

COMMENT

THE (REGULATORY) FORCE IS WITH YOU: USING EARLY AVIATION TO ANTICIPATE THE BLACK HOLES IN THE FAA’S PROPOSED REGULATORY CHANGES FOR COMMERCIAL HUMAN SPACE FLIGHT

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INTRODUCTION

Outer space has always been a subject of human fascination. Mayan priests believed that by studying celestial bodies they could prophesize the future.¹ The ancient Romans found planets, stars, and comets to be so extraordinary and prodigious that they named the celestial bodies after gods and goddesses.² Today, science fiction is one of the pinnacles of pop culture and space is brought to life daily in mediums such as film, television, video games, graphic novels, and even radio programs.³ The dialogue surrounding the recent advancements in space exploration is an example of humanity's hope for a future that moves beyond Earth's limits.⁴

Despite society's clear interest, a majority of the technological advancements in space are not driven by pure scientific curiosity. Commercialization and militaristic pursuit incentivized the United States' progress into outer space instead.⁵ In fact, a majority of the National

1. ARTHUR DEMAREST, *ANCIENT MAYA: THE RISE AND FALL OF A RAINFOREST CIVILIZATION* 192 (2004).

2. Elizabeth Nix, *Who Named the Planets?*, HISTORY.COM (Aug. 22, 2018), <https://www.history.com/news/who-named-the-planets>.

3. See Zachary Fedarko, *Star Wars: The Rise of Science Fiction in Cinematography*, VOCAL.MEDIA, <https://vocal.media/geeks/star-wars-the-rise-of-science-fiction-in-cinematography> (last visited May 8, 2020) (outlining the history of popular science fiction films); Lorraine Longhi, *Science Fiction: Shaping the Future*, ARIZ. ST. UNIV. (June 3, 2014), <https://research.asu.edu/stories/read/science-fiction-shaping-future>.

4. E.g., Blair Guild, *Listen to the Sound of Mars*, WASH. POST (Dec. 7, 2018), <https://www.washingtonpost.com/science/2018/12/08/listen-sound-mars/> ("NASA scientists released audio Friday of rumbles captured . . . on the surface of Mars."); Linda Herridge, *Meals Ready to Eat: Expedition 44 Crew Members Sample Leafy Greens Grown on Space Station*, NASA, https://www.nasa.gov/mission_pages/station/research/news/meals_ready_to_eat (last updated Apr. 17, 2019) ("Fresh food grown in . . . space officially is on the menu . . . for NASA astronauts on the International Space Station [ISS]).")

5. Steven J. Markovich & Andrew Chatzky, *Space Exploration and U.S. Competitiveness*,

Aeronautics and Space Administration's (NASA's) current budget goes to private contractors to design and manufacture spacecraft for NASA's use.⁶ Today, NASA's operations increasingly depend on the commercial sector for transportation to the International Space Station (ISS).⁷

The developments in space technology closely track the early developments of almost every mass transportation system; the focus is on how to transport more at the lowest possible price.⁸ In a shift similar to the aviation industry's transition from mail and military functions to human transportation, the new focus of space technology is commercial civilian space flight. The United States is entering the "21st-century space race[.]"⁹ The ability to put people in space on a larger scale could mean constructing space stations, exploring planets, and cultivating a market for space tourism.¹⁰ Though impressive, progress in human space flight is not as robust as expected and remains dangerous and unpredictable.¹¹ Thus, the dialogue surrounding space flight is focusing on how the Federal Aviation Administration (FAA), as regulatory authority, can balance the dually implicated interests of safety and commercial growth.¹²

While the government's role in regulating commercial space activity is the subject of much discussion, most are in agreement that the United States must continue to be an international leader in space exploration and that commercialization is essential to accomplish that goal.¹³ Part II of this

COUNCIL ON FOREIGN REL., <https://www.cfr.org/backgrounder/space-exploration-and-us-competitiveness> (last updated Sept. 10, 2019).

6. *Id.*

7. DOT, FAA, BUDGET ESTIMATES: FISCAL YEAR 2018 (2017), <https://www.transportation.gov/sites/dot.gov/files/docs/mission/budget/281191/faa-fy-2018-cj-final.pdf>.

8. See Letter from Gen. Lester L. Lyles, Chair, NASA Advisory Council, to James F. Bridenstine, Adm'r, NASA (June 6, 2019), https://www.nasa.gov/sites/default/files/atoms/files/lyles_to_bridenstine_letter_recs-findings_nac_public_meeting_may_30-31-2019_nasa_hq_final_tagged.pdf.

9. Owen Freeman, *Future of Spaceflight*, NAT'L GEO., <https://www.nationalgeographic.com/science/space/space-exploration/future-spaceflight> (last visited May 8, 2020).

10. See Markovich & Chatzky, *supra* note 5.

11. Chris Ciaccia, *Buzz Aldrin 'Disappointed' in America's Progress Since Apollo 11: 'We have the No. 1 rocket and spacecraft and they can't get into lunar orbit'*, FOX NEWS (July 19, 2019), <https://www.foxnews.com/science/buzz-aldrin-disappointed-progress-since-apollo-11>; Ramasamy Venugopal, *Space Disasters*, SPACE SAFETY MAG. <http://www.spacesafetymagazine.com/space-disasters/> (last visited May 9, 2020).

12. See FAA, OFFICE OF COMMERCIAL SPACE TRANSP., https://www.faa.gov/about/office_org/headquarters_offices/ast/ (last modified Apr. 6, 2020).

13. Press Release, White House, Presidential Message on Space Exploration Day, 2019 (July 20, 2019) [hereinafter Space Exploration Message], <https://www.whitehouse.gov/briefings->

Comment provides a background on the history, laws, agencies, and regulations that shape the growing commercial space industry and proposed changes to the regulatory framework. Part III demonstrates the similarities between the early aviation industry and the developing commercial human space flight industry. Part IV examines three key issues faced by the early aviation industry that are likely to emerge in the commercial human space flight industry: safety, economy, and stability. Finally, Part V recommends ways that Congress and the FAA can manage and support commercial growth by using lessons from early aviation to predict potential obstacles, affording agencies with an adequate budget, maintaining a consistent regulatory authority, and enacting incremental and transparent rulemaking.

I. BACKGROUND

A. *The Development of Commercial Human Space Flight Policy*

In the United States, private companies and government agencies collaborate on space flight and exploration initiatives.¹⁴ These companies contract with the government to supply the majority of materials and technology used by NASA's astronauts.¹⁵ This commercial activity has grown exponentially in recent decades.¹⁶ For example, the commercial sector owns, launches, and operates the majority of U.S. satellites.¹⁷ Meanwhile, the attentions of Congress and the public have turned to the commercial capabilities of space flight and data collection.¹⁸

Normalized space travel may still seem unrealistic, but the debate over the role of regulation in this new era of space exploration is relatively normal.

statements/presidential-message-space-exploration-day-2019/; Cary Funk & Mark Strauss, *Majority of Americans Believe It Is Essential that the U.S. Remain a Global Leader in Space*, PEW RES. CTR. (June 6, 2018), <https://www.pewresearch.org/science/2018/06/06/majority-of-americans-believe-it-is-essential-that-the-u-s-remain-a-global-leader-in-space/>.

14. Freeman, *supra* note 9 (“Private companies have played a part in the industry since 1962, when NASA launched the first privately-built satellite. In recent years, companies such as SpaceX and Boeing have started vying for more large-scale government contracts.”).

15. DANIEL MORGAN, CONG. RESEARCH SERV., R45416, COMMERCIAL SPACE: FEDERAL REGULATION, OVERSIGHT, AND UTILIZATION 1 (2018).

16. Freeman, *supra* note 9.

17. MORGAN, *supra* note 15; *see also* BILL CANIS, CONG. RESEARCH SERV., R44708, COMMERCIAL SPACE INDUSTRY LAUNCHES A NEW PHASE 4 (2016) (stating that of the 576 U.S. satellites in 2016, 286 are commercial, 146 are military, 132 are government, and twelve are civil).

18. Examples of this technology include reusable rockets and Earth-imaging satellites. CANIS, *supra* note 17, at 11.

Space law is defined as “the body of law governing space-related activities.”¹⁹ Civilian space flight in the United States is governed by a complex system that stretches from international treaties to administrative rulemaking.²⁰ Part IIB examines the FAA’s regulations; however, to fully understand the current regulatory atmosphere regarding human space flight, one must examine the history, national and international law, and presidential directives that developed it.

1. *History of Space Flight and the Development of U.S. Space Law*

Two major global superpowers, the United States and the Soviet Union, turned their attention to developing aerospace technology after World War II.²¹ In 1957, the Soviet Union launched the satellite Sputnik 1 and ignited the “space race.”²² This launch put the competition to explore space at the center of international politics and inspired a series of national and international initiatives to develop space law.²³

Less than four months later, the United States launched their first satellite into orbit.²⁴ In 1961, Alan Shepard was the first American to successfully fly into space and less than a year later John Glenn became the first American to orbit the Earth.²⁵ After catching up to the Soviet Union’s achievements in space, President Kennedy turned his attention to the Moon.²⁶ Finally in 1969, over half of one billion people watched as the United States successfully sent astronaut Neil Armstrong to the Moon.²⁷

19. *Space Law*; UNITED NATIONS, OFF. FOR OUTER SPACE AFF., <http://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html> (last visited May 8, 2020).

20. *E.g.*, Commercial Space Launch Act (CSLA), 51 U.S.C. §§ 50901–23 (1984) (national law); 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, 610 U.N.T.S. 205 (entered into force Oct. 10, 1967) [hereinafter Outer Space Treaty] (international law); 14 C.F.R. §§ 400–60 (2019) (administrative rulemaking).

21. *See generally A Brief History of Space Exploration*, AEROSPACE.COM (June 1, 2018), <https://aerospace.org/article/brief-history-space-exploration> [hereinafter *A Brief History*], (describing the first attempts at space exploration by the United States and the Soviet Union).

22. DEBORAH D. STINE, CONG. RESEARCH SERV., RL34263, U.S. CIVILIAN SPACE POLICY PRIORITIES: REFLECTIONS 50 YEARS AFTER SPUTNIK 1 (Dec. 3, 2007).

23. *Id.* at 1–3 (“When people today speak of a ‘Sputnik moment,’ they often refer to a rapid national response that quickly mobilizes major policy change as opposed to a response of inaction or incremental policy change.”).

24. *A Brief History*, *supra* note 21.

25. *Id.*

26. *See* President John F. Kennedy, Address at Rice University on the Nation’s Space Effort (Sept. 12, 1962) (“We choose to go to the Moon.”).

27. *July 20, 1969: One Giant Leap for Mankind*, NASA (July 20, 2019), https://www.nasa.gov/mission_pages/apollo/apollo11.html.

Despite this momentous achievement, public support for NASA's space program wavered over the next decade.²⁸ While NASA continued to conduct several exploratory missions, the *Challenger* disaster temporarily suspended the space program from early 1986 to September 1988.²⁹ To the disappointment of many, the Moon landing is the first and last accomplishment of its size for the U.S. government.³⁰ However, the commercial sector has reinvigorated public interest in space activity.³¹ This interest has ushered in an era aptly called "New Space."³² Currently, the commercial sector, sometimes operating independent of NASA, is developing the technology for human travel and future settlement in space.³³

2. *National and International Law*

On an international level, space law focuses on the actual use of space and provides methods for managing relationships between countries potentially affected by humanity's movement into space.³⁴ After Sputnik 1, the United

28. See William Sims Bainbridge, *The Impact of Space Exploration on Public Opinions, Attitudes, and Beliefs*, in HISTORICAL STUDIES IN THE SOCIETAL IMPACT OF SPACEFLIGHT 1, 18-32 (Steven J. Dick Ed. 2015), https://www.nasa.gov/sites/default/files/atoms/files/historical-studies-societal-impact-spacelght-ebook_tagged.pdf (analyzing the underlying reasons behind the various shifts in public support of the space program in the decade following the moon landing).

29. *The Challenger Disaster Put an End to NASA's Plan to Send Civilians into Space*, SMITHSONIAN MAG. (Jan. 27, 2016), <https://www.smithsonianmag.com/history/challenger-disaster-put-end-nasas-plans-send-civilians-space-180957922/> ("When the space shuttle Challenger broke apart . . . seven Americans died on board . . . Christa McAuliffe, the 37-year-old high school teacher . . . who was killed in the disaster[] was to be the first in what NASA envisioned as a series of civilian 'payload specialists.'" If not for the "Challenger catastrophe, the first journalist in space would have followed within the year. After that, there was talk of an artist in space. Then, perhaps, just about anybody.").

30. See, e.g., Space Exploration Message, *supra* note 13; Ciaccia, *supra* note 11.

31. See Funk & Strauss, *supra* note 13 ("Strong public support that the [United States] should [] be at the vanguard of space exploration is widely shared across gender, educational and political groups.").

32. Joel Achenbach, *Which Way to Space?*, WASH. POST (Nov. 23, 2013), <https://www.washingtonpost.com/sf/national/2013/11/23/which-way-to-space/>.

33. See NASA, NASA PLAN FOR COMMERCIAL LEO DEVELOPMENT 19 (2019), https://www.nasa.gov/sites/default/files/atoms/files/commleodevt_plan_6-7-19_final1.pdf (describing how future missions to the ISS will be funded privately and facilitate commercial space activity).

34. See generally Outer Space Treaty, *supra* note 20 (providing a framework for states' outer space activities).

Nations (UN) created the UN Committee on the Peaceful Uses of Outer Space, and its two subcommittees, in 1959 and 1961.³⁵ When human exploration of the Moon bordered on reality in 1967, the UN established the Outer Space Treaty.³⁶ The Outer Space Treaty allows for the peaceful use of outer space and provides a framework for international relations implicated by that use.³⁷ The Treaty provides that no nation may appropriate outer space and that nations are liable for any damage caused by their space objects.³⁸ Additionally, nations are responsible for any space activity conducted by governmental or nongovernmental entities within it, which requires private companies to comply with the Outer Space Treaty.³⁹

Five years later, the UN passed the Liability Convention to supplement the Outer Space Treaty.⁴⁰ This Convention postulates that a nation will bear international responsibility for all space objects launched within its territory.⁴¹ This means that the country from which a space object was launched is liable for any damage that space object causes, regardless of the entity that launched the object. For example, consider a space vessel that is carrying civilians to the ISS. The vessel is owned jointly by the United States and Japan but is launched from a U.S. space port. During the end of the launch, a piece of debris from the vessel falls to Earth and causes damage to a French property. Under the Liability Convention, the United States, not Japan, is liable to France for the damage, provided there was no previous contractual agreement outlining liability for the damage. The effect of this Convention, in conjunction with the Outer Space Treaty, urges nations to create a regulatory

35. *A Timeline of the Exploration and Peaceful Use of Outer Space*, UNITED NATIONS, OFF. FOR OUTER SPACE AFF., <http://www.unoosa.org/oosa/en/timeline/index.html> (last visited Mar. 29, 2020); *Committee on the Peaceful Uses of Outer Space*, UNITED NATIONS, OFF. FOR OUTER SPACE AFF., <http://www.unoosa.org/oosa/en/ourwork/copuos/index.html> (last visited Apr. 9, 2020).

36. Outer Space Treaty, *supra* note 20. As of 2019, 109 nations have adopted this Treaty. List of parties to *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, UNITED NATIONS OFF. FOR DISARMAMENT AFF., http://disarmament.un.org/treaties/t/outer_space (last visited May 8, 2020).

37. Outer Space Treaty, *supra* note 20, at art. I, IV.

38. *Id.* at art. II, VI–VII. The Outer Space Treaty also explicitly bans nuclear weapons, weapons of mass destruction, non-peaceful use of weapons in space, or contamination of space and celestial bodies. *Id.* at art. IV, IX.

39. *Id.* at art. VI.

40. Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 961 U.N.T.S. 187 (entered into force Oct. 9, 1973).

41. *Id.* at art. II.

system that controls the nation's space activity and minimizes the chance that the nation will be exposed to liability.⁴²

Following these measures from the UN, the United States responded to Sputnik 1's launch by codifying the National Aeronautics and Space Act of 1958 (NASA Act)⁴³ the very next year.⁴⁴ The NASA Act created a civilian space program—NASA—and assigned military space activities to the Department of Defense (DOD).⁴⁵ In addition to civilian and military uses, the NASA Authorization Act⁴⁶ amended the NASA Act and required NASA to “seek and encourage, to the maximum extent possible, the fullest commercial use of space.”⁴⁷

By 1984, Congress realized the economic and technological benefits of using private companies for U.S. space activity and codified the Commercial Space Launch Act (CSLA).⁴⁸ President Ronald Reagan designated the Office of Commercial Space Transportation (AST) within the Department of Transportation (DOT) as responsible for the regulation of commercial space activity.⁴⁹ The CSLA was amended in 2004 to extend regulations to human space flight and to temporarily freeze safety regulations except in instances of high risk or a serious or fatal injury.⁵⁰ Pursuant to the liability that international

42. The Liability Convention also offers a process for bringing claims of liability against other nations. *Id.* Two other documents also supplement the Outer Space Treaty: the Rescue Agreement and the Registration Convention. *See* Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Space, Apr. 22, 1968, 672 U.N.T.S. 119, art. I-IV (entered into force, Dec. 3, 1968); Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, 1023 U.N.T.S. 15 (entered into force Sept. 15, 1976).

43. Pub. L. No. 85-568, 72 Stat. 426 (codified in scattered sections of 5 U.S.C., 10 U.S.C., 18 U.S.C., 42 U.S.C., 50 U.S.C.), *amended by* NASA Authorization Act, 42 U.S.C. § 2451 (1990).

44. Mike Wall, *Happy Birthday, NASA! At 60, Agency Continues to Inspire*, SPACE.COM (Oct. 1, 2018), <https://www.space.com/41977-nasa-60-year-anniversary-unifying-force.html>.

45. § 102(b), 72 Stat. at 426.

46. Pub. L. No. 101-611, § 107, 104 Stat. 3188, 3197 (1990) (codified in scattered sections of 5 U.S.C., 10 U.S.C., 18 U.S.C., 42 U.S.C., 50 U.S.C.).

47. *Id.*

48. 51 U.S.C. §§ 50901-23 (1984), *amended by* the Commercial Space Launch Amendments Act, 49 U.S.C. §§ 70101-05 (2004).

49. Exec. Order No. 12,465, 49 Fed. Reg. 7211, 7211 (Feb. 28, 1984). The Office of Commercial Space Transportation (AST) eventually became part of the FAA within the DOT. 51 U.S.C. § 50905.

50. *See* Commercial Space Launch Amendments Act, 49 U.S.C. §§ 70101-05 (2004) (amending 51 U.S.C. §§ 50901-23 (1984)). These restrictions are referred to as a regulatory moratorium or “learning period” and were extended until 2023. 51 U.S.C. § 50905(c)(9).

law could impose, the CSLA requires that all launches *must* be licensed by the FAA, including those used for human space flight.⁵¹

3. *Presidential Directives and Political Opinions*

On January 30, 2017, President Trump signed Executive Order 13,771, which requires agencies to repeal two existing regulations for each new regulation imposed.⁵² It also requires that the “total incremental cost of all regulations . . . shall be no greater than zero.”⁵³ Pursuant to this order, the U.S. Secretary of Transportation, Elaine Chao,⁵⁴ issued a Notice of Proposed Rulemaking (NPRM) for “Streamlined Launch and Reentry Licensing Requirements” on March 26, 2019.⁵⁵ These changes aim to “simplify the licensing process for launch and reentry activity, enable novel operations, and reduce costs.”⁵⁶ Essentially, this rule consolidates the current regulatory process, which prescribes conditions for four types of licenses to a single, performance-based licensing procedure.⁵⁷ This proposal is discussed in detail in Part IIB.

In addition to reducing regulations on the commercial space industry, President Trump has ambitious expectations of NASA, including a directive to land astronauts on the Moon by 2024 and “to send the next man and first woman to the Moon and to . . . [send] Americans to Mars.”⁵⁸ President Trump also reinstated the National Space Council after a twenty-five year

51. Commercial Space Launch Act, Pub. L. No. 98-575, § 6, 98 Stat. 3055, 3057 (1984).

52. Exec. Order No. 13,771, 82 Fed. Reg. 9,339, 9,339 (Feb. 3, 2017).

53. *Id.*

54. *Meet the Secretary*, DOT, <https://www.transportation.gov/mission/meet-secretary/sec-retary-elaine-l-chao> (last visited May 8, 2020).

55. Streamlined Launch and Reentry Licensing Requirements, 84 Fed. Reg. 15,296, 15,297 (proposed Apr. 15, 2019).

56. Elaine L. Chao, U.S. Sec’y of Transp., Remarks to the National Space Council (Mar. 26, 2019).

57. See Streamlined Launch and Reentry Licensing Requirements, *supra* note 55, at 15,296. On the surface, this approach seems to be a straightforward solution that promotes the industry, but critics have expressed concerns about the FAA’s lack of transparency regarding this rule and the effect these regulations will have on foreign affairs and national security concerns. See Jeff Foust, *Industry Concerned About Fast Pace of Commercial Launch Regulatory Reform*, SPACE NEWS (Nov. 1, 2018), <https://spacenews.com/industry-concerned-about-fast-pace-of-commercial-launch-regulatory-reform/>.

58. See *Sending American Astronauts to Moon in 2024: NASA Accepts Challenge*, NASA (Apr. 9, 2019), <https://www.nasa.gov/feature/sending-american-astronauts-to-moon-in-2024-nasa-accepts-challenge>; Space Exploration Message, *supra* note 13. But see Kenneth Chang, *The Trump Administration Wants Astronauts on Moon by 2024. But What’s the Plan?*, N.Y. TIMES (Mar. 26, 2019), <https://www.nytimes.com/2019/03/26/science/nasa-moon-pence.html> (noting how President Trump’s ambitious plan to send astronauts to the Moon by 2024 is unclear).

hiatus and, subsequently, shifted the focus of NASA's space program to prioritize human exploration and discovery.⁵⁹ A second space policy directive also advised implementing a "new regulatory system for managing launch and reentry activity."⁶⁰ President Trump's changes to the federal budget may also indirectly affect the FAA's ability to regulate a growing commercial sector by straining their resources or hiring capabilities.⁶¹

Some companies have critiqued the license application process, claiming that it is too long and complicated and that there are new space activities that do not fit into the current framework.⁶² They argue that the current regulatory framework is based on antiquated policies and, thus, is insufficient to keep up with the technological and commercial growth.⁶³ As commercial space flight

59. Exec. Order No. 13,803, 82 Fed. Reg. 31,429, 31,429 (July 7, 2017); *Remarks by President Trump and Vice President Pence at Signing Ceremony for Space Policy Directive-1*, WHITEHOUSE.GOV (Dec. 11, 2017), <https://www.whitehouse.gov/briefings-statements/remarks-president-trump-vice-president-pence-signing-ceremony-space-policy-directive-1/>.

60. *Fact Sheets: President Donald J. Trump is Reforming and Modernizing American Commercial Space Policy*, WHITEHOUSE.GOV (May 24, 2018), <https://www.whitehouse.gov/briefings-statements/president-donald-j-trump-reforming-modernizing-american-commercial-space-policy/>. President Trump also ordered Space Policy Directives Three, implementing a national space traffic management policy, and Four, establishing the U.S. Space Force as a sixth branch of the military. Text of *Space Policy Directive-3, National Space Traffic Management Policy*, WHITEHOUSE.GOV (June 18, 2018), <https://www.whitehouse.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/>; Text of *Space Policy Directive-4: Establishment of the United States Space Force*, WHITEHOUSE.GOV (Feb. 19, 2019), <https://www.whitehouse.gov/presidential-actions/text-space-policy-directive-4-establishment-united-states-space-force/>. *But see* NASA Transition Authorization Act, 51 U.S.C. § 10101 (2017) (prioritizing continuity in NASA directives for presidential transitions to protect civil, military, and commercial projects in place). The creation of the Space Force was recently authorized by the House of Representatives. Catie Edmonson, *House Passes \$738 Billion Military Bill with Space Force and Parental Leave*, N.Y. TIMES (updated Dec. 17, 2019), <https://www.nytimes.com/2019/12/11/us/politics/house-ndaa-space-force-leave.html>.

61. *See* Marisa Garcia, *Did Trump Executive Orders Further Weaken FAA Oversight?*, FORBES (Mar. 18, 2019, 7:04 AM), <https://www.forbes.com/sites/marisagarcia/2019/03/18/did-trump-executive-orders-further-weaken-faa-oversight/#3b1d20e3ca78> ("Regulations are an entanglement of dependencies—one regulation may reference several others. Deciding which ones to pull, without tearing the fabric, is complex and tedious.")

62. *Space Law Then, Now, and in the Future: A Conversation with Pamela Meredith and Laura Montgomery*, 30 AIR & SPACE LAW., no. 4, 2017, at 16 [hereinafter *Space Law Then, Now, and Future*] ("For example, where does mining an asteroid fit among the traditional regulatory bodies?"); Foust, *supra* note 57.

63. Lucy Ingham, *Space and the Law: How Decades-Old Policy is Shaping Exploration*

grows, the debate over the government's role in the industry is politicized. Some lawmakers argue the industry will benefit from diverse competition and balance itself in price and safety.⁶⁴ These lawmakers also caution that agencies that are too closely involved with the industries they regulate are at risk of capture.⁶⁵ On the other hand, some lawmakers emphasize that regulation should ensure consumer safety and foster close government oversight of industries such as commercial space flight.⁶⁶ Lawmakers stress that these regulations help the United States comply with international agreements.⁶⁷

B. U.S. Regulations

In the United States, the purposes of government regulation of commercial space flight are to ensure that U.S. space activity complies with international law, to prevent risk to public interests or safety, to encourage innovation in space exploration, and to promote the commercial sector's economic growth.⁶⁸ Specifically, these regulations allow the government to oversee various aspects of the industry, such as launch activity, safety standards, licensing requirements, accident investigation, and environmental reviews.⁶⁹ Some of

and Commercialization, FACTOR-TECH (Aug. 22, 2014), <https://www.factor-tech.com/space/7435-space-and-the-law-how-decades-old-policy-is-shaping-exploration-and-commercialisation/>.

64. See Spencer H. Bromberg, *Public Space Travel-2005: A Legal Odyssey into the Current Regulatory Environment for United States Space Adventurers Pioneering the Final Frontier*, 70 J. AIR L. & COM. 639, 657 (2005) ("Private investment and competition rapidly decreased launch costs for suborbital spacecraft, making public space travel possible.").

65. Capture is defined as an agency's abuse of regulatory power to harm or advance particular parties that the agency is supposed to regulate. See generally Scott Hempling, "Regulatory Capture": Sources and Solutions, 1 EMORY CORP. GOVERNANCE & ACCOUNTABILITY REV. 23, 25 (2014). See, e.g., Alan Boyle, *SpaceX Files Lawsuit Against the Federal Government—But Asks to Keep the Details Under Wraps*, GEEKWIRE (May 17, 2019), <https://www.geekwire.com/2019/spacex-files-lawsuit-federal-government-asks-keep-details-wraps/>.

66. See, e.g., *Government Regulation: Costs Lower, Benefits Greater than Industry Estimates*, PEW CHARITABLE TRUSTS (May 26, 2015), https://www.pewtrusts.org/-/media/assets/2015/05/industry/government_regulation_costs_lower_benefits_greater_than_industry_estimates.pdf (providing examples of industries that were improved by government regulation).

67. For example, some agreements include the Outer Space Treaty and the Liability Convention. See Dimitri Linden, *The Impact of National Space Legislation on Private Space Undertakings: Regulatory Competition vs. Harmonization*, 8 J. SCI. POL'Y & GOVERNANCE, Feb. 2016, http://www.sciencepolicyjournal.org/uploads/5/4/3/4/5434385/linden_nationalspaceregulation.

68. See 51 U.S.C. § 50901(b) (2012); *Fact Sheet – Commercial Space Transportation Activities*, FAA (Dec. 9, 2019), https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=19074.

69. See generally 14 C.F.R. §§ 400–460 (2019) (listing procedural and licensing regulations).

the companies that operate under this oversight are Blue Origin, United Launch Alliance, SpaceX, and Virgin Galactic.⁷⁰

The regulatory authority for launch activity in the United States is the FAA, an administration within the DOT that regulates civil aviation.⁷¹ The DOT, which is an executive agency, also encompasses the AST, an office within the FAA that is responsible for the regulation and oversight of commercial space programs in the United States.⁷² Other agencies also play a role in the management of commercial space flight activity, such as the Department of Commerce (DOC), the Federal Communications Commission, the Department of State, NASA, the Department of Justice, and the DOD.⁷³ To manage these competing interests and develop a comprehensive space policy and strategy, President Trump re-established the National Space Council, comprised of cabinet members, agency heads, and senior officials.⁷⁴

1. *Current Regulations*

In order to determine how the FAA should exert regulatory authority, it is important to identify the role that Congress intended the FAA to have in the commercial space sector. Currently, private companies compete for government contracts to provide the transportation of people and supplies to the ISS and other exploratory missions.⁷⁵ The CSLA, which enabled the FAA to oversee launches and space flight activity, specifically assigns the FAA the responsibility of issuing commercial licenses in a simplified and expedited way to encourage the development of space technology for use by government

70. For a detailed list, see *Commercial Space Activities*, SPACEPOLICYONLINE.COM, <https://spacepolicyonline.com/topics/commercial-space-activities/> (last updated Dec. 29, 2019) (estimating about forty-eight companies that operate in some type of aerospace technology).

71. *Licenses & Permits: Commercial Space Transportation*, FAA, https://www.faa.gov/licenses_certificates/commercial_space_transportation/ (last visited May 8, 2020); *Our Administration*, DOT, <https://www.transportation.gov/administrations> (last visited May 8, 2020).

72. *About the Office of Commercial Space Transportation*, FAA, https://www.faa.gov/about/office_org/headquarters_offices/ast/ (last visited May 8, 2020). The FAA's core mission is "to provide the safest, most efficient aerospace system in the world." *Safety: The Foundation of Everything We Do*, FAA, https://www.faa.gov/about/safety_efficiency/ (last visited May 8, 2020).

73. For more information on the roles of these agencies, see MORGAN, *supra* note 15, at 8–14.

74. Exec. Order No. 13,803, 82 Fed. Reg. 31,429, 31,429 (July 7, 2017). The Vice President chairs the Council. *Id.*

75. MORGAN, *supra* note 15. For more information on the competition for these government contracts, see Miriam Kramer, *Space Companies Fight for Cash with Rockets on the Line*, AXIOS (Jun. 4, 2019), <https://www.axios.com/space-rockets-government-contracts-spacex-blue-origin-afe8a759-2d17-4aa6-82c8-d0510666fab3.html>.

programs, and to promote the safety of technology that will be used for human space flight.⁷⁶ Presently, private companies compete for government contracts to provide the transportation of people and supplies to the ISS and other exploratory missions.⁷⁷

The FAA's primary method of regulation is the grant of licenses and permits, which are required for private companies to engage in space launch activity in the United States.⁷⁸ The FAA grants four types of licenses or permits available to private companies engaging in space flight: specific licenses, operator licenses, experimental launch permits, and spaceport licenses.⁷⁹ A specific license authorizes one or more launches or reentries at the same site with the same type of vehicle.⁸⁰ An operator license authorizes an indefinite number of launches or reentries, using a family of vehicles, over a specified time period from specified sites.⁸¹ The FAA grants experimental launch and reentry permits to reusable vehicles to develop or test new equipment, which the agency approves more quickly and easily than the full license.⁸² Spaceports, which include launch and reentry sites, also require licenses.⁸³ Additionally, these regulations provide a framework for vehicle and safety requirements, party responsibility, administrative organization, and licensing conditions and procedures.⁸⁴ Since launching space objects is incredibly expensive, a launch licensee is required to obtain third-party liability insurance to protect a launch operator and participants from third-party claims.⁸⁵ This protection also extends the U.S. government in the event it becomes liable under the treaties

76. 51 U.S.C. § 50901(b)(2) (2012) (providing purposes of the CSLA).

77. MORGAN, *supra* note 15.

78. 51 U.S.C. § 50904(a) (2012).

79. 14 C.F.R. §§ 420, 431, 433, 435, 437 (2019).

80. 14 C.F.R. § 431.3(a). "Reentry means to return or attempt to return, purposefully . . . from Earth orbit or from outer space to Earth." 14 C.F.R. § 401.5 (2019).

81. 14 C.F.R. § 431.3(b). The first licensed launch was in 1989 and reentry was in 2010, with 342 launches and twenty-one reentries to date. *Commercial Space Data*, FAA, https://www.faa.gov/data_research/commercial_space_data/ (last modified May 8, 2020).

82. 14 C.F.R. § 437. There is only one active experimental launch permit, held by SpaceX for its Starship Hopper space vehicle, and the FAA has only granted forty-six permits to date. *Commercial Space Data*, *supra* note 81.

83. 14 C.F.R. § 420. There are currently eleven licensed spaceports, split between governmental launch facilities and commercial space ports. *Commercial Space Data*, *supra* note 81.

84. 14 C.F.R. §§ 404, 414–15, 417, 440 (2019).

85. 51 U.S.C. § 50914(a) (2012); 14 C.F.R. § 440.9(b) (2019). The FAA determines the insured amount below a statutory ceiling. 51 U.S.C. § 50914(a)(3). This is in accordance with the Liability Convention. See discussion *supra* pp. 212–13. For an example of a space insurance policy, see *Space Insurance*, AXA XL, <https://axaxl.com/insurance/insurance-coverage/specialty-insurance/space> (last visited May 8, 2020).

In addition to setting space launch requirements, the FAA has promulgated regulations that are specific to human space flight.⁸⁶ Commercial companies that possess an operator license are authorized to have participants or crew members on board their spacecraft, but must comply with the CSLA.⁸⁷ Both crew members and participants are required to waive their ability to bring claims against the U.S. government and the applicable parties involved in the launch and reentry services.⁸⁸ Crew members are also required to have extensive training for typical, atypical, and emergency scenarios.⁸⁹ Operators are responsible for this training, as well as maintaining records, obtaining informed consent, and ensuring the vehicle's atmospheric conditions, safety measures, and risk detection features.⁹⁰

2. Proposed Regulations

On March 26, 2019, the DOT and FAA filed an NPRM to streamline the licensing process for space launches and replace prescriptive safety requirements with performance-based ones.⁹¹ The proposed changes intend to lower administrative costs and promote growth in the commercial sector without sacrificing safety standards by permitting more flexibility in technological requirements.⁹² The licenses for expendable launch vehicles, reusable launch vehicles, and reentry vehicles will be consolidated into one type of license under 14 C.F.R. § 450.⁹³ The criteria for acquiring the new license under 14 C.F.R. § 450 would still use standards from 14 C.F.R. §§ 415, 417, 431, and 435.⁹⁴

Private companies with multiple types of vehicles will only have to apply for one type of license, and upon receiving that license they will have the freedom to launch various types of spacecraft from multiple launch sites on their own

86. 14 C.F.R. § 460 (2019).

87. See *id.* § 460.45; Pamela L. Meredith & Marshall M. Lammers, *Commercial Spacelight: "The Ticket to Ride"*, 25 AIR & SPACE LAW., no. 1, 2012, at 4-5.

88. 14 C.F.R. §§ 460.19, 460.49; 14 C.F.R. pt. 400, app. E (2019). 51 U.S.C. § 50914(b) (2012).

89. 14 C.F.R. §§ 460.5, 460.7. Participants must also have emergency training. *Id.* § 460.5.

90. *Id.* § 460. For the requirements of informed consent, see *id.* § 460.45.

91. See Streamlined Launch and Reentry Licensing Requirements, 84 Fed. Reg. 15,296, 15,297 (proposed Apr. 15, 2019).

92. *Id.* at 15,298, 15,301-05 (accomplishing flexibility through performance-based standards and structural changes that allow a license to accommodate many types of launches and reentries).

93. *Id.* at 15,302-03.

94. *Id.* at 15,301.

time.⁹⁵ These changes will make it easier and cheaper for a private company to acquire a launch license that they can use more freely than the current licenses.⁹⁶ Since human space flight vehicles are prohibited from launching without a license, the effects of this new licensing structure will apply to flights carrying human participants.⁹⁷

This NPRM has generated several critical comments. While many comments, particularly by private companies, express enthusiasm for expanding the commercial sector, they also acknowledge that this growth comes at the expense of concrete safety regulations.⁹⁸ A particular concern is that this transition to performance-based requirements, without sufficiently established track records from which to base performance on, relaxes safety standards and are exceedingly ambiguous.⁹⁹ Critics also point out that these changes will exclusively benefit established space flight companies that use expendable launch vehicle technology and the new, singular license requirements are too difficult for a new company to meet.¹⁰⁰

Commenters also express concern that the FAA did not provide the promised guidance documents throughout the comment period, which made it increasingly difficult for private companies and individuals to meaningfully

95. *Id.* at 15,302–03.

96. “[T]he FAA estimates this proposed rule would affect approximately 276 launches over the next five years (2019 through 2023).” *Id.* at 15,298. Considering there has only been 342 launches since 1989, this is a significant effect. *See Commercial Space Data, supra* note 81.

97. Streamlined Launch and Reentry Licensing Requirements, 84 Fed. Reg. at 15,442.

98. *See* Michael Kezirian, President, Int’l Space Safety Found., Comment Letter on Proposed Rule on Streamlined Launch and Reentry Licensing Requirements (Aug. 16, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0146> (“We are very much concerned about . . . the emphasis on quantitative performance requirements in lieu of [] qualitative performance requirements.”).

99. *See* Steve Weinkle, Comment Letter on Proposed Rule on Streamlined Launch and Reentry Licensing Requirements (Aug. 19, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0147>; *see also* Blue Origin, Comment Letter on Proposed Rule on Lighting Hazard Mitigation (Sept. 10, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0179>. Some comments even suggest that the Notice of Proposed Rulemaking (NPRM) simply uses alternative language and that the requirements are still prescriptive. *See* Commercial Spaceflight Federation, Comment Letter on Proposed Rule on Streamlined Launch and Reentry Licensing Requirements (Aug. 19, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0150>.

100. *See* Jacqueline Eichhorn, Comment Letter on Proposed Rule on Streamlined Launch and Reentry Licensing Requirements (Aug. 20, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0173>. Additionally, this leaves the established companies to largely self-regulate and drastically diminishes the FAA’s regulatory oversight after a license has been granted. *Id.*

participate in the discussion.¹⁰¹ Some comments question whether the FAA even has the regulatory authority to consolidate the rules into one single licensing process in the first place.¹⁰² Others caution that the regulations are too broad and are not accompanied by the resources necessary to accommodate them.¹⁰³ The FAA should prepare for the effect that these proposed changes are likely to have on the commercial space flight industry, and it can use aviation as a model to predict similar trends.

II. COMPARING COMMERCIAL AVIATION WITH COMMERCIAL HUMAN SPACE FLIGHT

Early aviation and human space flight are similar, but not identical.¹⁰⁴ For example, a major difference is the object of regulation in each industry. In aviation, the FAA regulates the individual aircraft through a system of certification.¹⁰⁵ In space flight, the FAA regulates launch and reentry activity, through a system of licenses and permits.¹⁰⁶ Still, both industries began as groundbreaking technological advancements in human transportation.¹⁰⁷ This Part argues that the similarities between aviation and space flight justify

101. See Space Exploration Technologies, Corp., Comment Letter on Proposed Rule on Streamlined Launch and Reentry Licensing Requirements (Aug. 19, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0168> (“For example, in § 450.35 Accepted Means of Compliance, there are seventeen [Advisory Circulars] cited that have yet to be developed or published for industry comment.”); Denver International Airport, Comment Letter on Proposed Rule on Streamlined Launch and Reentry Licensing Requirements (Aug. 19, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0161>.

102. See Denver International Airport, *supra* note 101.

103. See Aviation Community Group Letter to Administrator, Comment Letter on Proposed Rule on Streamlined Launch and Reentry Licensing Requirements (Aug. 19, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0175>; Space Florida, Comment Letter on Proposed Rule on Streamlined Launch and Reentry Licensing Requirements (Aug. 19, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0155>.

104. See generally Louis Francis Rosa, *Apples and Oranges: Why Aircraft Protocols Don't Work in Space*, 39 J. SPACE L. 327 (2014) (contrasting the history of aircraft and space craft to show that industry lacked support for one and was a driving force for the other).

105. See generally 14 C.F.R. §§ 1.1-49.63 (2019) (outlining general terms, procedural rules, and aircraft standards).

106. See discussion *supra* Part I.B.1.

107. See AIR LINE PILOTS ASS'N, INT'L, ADDRESSING THE CHALLENGES TO AVIATION FROM EVOLVING SPACE TRANSPORTATION 2-3 (2018) [hereinafter ALPA] [https://www.alpa.org/~media/ALPA/Files/pdfs/news-events/white-papers/white-paper-aviation-space.pdf](https://www.alpa.org/~/media/ALPA/Files/pdfs/news-events/white-papers/white-paper-aviation-space.pdf).

using the early development of the aviation industry as a model to predict the trends and limitations of commercial space flight.¹⁰⁸

A. *Aviation as an Early Indicator for Issues in Space Flight*

On December 17, 1903, Orville Wright revolutionized human transportation and became the first human to fly when a flying machine he and his brother built took off on the North Carolina coast.¹⁰⁹ Still, it took almost forty years for planes to evolve from the Wright Brothers' jerry-rigged glider to the jet airliners that are commonplace today.¹¹⁰ While the spacecraft used for the lunar mission was far from a "jerry-rigged glider," the movement for more efficient technology and normalized space travel illustrates notable similarities between aviation and space flight. For example, the markets for both aviation and space flight were created by new technological developments in transportation systems that revolutionized the way humans travel and view the world.¹¹¹ The most notable similarities include the technological development, regulatory authority, and dependence on the commercial sector.

1. *Technological Development*

One major similarity between the aviation and space flight industries is the progression of technological developments and events that motivated each

108. Cost is another notable difference between aviation and space flight. Space flight technology is much more expensive than early aviation technology. Compare Tim Sharp, *World's First Commercial Airline: The Greatest Moments in Flight*, SPACE.COM (May 22, 2018), <https://www.space.com/16657-worlds-first-commercial-airline-the-greatest-moments-in-flight.html> (stating that first commercial plane ticket cost \$400.00, which would be about \$8,500.00 today), with Eric M. Johnson, *Virgin Galactic Completes Crewed Space Test*, REUTERS (Dec. 13, 2018, 8:25 AM), <https://www.reuters.com/article/us-virgingalactic-rockets/virgin-galactic-completes-crewed-space-test-more-flights-soon-idUSKBN1OC1HA> ("A 90-minute flight costs \$250,000."), and Jason Davis, *How Much Does Space Travel Cost?*, NBC NEWS (Oct. 15, 2018, 11:46 AM), <https://www.nbcnews.com/mach/science/how-much-does-space-travel-cost-ncna919011> (estimating that tickets will cost tens of millions of dollars).

109. *1903 The First Flight*, NAT'L PARK SERV. (Apr. 14, 2015), <https://www.nps.gov/wrbr/learn/historyculture/thefirstflight.htm>.

110. See Richard P. Hallion, *Airplanes That Transformed Aviation*, AIR & SPACE MAG. (July 2008), <https://www.airspacemag.com/history-of-flight/airplanes-that-transformed-aviation-46502830/?all>.

111. See John Demartini, *The Evolution of Space Transportation*, JETSET MAG. (June 30, 2014), <http://www.jetsetmag.com/travel/aviation/evolution-of-transportation/>; see also Hamilton DeSaussure, *Maritime and Space Law, Comparisons and Contrasts (An Oceanic View of Space Transport)*, 9 J. SPACE L. 93, 94 (1981) (comparing maritime law and space law).

industry. Prior to World War I, one of the premiere functions of commercial aviation was to improve the U.S. Postal Service.¹¹² The increased use of these planes led the military to realize the advantage of aircraft in an offensive, defensive, and reconnaissance capacity.¹¹³ Planes grew bigger, faster, and more powerful over the next decades.¹¹⁴ This era is commonly referred to as “Early Aviation” and was followed by a shift to commercial uses of airplanes, known as the “Jet Age.”¹¹⁵ There was also a surplus of planes and pilots after World War II.¹¹⁶ Fortunately, the aviation industry needed planes and pilots, and turned its attention to the transportation of people and cargo on a larger scale.¹¹⁷

Space flight in the United States developed at the rate that it did due to the international pressures of the “Space Race” and military budgeting for NASA’s space technology programs.¹¹⁸ In fact, NASA facilitated all U.S. human space flight activity until the early 2000’s.¹¹⁹ As a result of increasing interest in human space flight, private companies developed technology with commercial uses in mind, including space tourism.¹²⁰ Today, the government relies on private space flight companies to transport cargo to the ISS.¹²¹ This commercial activity revived public interest in space flight and ushered in the era of “New Space.”¹²²

112. William M. Leary, Jr., *At the Dawn of Aviation: Inglis M. Uppercu and Aeromarine Airways*, BUS. H. REV. 180, 180–83 (1979).

113. See Michael A. Clarke, *The Evolution of Military Aviation*, 34 NAT’L ACAD. ENG’G, Spring 2014, at 29, 30–31, <https://www.nae.edu/File.aspx?id=7351&v=fdd1a810>.

114. See *id.* at 31–32.

115. *The Jet Age*, BRITANNICA ONLINE ENCYCLOPAEDIA, <https://www.britannica.com/print/article/210191> (last visited May 8, 2020).

116. See Clarke, *supra* note 113.

117. *The First Generation of Jet Airlines*, SMITHSONIAN NAT’L AIR & SPACE MUSEUM, <https://airandspace.si.edu/exhibitions/america-by-air/online/jetage/jetage02.cfm> (last visited May 8, 2020).

118. See STINE, *supra* note 22, at 2–3.

119. See MORGAN, *supra* note 15.

120. See Michael Sheetz, *Super Fast Travel Using Outer Space Could be \$20 Billion Market, Disrupting Airlines, UBS Predicts*, CNBC (Mar 18, 2019, 2:40 PM), <https://www.cnbc.com/2019/03/18/ubs-space-travel-and-space-tourism-a-23-billion-business-in-a-decade.html>.

121. See *Contracts for Feb. 19, 2019*, U.S. DEP’T OF DEF., <https://www.defense.gov/Newsroom/Contracts/Contract/Article/1760766/>. See ALPA, *supra* note 107, at 3 (“[O]nly [28%] of all space launches are for the United States government. The remainder are for commercial purposes.”).

122. See *The Dawn of a New Era in Human Spaceflight*, NASA, <https://www.nasa.gov/image-feature/the-dawn-of-a-new-era-in-human-spaceflight> (last updated Mar. 5, 2019) (quoting Astronaut McClain, aboard SpaceX’s Dragon spacecraft).

2. Regulatory History

Another similarity is that both the aviation and space flight industries are subject to oversight by the FAA.¹²³ The legislation and regulation of the early aviation industry and current space flight industry were primarily focused on public safety.¹²⁴ Leaders recognized early on that safety, and perceived safety, impacts these industries by encouraging financiers and participants to invest in the market.¹²⁵ When equipment and safeguards fail, investors lose money on their investments and public demand drops due to a concern for safety.¹²⁶ However, the government struggled from the beginning to identify a balance between safety and economic interests as commercial aviation became the focus of the industry.

In 1926, the Air Commerce Act (ACA),¹²⁷ established the Aeronautics Branch of the DOC, which enacted regulations to oversee safety in six major ways: inspections, licensing, medical issues, engineering, statistics, and enforcement.¹²⁸ The primary purpose of the ACA was to promote a commercial sector by improving aviation safety.¹²⁹ However, legislators seriously underestimated the growth of the industry when developing its budget, and the agency could not keep up.¹³⁰ Inspectors often abused their authority as a result of insufficient pay, long hours, and a lack of oversight.¹³¹ Correspondingly, aircraft accidents and fatalities increased, which, along with the Great Depression, caused airlines and the industry to suffer.¹³²

In response, Congress passed the Civil Aeronautics Act (CAA) of 1938.¹³³ The CAA created the Civil Aeronautics Board (CAB) and shifted the

123. See *What We Do*, FAA, <https://www.faa.gov/about/mission/activities/> (last visited May 8, 2020).

124. OFFICE OF AVIATION RESEARCH & DEV., FAA, REPORT NO. DOT/FAA/AR-08/39, HISTORY OF AVIATION SAFETY OVERSIGHT IN THE UNITED STATES 1-2 (2008) [hereinafter HISTORY OF AVIATION OVERSIGHT], <http://www.tc.faa.gov/its/worldpac/techrpt/ar0839.pdf>; *Safety: The Foundation of Everything We Do*, FAA, https://www.faa.gov/about/safety_efficiency/ (last visited May 8, 2020).

125. See MORGAN, *supra* note 15, at 6.

126. *Id.*

127. Pub. L. No. 69-254, 44 Stat. 568 (1926).

128. HISTORY OF AVIATION OVERSIGHT, *supra* note 124, at 2.

129. See M. HOUSTON JOHNSON V, TAKING FLIGHT: THE FOUNDATIONS OF AMERICAN COMMERCIAL AVIATION, 1918-1938, at 65 (2019).

130. *Id.* at 70. Even with increases in the budget and the creation of temporary certificates and licenses, the backlog did not catch up until almost five years later. *Id.*

131. See NICK A. KOMONS, BONFIRES TO BEACONS: FEDERAL CIVIL AVIATION POLICY UNDER THE AIR COMMERCE ACT, 1926-1938, at 222, 277 (Smithsonian Institution Press 1989).

132. *Id.*

133. Pub. L. No. 75-706, 52 Stat. 973.

economic regulatory authority to the CAB.¹³⁴ The CAB's regulations limited which carriers could enter or exit the market and controlled the output, profit, and prices of these carriers.¹³⁵ These regulations, which were based on economic growth, indirectly raised service quality and passenger safety and reduced the number of operable airlines.¹³⁶

In 1959, Congress established the FAA to oversee carrier safety and rulemaking activities for the aviation industry.¹³⁷ The newly formed FAA had a tense relationship with the CAB, predominantly because the FAA took all responsibilities, except for accident investigations and some economic oversight, from the CAB.¹³⁸ The FAA regulated safety heavily, which was a sharp contrast from CAB regulations.¹³⁹ This shift, combined with inconsistent leadership initiatives in the FAA, caused increasingly fractured relations between airlines and their regulators.¹⁴⁰ Congress did not decide to reduce economic regulations on airlines until 1978, when it passed the Airline Deregulation Act.¹⁴¹ This sudden reduction of economic regulations triggered another influx of commercial carriers, but this time the legislation was accompanied by a budget that adequately addressed the workload concerns for inspectors.¹⁴² This system, which persists today, regulates aircraft design, inspection, and maintenance by certifying an aircraft's airworthiness with specific safety standards but leaves the industry to generally self-regulate economic forces.¹⁴³

134. See WILLIAM A. JORDAN, AIRLINE REGULATION IN AMERICA: EFFECTS AND IMPERFECTIONS 1-2 (1970) (analyzing the success of the Civil Aeronautics Act by comparing Civil Aeronautics Board (CAB) certificated carriers with intrastate airlines not regulated by the CAB).

135. *Id.* at 33, 35. Airline fares were subject to approval by the CAB. Federal Aviation Act of 1958, Pub. L. No. 85-726, § 403(a), 72 Stat. 731, 758-59.

136. JORDAN, *supra* note 134, at 51-53, 178 ("Of the sixteen intrastate carriers that operated within California between 1946 and 1965, all but two terminated service by the end of 1965."). Economic pressure and airline rivalries are likely responsible for the increase in airline safety and service, not CAB safety regulations. See also W. DAVID LEWIS, AIRLINE EXECUTIVES AND FEDERAL REGULATION 19-22 (2000).

137. JORDAN, *supra* note 134, at 51-53.

138. *See id.*

139. *See id.*

140. *See id.*

141. *See* Pub. L. No. 95-504, 92 Stat. 1705 (1978). This effectively abolished the CAB, with its official end in 1985. *See* Civil Aeronautics Board Sunset Act of 1984, Pub. L. No. 98-443, 98 Stat. 1703.

142. *See* HISTORY OF AVIATION OVERSIGHT, *supra* note 124, at 23, 26 (highlighting that the FAA called for increased standardization of inspection procedures and emphasized performance standards).

143. 14 C.F.R. §§ 21.1-49.63 (2019); JOHNSON, *supra* note 129, at 236.

A major consequence of all of the inconsistent and shifting legislation is the creation of multiple different regulatory authorities, each with its own goals and strategies. The ACA focused on commercial growth and safety.¹⁴⁴ The CAA prioritized the development of the commercial sector.¹⁴⁵ Finally, the FAA focused on safety and consumer protections.¹⁴⁶ Similarly, in space flight, the government's role has switched from developer, to operator, to supporter, and now to overseer in just fifty years. Even the proposed regulatory changes appear to be driven by an administrative interest in increased promotion of the commercial sector.¹⁴⁷

Currently, FAA regulations on human space flight are not directed to protect crew members and participants. While the regulations do provide some safety measures, such as vehicle standards, emergency training, and informing passengers of the risks, the safety of crew members and space flight participants is not the primary priority behind the regulations.¹⁴⁸ In fact, amendments to the CSLA effectively issued a temporary moratorium on any new space flight regulations to allow commercial developers the freedom to experiment with innovative technologies in human space flight.¹⁴⁹ While this may seem like relaxed safety standards, the safety regulations for the launch of space vehicles are still in place—the moratorium simply prevents *new* regulatory action that would make technological innovations unduly difficult without an adequate reason to do so. Additionally, technology is tested extensively before carrying civilian space flight participants.¹⁵⁰

3. *Dependence on Commercial Activity*

The CSLA is comparable to the ACA in that the ACA also created the federal authority to regulate commercial activity, develop an infrastructure, and promote the aviation industry.¹⁵¹ However, while that oversight would

144. Air Commerce Act (ACA) of 1926, Pub. L. No. 69-254, 44 Stat. 568.

145. 49 U.S.C. § 40101 (2012).

146. See HISTORY OF AVIATION OVERSIGHT, *supra* note 124, at 1 (showing safety is the FAA's mission).

147. See Chao, *supra* note 56 (“[T]his action will strengthen our country's competitiveness in the commercial space sector.”).

148. See generally 14 C.F.R. §§ 400–460 (2019). Informing participants of the risks of human space flight is part of the participant's assumption of risk and informed consent. § 460.9.

149. See 51 U.S.C. § 50905(c)(9) (2012) (providing that the Secretary *may* propose new regulations based on evolving safety standards) (emphasis added).

150. See *Virgin Galactic to Make 2nd Key Test Flight out of Mojave with Goal of Commercial Space Travel*, KTLA (Feb. 21, 2019, 6:16 PM), <https://ktla.com/news/local-news/virgin-galactic-to-make-2nd-key-test-flight-out-of-mojave-with-goal-of-commercial-space-travel/> (describing the test work of two veteran pilots).

151. See JOHNSON, *supra* note 129, at 65.

change agencies, roles, and goals over the next thirty years, the ultimate regulatory authority would vest in the FAA.¹⁵² One of the driving factors behind these legislative changes is that the government predominantly emphasized commercial growth. In fact, the CAA, which replaced the ACA, explicitly prioritized economic expansion.¹⁵³

Like the early days of commercial aviation, the United States is dependent upon contracts with private companies to develop technology that will be used for both private and public purposes.¹⁵⁴ The CSLA allowed the government to encourage technological developments in space travel and maintain a level of control over the industry at a time when public support and funds for NASA were waning.¹⁵⁵ The CSLA expects the FAA to promote commercial space transportation but only provides the FAA with the regulatory authority to manage the licensing process of launches for various space flight activity.¹⁵⁶

B. *The Aviation Industry Today*

Early aviation regulations interrupted industry growth and contributed to an unsteadiness that persisted for almost fifty years. Legislation was reactionary to the weaknesses of the industry. The era of FAA regulation, which used its authority to focus on licensing and safety measures, was the regulatory era with the most overall growth in the industry.¹⁵⁷

Today, the aviation industry is a global market that is fundamentally strong and stable.¹⁵⁸ Despite cost fluctuations, the industry's profitability remains largely consistent.¹⁵⁹ Regulations are focused on security, safety, consumer

152. See *A Brief History of the FAA*, NAT'L AERONAUTICS & SPACE ADMIN, https://www.faa.gov/about/history/brief_history/ (last visited May 8, 2020).

153. Pub. L. No. 75-706, 52 Stat. 973 (1938); HISTORY OF AVIATION OVERSIGHT, *supra* note 124.

154. See, e.g., *Contracts for Feb. 19, 2019*, *supra* note 121 (outlining contracts with companies in the United States and the U.S. military).

155. See generally 51 U.S.C. §§ 50901–23 (2012) (space commerce).

156. See § 50901(b).

157. HISTORY OF AVIATION OVERSIGHT, *supra* note 124 (stating that this was the ACA's initial strategy, but its budget constrained the effectiveness of these regulations).

158. See AIRLINE ECON. & KPMG, *The State of the Aviation Industry*, in AVIATION INDUSTRY LEADERS REPORT 2019: TACKLING HEADWINDS, at 9 (2019), <https://assets.kpmg/content/dam/kpmg/ie/pdf/2019/01/ie-aviation-industry-leaders-report-2019.pdf>.

159. *Id.* (suggesting that shifts in cost are due to factors like fuel prices); see also ALPA, *supra* note 107, at 4 (“In 2017, commercial aviation provided a record \$15 billion in revenue.”).

protection, and the modernization of the FAA.¹⁶⁰ Additionally, the penalties for failing to comply with these regulations are very high.¹⁶¹ Compliance is a key consideration in an airline's decisionmaking, and the risk of noncompliance could jeopardize even the most successful airlines.¹⁶²

III. USING AN EARLY AVIATION MODEL ON COMMERCIAL SPACE FLIGHT

The issues emerging in commercial space flight closely mirror the issues that arose in early commercial aviation.¹⁶³ For example, public and government interest in space flight as a revolutionary transport system is a driving factor behind technological innovation.¹⁶⁴ The aviation and space flight industries are not a perfect match, but are comparable enough to use early aviation as a cautionary tale for the obstacles the space flight industry may face. While there are several issues emerging in commercial space law,¹⁶⁵ this Part will focus on current commercial human space flight regulation. Specifically, this Part uses trends in early aviation to predict issues in safety, economy, and stability.

A. Safety

When the FAA prioritizes safety, it meets several key regulatory objectives. In addition to the health and safety of pilots, crew members, and space flight participants, the industry is motivated to protect their investments in very expensive technology.¹⁶⁶ The government and commercial sector both have

160. See Jennifer P. Henry & Mackenzie S. Wallace, *Buried in Regulations: Emerging Issues in the Aviation Industry*, 43 BRIEF 50, 52 (2014).

161. *Id.*; see also Benjamin Zhang, *Airlines are Making More Money than Ever—But They're Facing a Mountain of Problems*, BUS. INSIDER (Apr. 15, 2018, 8:57 AM), <https://www.businessinsider.com/airlines-biggest-business-problems-2018-4>.

162. See Henry & Wallace, *supra* note 160.

163. See discussion *supra* Part I.

164. Lou Friedman, *Public Interest and Space Exploration*, SPACE REV. (Jan. 10, 2011), <http://www.thespacereview.com/article/1755/1>.

165. Other issues not mentioned include: How is tort liability applied when space objects—such as retired or operative satellites—collide? Robert P. Merges & Glenn H. Reynolds, Comment, *Rules of the Road for Space?: Satellite Collisions and the Adequacy of Current Space Law*, 40 ENVTL. L. REP. 10,009 (2010). What is the best way to resolve property rights as human activity in space increases? *Space Law Then, Now, and Future*, *supra* note 62, at 14. As human space flight becomes commonplace among the general public, will the international law standard of common carrier liability apply to persons, luggage, or goods carried by spacecraft? See Convention for the Unification of Certain Rules Relating to International Transportation by Air, October 12, 1929, 49 Stat. 3000.

166. See Diane Howard, *Safety as a Synergistic Principle in Space Activities*, 10 FIU L.

an interest in maintaining public confidence as the market will depend on a consumer base to turn these business investments into profits.¹⁶⁷ This is aggravated by the fact that space flight is inherently dangerous and unpredictable, and even the slightest setback may attract negative media attention and thus delay technological development.¹⁶⁸

When it came to safety, commercial aviation regulators recognized that the government could play an efficient role in minimizing risk of death or injury. The successful operation of the U.S. Air Mail Service gave Congress the confidence to enact the ACA, thereby establishing agency oversight over commercial aviation.¹⁶⁹ However, Congress underestimated the resources that this new regulatory authority would need to effectively monitor the industry and complete the extensive license and certification process required. A limited budget led to a backlog in inspection schedules, numerous corrupt inspectors, and a couple of majorly publicized aviation accidents that weakened public confidence in the commercial sector and the government's ability to regulate it.¹⁷⁰ While the nature of the government oversight changed repeatedly throughout the century, the oversight was most successful when safety was the regulatory focus.¹⁷¹

For space flight, the CSLA gives the FAA authority to impose regulations on safety measures, training, liability considerations, insurance requirements, and compliance with international treaties. Space flight companies must meet these requirements in order to apply for and receive certain licenses or permits that authorize launching capabilities.¹⁷² Maintaining safety is the FAA's

REV. 713, 713, 717-18, 727 (2015) (indicating that protecting space infrastructure is also considered "space safety").

167. For example, Boeing grounded its 737s beginning in July 2019; this near-unprecedented move had a significant effect on airlines and passengers. See Jim Zarroli, *Boeing 737 Max Grounding Takes Toll on Airlines and Passengers*, NPR (July 29, 2019, 5:47 PM), <https://www.npr.org/2019/07/29/746345317/boeing-737-max-grounding-takes-toll-on-airlines-and-passengers>.

168. See Meredith & Lammers, *supra* note 87.

169. Air Commerce Act of 1926, Pub. L. No. 69-254, 44 Stat. 568 (1926).

170. HISTORY OF AVIATION OVERSIGHT, *supra* note 124.

171. See Grant Cates, *Airmail and the Evolution of the U.S. Aviation Industry in the 1920s and 1930s: A Potential Model for the Space Industry in the Next Millennium*, Paper Session at the Space Means Business in the 21st Century Conference (May 2, 2000), in 37 SPACE CONG. PROCEED., no. 6, 2000, at 6-8 (identifying nexus between safety and success in early aviation).

172. See generally MORGAN, *supra* note 15, at 2-7 (discussing licensing launch and reentry, insurance, and safety requirements); see also Howard, *supra* note 166, at 713, 717-18, 727 (describing the role safety plays in formulating national space laws).

number one priority.¹⁷³ However, since space flight is still very experimental, most FAA safety regulations focus on the safety of the “general public,” not space flight participants or personnel.¹⁷⁴ As human space flight continues to modernize, space flight participants will begin to make up a larger portion of the “general public.” Therefore, FAA regulations may shift to prioritize the safety of space vehicles and minimize the risk to space flight participants and crew members.

There are concerns that the license application and acceptance process is too long and tedious. However, the safety standards are properly uniform and predictable. These regulations apply to both established space flight companies experimenting with new designs, and new space flight companies looking to enter the market.¹⁷⁵ A company also can acquire an experimental permit if it is looking for flexibility in designing new technology.¹⁷⁶ Additionally, while the proposed performance-based requirements are more flexible, they are also vaguer.¹⁷⁷

B. Economy

While private companies have historically contributed to developing space flight technology, commercial space activity cannot subsist on curiosity alone—it will need a profitable market and a return on investments in order to continue growing.¹⁷⁸ Considering the government investment in and

173. *Mission*, FAA, <https://www.faa.gov/about/mission/> (last visited May 8, 2020). *But see* H.R. Rep. No. 108-429 (2004), at 2-3 (indicating that lawmakers intended a different approach to space flight than to aviation by prioritizing public safety and industry growth over participant safety).

174. 51 U.S.C. § 50901(b)(3) (2012) (“[T]o protect the public health and safety, safety of property, and national security and foreign policy interests of the United States.”).

175. *See* Foust, *supra* note 57 (noting emphasis in having a streamlined process). This consistency is also due to Congress imposing a moratorium on new regulations. However, some private companies may not be as compliant as was thought. *See, e.g.*, Press Release, U.S. Dep’t of Justice, Penn Yan Man Charged with Falsifying Inspection Reports for Space Parts (May 22, 2019), <https://www.justice.gov/usao-wdny/pr/penn-yan-man-charged-falsifying-inspection-reports-space-parts> (detailing a criminal complaint against an engineer at an aerospace company for creating false certifications, for space vehicle parts procured by SpaceX).

176. 14 C.F.R. § 437 (2019).

177. *See* Weinkle, *supra* note 99 (providing an example of the FAA’s failure to recognize problems with Spaceport Camden’s Environmental Impact Statement).

178. *See The Pros and Cons of Privatizing Space Exploration*, FORBES (Apr. 4, 2017, 1:29 PM), <https://www.forbes.com/sites/quora/2017/04/04/the-pros-and-cons-of-privatizing-space-exploration/#2a20245b3319> (“In order to be something worth doing, for a private company, there would need to be a way to recoup the cost and to return a profit sufficient to attract the investors that would fund that cost.”); *see, e.g.*, I. H. Ph. Diederiks-Vershoor & W. Paul Gormley, *Future Legal Status of Nongovernmental Entities in Outer Space: Private Individuals*

dependence on space flight technology, the recent shift in agency attention to commercial growth is understandable. Similar shifts in regulatory goals for aviation caused the industry to struggle in its early days.¹⁷⁹

Despite many efforts, regulations failed to effectively promote the early aviation industry's commercial growth.¹⁸⁰ This failure is primarily due to Congress's difficulty in identifying a suitable balance between safety and commercial growth, which resulted in inconsistent and unpredictable oversight.¹⁸¹ Additionally, relaxed safety standards and commercial incentives created an influx of new companies entering the market, which heightened competition and strained regulatory authority to manage the industry without expansions to its budget.¹⁸²

Given the appeal of human space flight, consistency in economic regulations and oversight is critical in defining commercial expansion. Fortunately, the government does not have to sacrifice safety standards entirely to promote the commercial sector's growth. Safe space flight vehicles promote commercial activity in two major ways: by increasing public confidence in the technology, and protecting public and private investments.¹⁸³ Considering the effect these regulatory changes had on early aviation, it is likely that proposed changes to FAA regulations will encourage more companies to invest in human space flight. But, it would also increase the workload that the FAA will be required to oversee.¹⁸⁴ Currently, the FAA's budget for space flight is not reflective of the expansion that these regulatory changes hope to achieve.¹⁸⁵

and Companies as Subjects and Beneficiaries of International Space Law, 5 J. SPACE L. 125, 140 (1977) ("Officials of NASA estimate that the materials discovered on the [M]oon and returned to earth are, at the very least, equal in value to the twenty-five billion dollars spent on the Apollo program.").

179. See *supra* Part II.A.2 (explaining the difficulties of balancing economic prosperity with consumer safety).

180. See *supra* Part II.A.1 (discussing the mismatch between regulatory goals and outcomes).

181. See JORDAN, *supra* note 134, at 51–52 (noting inconsistent effects).

182. See discussion *supra* Part II.A.2 (analyzing how the FAA carried out oversight).

183. Tom Reddon, *Realize the Connection Between Productivity and Safety*, ISHN (Oct. 2, 2014), <https://www.ishn.com/articles/99728-realize-the-connection-between-productivity-and-safety>.

184. See ALPA, *supra* note 107, at 9 (indicating industry support for the FAA participating in safety risk analysis and rulemaking processes).

185. See generally BUDGET ESTIMATES: FISCAL YEAR 2018, *supra* note 7, at 3–7 (including language to promote space flight growth, but failing to show corresponding appropriations increases); see, e.g., Curt Nickisch, *Understanding the Space Economy*, HARV. BUS. REV. (May 28, 2019), <https://hbr.org/ideacast/2019/05/understanding-the-space-economy> ("Amazon CEO

C. Stability

A consistent regulatory system with predictable requirements is key to help new space flight companies avoid unnecessary waste, as they are already fronting the high expenses of developing this technology. Additionally, FAA reliability is extremely important to creating a domestic space policy that will stand the test of time and changes in political leadership.¹⁸⁶

Legislators overlooked the value of a consistent framework in developing commercial aviation and repeatedly delegated a new regulatory authority as a reaction to a struggling industry.¹⁸⁷ The early aviation industry was not as profitable as Congress hoped it would be.¹⁸⁸ This lack of commercial growth is likely due to fluctuating regulations and the government's early role, which was neither helpful nor reliable.¹⁸⁹ When the industry did stabilize, it was due to Congress's response to the issues that they created in the first place.¹⁹⁰

Designing, manufacturing, testing, and perfecting the technology required to successfully launch spacecraft and people into space comes at not only a high monetary cost, but also substantial investments of time and labor.¹⁹¹ The time, cost, and labor involved all heighten the need for a dependable regulatory framework, and were major factors behind a moratorium that limited the creation of new regulations without a substantial justification to do so.¹⁹² Despite this consideration, the current Administration is shifting the

Jeff Bezos says he's personally spending more than \$1 billion each year to fund his other enterprise.”).

186. However, the FAA is an independent executive agency, and therefore at the direction of the President, who changes every four or eight years. Haley Weiss, *A Short History of Presidential Vacillation: Mars or the Moon*, THE ATLANTIC (June 8, 2019), <https://www.theatlantic.com/science/archive/2019/06/trump-moon-part-of-mars/591319/>.

187. See *supra* Part II.A.2 (analyzing actions taken by the CAB and the FAA).

188. W. Lloyd Lane, *Federal Regulation of Aviation*, 37 MICH. ST. B.J. 15, 16 (1958) (“[A] Senate committee stated that commercial aviation had not advanced as rapidly in the United States as had been hoped.”).

189. See *id.* (“This [lack of growth] was widely attributed to the failure of the federal government up to that time to encourage and regulate the use of aircraft in air commerce.”).

190. See Douglas Messier, *Early Aviation & the Safety of Space Tourism*, PARABOLICARC (Mar. 9, 2016), <http://www.parabolicarc.com/2016/03/09/early-aviation-safety-space-tourism/> (attributing aviation accidents and a weak aviation industry to a lack of resources and industry preparedness).

191. See, e.g., Davis, *supra* note 108 (listing prices in the millions and billions for satellites, private astronauts, and rocket launches).

192. See 51 U.S.C. § 50905(c)(9) (2012) (codifying moratorium). See generally U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-15-706, FEDERAL AVIATION ADMINISTRATION: COMMERCIAL SPACE LAUNCH INDUSTRY DEVELOPMENTS PRESENT MULTIPLE CHALLENGES (2015), <https://www.gao.gov/assets/680/672144.pdf> (describing factors considered in keeping the moratorium in 2015).

objectives of space flight regulation from promoting safety to expanding the commercial sector—namely, by making it easier to obtain a license for space flight launches.¹⁹³

These changes will likely encourage an influx of companies entering the commercial space flight sector. Without a budget that accounts for industry growth, this growth could extend the amount of time and personnel needed to approve and grant a license. In trying to maintain a quick application process, inspectors may be less thorough and, therefore, put public safety at risk.¹⁹⁴ Obviously, space flight regulations cannot remain stagnant forever; but the moratorium accounts for this and provides a framework for when and why the FAA should promulgate new regulations.¹⁹⁵

IV. RECOMMENDATIONS

Given the similarities summarized above, Congress and the FAA should use the failed government action and industry weaknesses that defined the struggles of early aviation to inform and predict weaknesses in the commercial human space flight industry. It is evident that if the United States wants to continue to be a leader in human space activity and exploration, it will depend on the commercial sector. The FAA's proposed regulations on launch activity signal a huge step toward promoting commercial interests within the regulatory framework for space flight.¹⁹⁶ However, this step puts future civilian space flight participants at risk, and may also indirectly affect the commercial sector by negatively impacting public confidence in private companies and the FAA.¹⁹⁷ This step also adversely affects the FAA's capability to regulate human space flight by decreasing the FAA's regulatory authority and straining its resources.¹⁹⁸ The NPRM represents a radical change to the FAA's regulatory

193. Chao, *supra* note 56. There is also discussion of completely replacing the FAA as the primary regulatory authority over commercial space flight. See Tereza Pultarova, *Independent Body Proposed to Ensure Commercial Spaceflight Safety*, SPACENEWS (Apr. 26, 2019), <https://spacenews.com/independent-body-proposed-to-ensure-commercial-spaceflight-safety/> (analyzing proposed Space Safety Institute, designed to help grow industry and public trust).

194. This backlog compares to the backlog of issues faced by early aviation regulators. See *supra* note 172 (identifying inspection hastiness as undermining public confidence in the industry).

195. See 51 U.S.C. § 50905(c)(9) (2012) (providing timeline for moratorium).

196. See Streamlined Launch and Reentry Licensing Requirements, 84 Fed. Reg. 15,296, 15,297-98 (proposed Apr. 15, 2019) (emphasizing that the benefits from the proposed rule are commercial in nature, such as flexible safety standards, reduced costs, and an increase in profits).

197. See ALPA, *supra* note 107, at 9 (“[T]he elevated levels of risk may not be acceptable.”).

198. See, e.g., Denver International Airport, *supra* note 101 (discussing FAA regulatory authority for multiple launch or reentry sites).

system. It mirrors the beginning of the dangerous patterns seen in early aviation: instability and tense relations between private companies and regulators.

With the power of the purse, Congress can ensure that the FAA's regulatory system is running smoothly by affording it adequate and consistent funding. Congressional funding for space activity should have two different, co-equal functions: to support the regulatory aspect and to invest in research. Cost is one of the biggest obstacles to activity in space.¹⁹⁹ By consistently funding NASA and other research initiatives, Congress could demonstrate commitment to supporting the commercial sector and the United States' movement into space.²⁰⁰ The possibility of generating a profit from government contracts for space flight services is another incentive for private companies to comply with regulations, which would cut enforcement costs even further.

Another way for the government to maintain a good relationship with the commercial sector is to ensure that the FAA has a dependable and effective regulatory framework. To be successful, the FAA needs a budget that is consistent and sufficient, even if public support for programs wavers.²⁰¹ Congress can effectively control the DOT's budget, regardless of regulatory shifts, by appropriating funds to be used specifically for space flight programs or conditioning the use of funds exclusively for safety goals.²⁰² However,

199. See, e.g., *Space Technology Grand Challenges*, NASA, https://www.nasa.gov/offices/oct/strategic_integration/grand_challenges_detail.html (last updated Dec. 21, 2010) (“[I]t costs about \$10,000 to get a single pound of mass into low earth orbit.”); Oliver Holmes, *Space: How Far Have We Gone—and Where Are We Going?*, THE GUARDIAN (Nov. 19, 2018, 1:00 PM), <https://www.theguardian.com/science/2018/nov/19/space-how-far-have-we-gone-and-where-are-we-going> (“[T]he ISS is the most expensive machine ever constructed.”).

200. See also Casey Dreier, *NASA Rings in the New Year with \$22.6 Billion*, PLANETARY SOCIETY (Jan. 10, 2020), <https://www.planetary.org/blogs/casey-dreier/2020/nasa-2020-budget-final-22-6-billion.html> (stating that NASA's 2020 budget, at \$22.6 billion, increased 5.3% from 2019); AMERICA TO THE MOON BY 2024: NASA'S FY 2020 BUDGET AMENDMENT SUMMARY, NASA (2019), https://www.nasa.gov/sites/default/files/atoms/files/nasa_fy_2020_budget_amendment_summary.pdf (prioritizing space exploration).

201. See ALPA, *supra* note 107, at 14 (“It is not possible for the AST to manage this important responsibility with ninety-eight employees and an annual budget of around \$20 million.”); see also Sarah Ayres Steinberg, *The Safety Net is Good Economic Policy*, CTR. FOR AM. PROG. (Mar. 31, 2014, 6:00 AM), <https://www.americanprogress.org/issues/economy/reports/2014/03/31/86693/the-safety-net-is-good-economic-policy/> (showing how public perception of social welfare programs affects congressional funding).

202. See TODD GARVEY & DANIEL SHEFFNER, CONG. RESEARCH SERV., R45442, CONGRESS'S AUTHORITY TO INFLUENCE AND CONTROL EXECUTIVE BRANCH AGENCIES 1 (2018) (noting agency funding as a powerful tool for Congress to influence agency behavior);

Congress should exercise caution in restricting the FAA's budget as an enforcement tactic, as it will limit the FAA's ability to oversee the industry.²⁰³

Congress should also avoid passing new enabling statutes or establishing new agencies to regulate commercial human space flight. This restraint would preserve a consistent regulatory authority that private companies can depend on, and establish an enduring and cooperative relationship with the companies over time.²⁰⁴ Constant regulatory changes in early aviation hindered commercial growth and put the safety of passengers and crew members at risk.²⁰⁵ While commercial human space flight will need interagency coordination, merging all commercial space activity to a new office is extreme, and may have detrimental effects, similar to the trends in early aviation.

By delegating one agency to oversee stable long-term policies and facilitate interagency communication, Congress can inject stability into the commercial human space flight industry and contribute to the industry's long-term growth. Both the AST in the FAA and the Office of Space Commerce in the DOC would be appropriate agencies to designate in this role, as both offices address commercial space activity as a whole.²⁰⁶ While the National Space Council may facilitate interagency communication and discuss policy annually, it is very susceptible to changes in leadership, and does not have the organization, time, or resources to exclusively dedicate to these issues.²⁰⁷

see also Marica Smith, *DOT Requests Big Boost for Commercial Space Transportation in FY 2020*, SPACE POL'Y ONLINE (Mar. 11, 2019, 11:14 PM), <https://spacepolicyonline.com/news/dot-requests-big-boost-for-commercial-space-transportation-in-fy2020/> (stating that DOT's budget request for commercial space transportation activities for 2020 was \$64.6 million).

203. Given the high costs of commercial space transportation, *see* discussion *supra* note 108, simply reducing the budget as an enforcement tactic would devastate the FAA's ability to approve launch licenses, guarantee safety standards, and properly regulate the commercial space flight industry. This action would result in industry issues similar to the ones faced by the early aviation industry, where aviation accidents rose, public confidence fell, and companies closed due to reduced profits and regulatory uncertainty. *See generally* HISTORY OF AVIATION OVERSIGHT, *supra* note 124 (describing problems in the early aviation industry).

204. *See* ALPA, *supra* note 107, at 14–15 (suggesting consolidation of competing departments will result in a clear, defined governmental role and communication structure).

205. *See* discussion *supra* Part II (analyzing centuries of aviation industry development).

206. *See generally* *About the Office of Commercial Space Transportation*, FAA, https://www.faa.gov/about/office_org/headquarters_offices/ast/ (last modified Apr. 24, 2020) (stating the objectives of the Office of Commercial Space Transportation in the FAA); *Mission, OFF. OF SPACE COM.*, <https://www.space.commerce.gov/about/mission/> (last visited Mar. 29, 2020) (stating the mission statement and focus areas for the Office of Space Commerce in the Department of Commerce).

207. *See generally* Exec. Order No. 13,803, 82 Fed. Reg. 31,429, 31,430 (July 7, 2017)

The FAA possesses the regulatory authority to change licensing procedures per the agency's goals in its enabling statute, the CSLA.²⁰⁸ However, the FAA should consider the effect of constantly changing regulations on early aviation before doing so. Human space flight as a commercial enterprise is still relatively new and may be extremely vulnerable to system-wide changes in the FAA's regulatory framework. Though the current regulations may seem strict, they have been successful in mitigating potential risk in a technology that is unpredictable and incredibly dangerous.²⁰⁹ The initiative to consolidate some of the licensing procedures is not without merit, as it does encourage new companies to enter the market and facilitate some flexibility for creating innovative technologies. However, consolidating four very different licensing procedures into one broad license that grants extreme flexibility is too drastic. Commercial space flight companies will benefit in the long run from smaller, incremental changes to facilitate access to licenses without sacrificing safety standards.

The FAA could also significantly benefit from honoring the temporary moratorium ending in 2023. By not changing or making new regulations, the FAA shows a commitment to maintaining a reliable framework for the companies it oversees. The moratorium also serves as a learning period that allows the FAA to gather data on safety and production estimates.²¹⁰ This data can be used to assess the safety level of current regulations and to promote data-driven rulemaking and transparency in regulatory changes.²¹¹ While waiting for the moratorium to expire, the FAA should discuss potential new regulations with private space flight companies so that they can prepare for future compliance.²¹² The FAA could also consider safety regulations on space vehicle design and space flight crew certification.²¹³

Finally, feedback from private companies, big and small, is crucial to the formulation of the proposed regulations. However, these entities cannot provide meaningful feedback without all of the guidance documents used to

(asserting that the Council consists of various appointed agency heads that may have frequent leadership turnover and that their purpose is to advise the President, not interfere with agency activity).

208. See generally 51 U.S.C. §§ 50901–50923 (2012) (explaining regulatory authority).

209. See ALPA, *supra* note 107, at 15 (emphasizing safety as top priority for FAA and the aerospace industry).

210. See *id.* at 13 (providing legislative context for moratorium).

211. For benefits of data-driven rulemaking, see Cary Coglianese, *E-Rulemaking: Information Technology and the Regulatory Process*, 56 ADMIN. L. REV. 353, 395 (2004) (arguing advantages include increased speed and efficiency).

212. See ALPA, *supra* note 107, at 13 (urging FAA to start crafting policies on space worthiness).

213. *Id.* at 13–14.

develop the proposed rule in the first place.²¹⁴ If the FAA intends to streamline the licensing process, it should restart the notice-and-comment process—this time with all guidance documents.²¹⁵ The guidance documents should include third-party research into commercial space flight activity, as well as industry leaders. Supplying these documents would address the calls for transparency and consistency in rulemaking; they are also essential to encourage positive relations between the commercial sector and the FAA as a regulatory authority.²¹⁶

CONCLUSION

The future of commercial human space flight is optimistic. If the United States wants to continue to be an international leader in space technology, Congress and the FAA should anticipate issues arising from increased commercialization of human space flight. This action is especially important with the proposed regulatory changes. By acknowledging similarities between early aviation and the human space flight industry, agency and congressional leaders can identify three key areas that require attention: public safety, economic growth, and the identification of a balance between the two within the regulatory framework. Keeping these key areas in mind, Congress should ensure that the FAA has a budget capable of managing the growth it hopes and expects regulatory agencies, such as FAA and NASA, to accomplish. In the face of industry setbacks, Congress should not create or combine regulatory authority. Instead, it should anticipate the setbacks and preemptively establish which regulatory authority will resolve them. As for the FAA, the agency should honor the purpose behind the temporary moratorium—to maintain predictability in regulatory changes. With incremental rulemaking, the FAA is able to accomplish the transparency and consistency necessary for commercial growth and a positive relationship between the agency and the companies it regulates.

214. See Space Exploration Technologies, Corp., Second Request for Clarification Regarding Notice of Proposed Rulemaking for Streamlined Launch and Reentry Licensing Requirements (July 29, 2019), <https://www.regulations.gov/document?D=FAA-2019-0229-0120> (calling attention to several sections of the NPRM that need clarification and suggesting that a public meeting would be appropriate to adequately address their concerns).

215. The FAA has not formally responded to the comments on this rulemaking since January 23, 2020. *Docket Folder Summary: Streamlined Launch and Reentry Licensing Requirements*, REGULATIONS.GOV, <https://www.regulations.gov/docket?D=FAA-2019-0229> (last visited May 8, 2020).

216. See Foust, *supra* note 57 (fostering good will between the agency and private companies by having clear schedules).