate-non-traditional-space-activities/.

288. *Id.*; *New Regulations Govern Private Human Space Flight Requirements for Crew and Space Flight Participants*, FED. AVIATION ADMIN. (Dec. 30, 2016, 1:54 PM), https://www.faa.gov/about/office_org/headquarters_offices/ast/human_space_flight_reqs/.

289. *Launching from Both U.S. Coasts*, NASA (May 14, 2009), https://www.nasa.gov/centers/kennedy/launchingrockets/sites.html.

290. *See* Jesse Roman, *Primed for Lift-Off*, NFPA J. (Mar. 1, 2018), https://www.nfpa.org/News-and-Research/Publications/NFPA-Journal/2018/March-April-2018/Features/Spaceports.

291. *See, e.g.*, Terry Jones, *Deregulation Nation: President Trump Cuts Regulations at Record Rate*, INVESTOR'S BUS. DAILY (Aug. 14, 2018), https://www.investors.com/politics/commentary/deregulation-nation-president-trump-cuts-regulations-at-record-rate/.

Although there have been prior attempts to delineate the responsibilities of the Air Force and the FAA, lists should be published which document the divergence of the two agencies in terms of launch regulations and provide practical advice to private actors looking to takeoff. Further, a subcommittee should be established to assess the existing regulations, eliminate duplicity, and evaluate new technologies and ventures that might warrant new regulation.[292]

Additionally, Congress should consolidate supervisory authority of commercial space under a sole qualified agency. Rather than create a redundant branch of the military, the government should develop a legitimately qualified agency to regulate commercial space.[293] As the government debates which agency should be granted such authority, the private sector has agreed that it should be the FAA.[294] Executives from Lockheed Martin, Sierra Nevada Corporation, Orbital ATK, and Astrobotic Technology have suggested the FAA because of its track record, culture, and proven ability to regulate in accordance with Article VI, albeit with a light touch.[295] It is clear that the FAA is better suited to regulate commercial space ventures, as it is already imbued with aerospace experience. Furthermore, the Office of Commercial Space Transportation recently released a report setting a three-month goal for approving launch licenses, indicating its acknowledgment of the private sector's needs.[296] The Swarm Technologies debacle

292. *See* Alex Derber, *MROs Seek Less Duplication, More Efficiency in Compliance*, INSIDEMRO (Mar. 1, 2017), http://www.mro-network.com/safety-regulatory/mros-seek-less-duplication-more-efficiency-compliance (outlining the issues with regulatory duplicity faced by the aviation industry). For example, the executive branch needs to reconsider the regulations governing reentry given the advent of the reusable rocket.

293. Contrary to the current narrative on Capitol Hill, a Space Force is both wasteful and unnecessary. The Air Force has historically proven itself qualified and capable of managing United States military interests in outer space. Furthermore, a Space Force stands in opposition to the Outer Space Treaty's prohibition of military installations in space. *See* Bryan Nakayama, *3 Reasons Trump's New Space Force Would Be a Disaster*, FORTUNE (June 21, 2018), http://fortune.com/2018/06/21/trump-space-force-bad-idea/.

294. Smith, *supra* note 287.

295. *Id.*

296. Debra Werner, *Three Months from Application to Launch License? A New Report Says It's Possible*, SPACENEWS (Nov. 23, 2018), https://spacenews.com/launch-certification-seac-report/.

proves the necessity of empowering a single entity to mitigate risk and uncertainty for the private sector.

D. *Preserving the Longevity of America's Space Policy and Programs*

One of the predominant problems with ensuring efficient and sustainable progress in the final frontier is transient leadership. Our democracy enables U.S. citizens to change the executive and legislative representatives at the end of each elected term. Unfortunately, the benefits of democracy inadvertently stagnate our progress on long-term scientific endeavors, such as investing in public space missions and catalyzing private involvement.[297] The space shuttle took over ten years to design and build,[298] and it is conceivable that the technologies that will enable life in otherwise desolate and unexplored corners of our solar system will take even longer.[299] In the past decade, the United States has shifted its focus from lunar to asteroid colonies—two radically different missions—only to revert back to lunar colonies again.[300] If the United States continues to errantly invest billions of dollars in different directions every four or eight years, the bold vision commonly embraced by government officials and corporate executives will never be realized.

Fortunately, the 2017 reinstitution of the National Space Council provides a mechanism for ensuring commitment and consistency through changing administrations.[301] The Council should be reinvented, however, to incorporate influential

297. *It's Time to End Washington's Bad Habit of Changing NASA's Goals in Midstream*, SCI. AM. (Jan. 1, 2017), https://www.scientificamerican.com/article/its-time-to-end-washington-rsquo-s-bad-habit-of-changing-nasa-rsquo-s-goals-in-midstream/.

298. *See* Mike Wall, *How the Space Shuttle Was Born*, SPACE.COM (June 28, 2011), https://www.space.com/12085-nasa-space-shuttle-history-born.html. For example, the post-Apollo spacecraft conception and design efforts began in 1969 under President Nixon, and the first space shuttle, Columbia, did not launch until April 12, 2981. *Id.*

299. *Space Shuttle Orbiter: Historical Snapshot*, BOEING, http://www.boeing.com/history/products/space-shuttle-orbiter.page (last visited Apr. 16, 2019).

300. *See supra* Section III.A.

301. *See President Trump Reestablishes National Space Council*, SPACENEWS (June 30, 2017), https://spacenews.com/breaking-president-trump-reestablishes-national-space-council/.

voices from the space industry and the scientific community, build confidence that the national investment in civil space will optimize value and properly align with the interests of the private sector, and facilitate the transition previously proposed. Furthermore, by including members from the international community, our efforts in space—which could easily be perceived as vehement acts of nationalism—would be integrated with our allies and instill a global confidence in our commitment to the Outer Space Treaty. Finally, by requiring a bipartisan involvement by means of party quorums, additional resiliency to administration changes will be introduced. Such changes would remove space policies from the political spin, and better position the United States to start achieving goals that have been discussed for years.[302] Such progress will inspire universal public support, have a beneficial impact on Science, Technology, Engineering, and Mathematics (STEM) initiatives, and in turn inspire a new generation of dreamers to take humanity even further.[303]

E. *A Cautionary Note*

The private sector continues to serve as "America's secret weapon."[304] Humanity has proven time and time again that it is capable of achieving incredible things when properly motivated. Unfortunately, other countries are beginning to recognize the benefits of competing for a commercial space sector, and the United States is not guaranteed to remain the exclusive leader of this new industry.[305]

---

302. *See* Jason Davis, *'Apollo on Steroids': The Rise and Fall of NASA's Constellation Moon Program*, PLANETARY SOC'Y (Aug. 1, 2016), http://www.planetary.org/blogs/jason-davis/2016/20160801-horizon-goal-part-2.html.

303. *See* Sarah Kaplan, *Trump Wants to Kill NASA Office Popular with Congress, Astronauts and Kids*, WASH. POST (Mar. 16, 2017), https://www.washingtonpost.com/news/speaking-of-science/wp/2017/03/16/trump-wants-to-kill-nasa-office-popular-with-congress-astronauts-and-kids/?utm_term=.50e87ed69b96.

304. Joe Pappalardo, *How American Space Launch Left Europe in the Dust*, POPULAR MECHANICS (Oct. 18, 2018), https://www.popularmechanics.com/space/rockets/a23889639/american-space-launch-industry-europe/.

305. *See, e.g.*, Blaine Curcio & Tianyi Lan, *The Rise of China's Private Space Industry*, SPACENEWS (May 28, 2018), https://spacenews.com/analysis-the-rise-of-chinas-private-space-

For example, China is predictably planning on responding to the progress made by U.S. companies such as SpaceX and Blue Origin via state-owned agencies and is on track to launch reusable rockets no later than 2020.[306] A company known as LandSpace, however, has quietly emerged as China's most advanced commercial launch company and is, surprisingly, privately owned.[307] LandSpace has been developing rocket engines projected to be ten times more powerful than the small satellite rockets recently launched by Rocket Lab.[308] Likewise, Dauria Aerospace and Sputnix—two of Russia's first privately-owned space companies—have been working to compete for commercial business, as the monopoly once maintained by the government-sponsored Roscosmos is continually threatened by the progress of the American private sector.[309] India too, has willingly and ably poached the business of U.S. companies that have grown frustrated with a cumbersome regulatory scheme that does not facilitate their success.[310] And where the United States has abandoned its own mission to once again shift its focus to the moon, a Japanese robot successfully landed on an asteroid in October 2018.[311]

It is becoming increasingly evident that the international community is excited about the innovative new economy that commercial space promises to deliver.[312] How long is the United States willing to wait before it takes the enabling legal action necessary to signal its interest in the mutual success of both

---

industry/; Jeffrey Lin & P.W. Singer, *Here's China's Plan to Compete with SpaceX and Blue Origin*, POPULAR SCI. (May 14, 2018), https://www.popsci.com/chinas-2020-plan-for-reusable-space-launch.

306. Lin & Singer, *supra* note 305.

307. Curcio & Lan, *supra* note 305.

308. *See id.*

309. *See* Sergey Zhukov & Mikhail Kokorich, *Skolkovo and a New Breed of Russian Space Startups*, ROOM (2014), https://room.eu.com/article/Skolkovo_and_a_new_breed_of_Russian_space_startups.

310. *See* Sheetz, *supra* note 198.

311. *Touchdown! Japan Space Probe Lands New Robot on Asteroid*, PHYS.ORG (Oct. 3, 2018), https://phys.org/news/2018-10-japanese-spacecraft-device-asteroid.html. As previously discussed, President Trump cancelled NASA's planned mission to redirect an asteroid. *See* Malik, *supra* note 229.

312. Ram, *supra* note 189.

public and private sectors? By adopting the common sense proposals in this Note, the United States will remain the preeminent space-faring nation and posture itself to be a principal beneficiary of the fourth industrial revolution. If the government continues to delay, however, there are plenty of countries willing to take both its place and its business.

CONCLUSION

Outer space will continue to be a source of economic and militaristic stability, as well as a source of infinite opportunities to advance our understanding of the universe. While the United States has led the global effort in space to date, it has been decades since the country has truly accomplished an unprecedented mission progressing our reach beyond low-Earth orbit.[313] Still, as the United States has stagnated, other countries have increased their capabilities at our expense.[314] To preserve its status as an industry innovator, the United States must leverage its biggest advantage: the free market. This generation has seen an unparalleled number of entrepreneurs willing to leave Earth in pursuit of new opportunities.[315] By increasing investments in civil missions, signing new legislation, and re-evaluating existing regulations, the United States can incentivize and unlock the private sector's potential to advance our extra-terrestrial reach. We must not, however, act only in accordance with the Outer Space Treaty's restrictions; we must also acknowledge the harm that can come from isolated acts of national appropriation. By leveraging the National Space Council and expanding its influence, the United States can resolve such concerns, lend itself to the needs of the industry, and establish consistent, bipartisan policies and programs that will have the requisite support to achieve the impossible.

313. *See, e.g.*, Clark, *supra* note 10.

314. *See, e.g.*, Nathan, *supra* note 21.

315. *See* Grady, *supra* note 11.