Welcome To The Space Jam: How United States Regulators Should Govern Google And Facebook's New Internet Providing High Altitude Platforms

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There are still parts of the United States and the world that do not have access to wireless broadband Internet. To alleviate this Internet shortage, companies, such as Google and Facebook, are creating their own Internet-providing high altitude platforms ("HAPs"): balloons and Unmanned Aircraft Systems ("UAS") that will use radio spectrum and free space optics. This Comment will examine which agency or agencies should have complete or overlapping jurisdiction over these HAPs. It will then recommend that, although there are Federal Aviation Administration ("FAA") unmanned free balloon regulations, Google's Project Loon balloons might pose greater risks than traditional unmanned balloons; accordingly, the FAA should categorize these balloons as UAS. Next, to keep the airspace safe and to eliminate harmful radio interference, the FAA and Federal Communications Commission ("FCC") should work with the International Telecommunications Union and International Civil Aviation Organization to create "aerial slots" for all HAPs. Furthermore, the FCC should regulate those HAPs that will use free space optics since it is a communication that may be sent from
and received within the country and since it is in the public interest. Lastly, the National Oceanic and Atmospheric Administration ("NOAA") will need to update its remote sensing licensing criteria to accommodate the more unpredictable balloons and, in some cases, the unregulated laser-beaming HAPs.

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INTRODUCTION

The Internet is an electronic communications network that connects computers, other electronic devices, people, and businesses. It was the Internet that pushed the 2011 Arab Spring across the Middle East. People across twenty countries used the Internet to unite, and the different countries’ inhabitants posted thousands of tweets, Facebook messages, and YouTube videos to further their cause in toppling powerful existing governments. This is just one of the many instances showcasing the power of the Internet.

The Internet has grown significantly since its mainstream inception in the 1990s. Tim Berners-Lee brought his “World-Wide Web” to life in 1990, and Marc Andreessen launched “Mosaic,” the first Internet browser, in 1993. By 1995, the Internet had an estimated 16 million users. Today, the Internet allows us to store, to communicate, and to compute information.
much easier than ever before.⁷

Though communications technologies have developed significantly, there are parts of the United States and of the world that still do not have access to broadband wireless Internet. In August 2014, McKinsey & Company, a multinational managerial consulting firm, and Facebook, Inc. ("Facebook") created a report to quantify what the global offline population looks like.⁸ The report estimated that there are over 7-billion people alive today but that more than half are offline.⁹

Since it appears that nearly two-thirds of the world remains unconnected,¹⁰ companies such as Google, Inc. ("Google") and Facebook, whose services run on the Internet, are losing out on current and future revenue streams. Amongst its other profit-making services, Google makes a good portion of its revenue through its AdWords service,¹¹ and similarly, Facebook earns a percentage of its profits through its advertising service.¹² To grow their revenue streams and to expand these particular online services, the two companies, along with others, are trying to extend broadband wireless services for customers across the United States and the world. Future growth for these companies will come from those lacking a proper Internet connection today.

To alleviate this Internet shortage, the private sector is beginning to create Internet-providing vehicles or High Altitude Platform Stations ("HAPS,"
“HAPs,” or “high altitude platforms”). These alternatives to traditional satellites can provide weather imagery and disaster relief in addition to Internet connectivity. Additionally, these newer Internet-providing alternatives provide environmental assistance because all of the materials used to make these new vehicles are retrievable, meaning that the remaining debris will not remain in the atmosphere after usage as is the case with traditional satellites. All in all, these new vehicles provide more services and appear to be more cost-effective than the normal commercial satellites that are in the marketplace.

These HAPs are unique because they operate similar to airplanes for shorter periods of time than traditional satellites, are lower in the atmosphere than traditional satellites, and have communication capabilities. This Comment will analyze which regulator(s)—the FCC, FAA, or NOAA—should have control over these new Internet-providing high altitude vehicles, and it will also discuss the associated problems accompanying such

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13. See 47 C.F.R. § 2.1 (2014) (defining a High Altitude Platform Station, as defined in the ITU regulations, as a radio station located on an object at an altitude of [approximately 66,000 to 164,000 feet or twenty to fifty kilometers respectively] and at a specified, nominal, fixed point relative to the Earth). See generally High Altitude Platforms (HAPs) and Satellites: Projects, UNIVERSITY OF YORK DEPARTMENT OF ELECTRONICS, https://www.elec.york.ac.uk/research/comms/haps.html. Please, note that the FAA and NOAA have not defined high altitude platforms and that it just a colloquial term.

14. See e.g., Eric Mack, Google Confirms Purchase Of Titan Aerospace For Data Drone Effort, FORBES (Apr. 4, 2014, 2:40 PM), http://www.forbes.com/sites/ericmack/2014/04/14/google-reportedly-buying-solar-drone-maker-not-facebook/ (showing that atmospheric satellites could help bring Internet access to millions of people and help solve other problems including disaster relief and environmental damage, like deforestation); see also Leo Mirani, These are the people who will build Facebook's drones, QUARTZ (Mar. 28, 2014), http://qz.com/193045/these-are-the-people-who-will-build-facebook-drone-vehicles/ ("[Facebook's drones/systems] are designed for survey and real-time monitoring of detected signals or targeted information," and they "can be launched and recovered from a small footprint and [are] ideal for border surveillance, anti-poaching, communications intercept or private [communications].").

15. Compare How Loon Works, GOOGLE, http://www.google.com/loon/how/#tab=equipment (advertising that the balloons come down after 100 days in the air by gently releasing air), and Connecting the World from the Sky, FACEBOOK, https://fbcdn-dragon.akamaihd.net/hphotos-ak-ash3/t39.2365-6/851574_611544752265540_1262758947_n.pdf (showing that the drones are easily movable and are quicker to reuse and to dispose as opposed to traditional satellites), with Advantages & Disadvantages of satellite communications, SATCOM ONLINE (June 6, 2001), http://www.satcom.co.uk/article.asp?article=3&section=4 (including large up front capital costs, interference and propagation, and congestion of frequencies and orbit as disadvantages of traditional satellites).

regulation. It then recommends that no one agency take full jurisdiction over these Internet-providing HAPs and that the agencies should work together to complete the collective goal of ensuring safety in the air and on the ground and of preventing harmful radio interference.

I. GOOGLE AND FACEBOOK’S INTERNET-PROVIDING VEHICLES

Federal regulators need to determine whether Google and Facebook’s HAPs are Unmanned Aircraft Systems (“UAS,” “UAVs,” or “drones”), satellites, or something else. To comply with international and domestic obligations, regulators in the United States will look to ensure the health and safety of those spacecraft in the air already and those on the ground when regulating these HAPs.

A. Google’s Project Loon and Unmanned Vehicles Are No Longer Secrets

GoogleX is a semi-secret facility run by Google, and it is dedicated to making major technological advancements. GoogleX is in the process of creating two HAPs, which will provide Internet access. One of the platforms, named “Project Loon,” is a network of balloons floating high up in the atmosphere. The company has designed the balloons “to connect people in rural and remote areas, to help fill coverage gaps, and to bring people back online after disasters.” The balloons drift for up to 100 days at altitudes roughly between 60,000 feet and 88,000 feet (roughly eighteen

17. Please, note that UAS can be referred to as UAV (unpiloted aerial vehicle), RPAS (remote piloted aircraft systems), model aircraft, or drones.

18. See generally 49 U.S.C. § 40101 (2013) (assigning and maintaining safety as the highest priority in air commerce while also evaluating the safety implications of those services before authorizing new air transportation services).


22. Id.; see also Canterbury student to explain wider benefits of Project Loon, DIGITAL ADVANCED LIMITED (Nov. 7, 2014, 6:30 AM), http://www.voxy.co.nz/technology/canterbury-student-explain-wider-benefits-project-loon/5/206761 (explaining that the balloons will also help improve climate models and provide better understanding of stratospheric transport processes, which will present better simulations of future climate change).
and twenty-seven kilometers respectively). Operators on the ground guide the Loon balloons by rising or descending them into a layer of wind blowing in the direction they want them to go. A single balloon can provide Internet to an area larger than 600 square miles, and it can transmit phone-friendly Long Term Evolution (“LTE”) data. Users can connect to the balloon network using a special Internet antenna attached to their building.

Google’s other Internet-providing vehicle is a type of UAS or drone. These UAS, such as the Solara 50, will operate at an altitude of 65,000 feet (roughly twenty kilometers), where there is no weather present, for up to five years at a time.

B. Facebook’s Connectivity Lab Project May Also Connect the World

Facebook is also currently working on its own Internet-beaming HAP. The Internet.org initiative ultimately seeks to use its solar-powered UAS to beam Internet to users via light instead of through radio spectrum. Facebook’s HAPs will be roughly the size of 747 or 767 airplanes, but they

23. Compare What is Loon?, supra note 20 (describing Project Loon balloons as floating in the stratosphere, twice as high as airplanes and the weather and also noting that the balloons are fifteen meters in diameter), with Airlines Use Low-Altitude Flights to Ease Delays, ABC NEWS, http://abcnews.go.com/Travel/story?id=118812 (pointing out that standard cruising altitude for commercial jetliners is between 33,000 and 39,000 feet (roughly ten kilometers and twelve kilometers respectively)).


25. See id.; Long Term Evolution (LTE): A Technical Overview, MOTOROLA, INC., at 2, http://www.3g4g.co.uk/Lte/LTE_WP_0706_Motorola.pdf (“[Long Term Evolution Internet] is scheduled to provide support for IP-based traffic with end-to end Quality of service (“QoS”). Voice traffic will be supported mainly as Voice over IP (“VoIP”) enabling better integration with other multimedia services.”).

26. See How Loon Works, supra note 15 (showing that the signal bounces from the antenna up to the balloon network and that it then bounces Internet back down to Earth).


28. See Solara 50 Atmospheric Satellite, United States of America, supra note 20 (summarizing that the drone will be capable of carrying seventy pounds of telecommunications, reconnaissance, atmospheric sensors, and other payloads).

29. See Announcing the Connectivity Lab at Facebook, INTERNET.ORG (Mar. 27, 2014), http://www.internet.org/press/announcing-the-connectivity-lab-at-facebook (announcing Facebook’s Connectivity Lab and its partnership with the Internet.org project); see also Mark Zuckerberg, FACEBOOK (Mar. 27, 2014, 1:03 PM), https://www.facebook.com/zuck/posts/10101322049893211 (announcing that Facebook’s founder wants to bring Internet to the rest of the world).

30. See Announcing the Connectivity Lab at Facebook, supra note 29 (detailing the logistics of the HAPs that will provide Internet).
will be much lighter. These particular UAS will be up in the sky for five years before they come back down to the Earth.

1. Free Space Optical Communication = Laser Beam Internet

For Facebook's unmanned HAP, the company is looking to use free space optical communications ("free space optics") instead of using radio spectrum like traditional satellites. Utilizing invisible infrared laser beams, free space optics employs light to transmit data through space. The technology avoids the use of physical connections that may be impractical due to high costs. It is a promising technology that will allow companies to dramatically boost the speed of Internet connections.

LightPointe is one manufacturer of free space optics. Currently, LightPointe's technology provides carriers, businesses, and government agencies with the capability to quickly connect two or more buildings, for communications purposes, without a regulatory license from the FCC. In all, the technology does not use the typical mediums of wire or radio to transmit its communications; instead, it uses the power of light to beam Internet or data.

31. See Kyle Russell, Facebook's Aquila Drone Will Beam Down Internet Access With Lasers, TECH CRUNCH (Mar. 26, 2015), http://techcrunch.com/2015/03/26/facebook-aquila-drone-will-beam-down-internet-access-with-lasers/ (revealing that the Internet drones, the size of 767s, will fly in between 60,000 and 90,000 feet and that planes do not routinely fly in that altitude); see also Carl Franzen, Facebook says its internet drones will be the size of 747s and fly for years, THE VERGE (Sept. 24, 2014, 1:31 PM), http://www.theverge.com/2014/9/24/6839225/facebook-says-its-internet-drones-will-be-the-size-of-747s. Please, note that there are conflicting reports as to the actual size of the UAS; they will be either 747s or 767s.


35. See id. (discussing the advantages of free space optics).

36. See id. (contrasting the advantages of free space optics with the disadvantages of optical fiber cables or optical transmission lines).

37. See generally LIGHTPOINTE, http://www.lightpointe.com/home.html. Please, note that it is not clear yet if Facebook will use LightPointe as its manufacturer of free space optics.

38. See Free Space Optics (FSO), supra note 34 (summarizing that different entities can use this technology due to the minimal legal restrictions).
II. LEGAL BACKGROUND FOR SATELLITES

The potential regulatory scheme for these newer technologies, which Google and Facebook have created, may overlap with or may be the same as the current regulatory scheme for satellites. In fact, some of the only commercial platforms in the sky now are satellites, and they require special licensing before their launches. The launching and/or operation of satellites constitute space activities and thus are subject to a regulatory regime. Article VI of the Outer Space Treaty ("OST") promotes the idea that international states are responsible for the authorization and supervision of all space activities. States are liable for damages caused in outer space and on Earth under OST Article VII. Moreover, OST Article VIII advances that states must retain jurisdiction and control over all space objects, and more importantly, it requires registration for all of them. Finally, OST Article IX requires states to avoid harmful contamination of outer space.

As noted, the United States is under an international obligation, as an OST signatory, to authorize or license and to supervise space operations by private parties under its jurisdiction. Normally, satellite operators need to obtain licenses from different regulatory agencies to operate their satellites. First, the FAA issues licenses for launch vehicles that want to launch a payload, such as a satellite, into orbit. Further, the United States requires satellite operators within its jurisdiction to obtain a license from the FCC to


43. See Outer Space Treaty, supra note 40, art. IX.

44. See id., art. VI; see also Pamela L. Meredith & Franceska O. Schroeder, Privately-Owned Commercial Telecommunications Satellites: Licensing and Regulation by the Federal Communications Commission, 27 CAL. W. L. REV. 107, 112 (1991) ("Private satellite operations are permitted as a matter of international law, provided they are authorized and supervised by a nation-state.").

45. 51 U.S.C. § 50904 (2012). See generally 51 U.S.C. § 50902(10) (2012) (defining payload as "an object that a person undertakes to place in outer space by means of a launch vehicle or reentry vehicle, including components of the vehicle specifically designed or adapted for that object").
commence radio communications.\textsuperscript{46} Finally, if the satellite has a remote sensing capability, then the operator needs to obtain a license from NOAA.\textsuperscript{47}

A. The FAA’s Launch Vehicle Licensing Process

Prior to a vehicle launch, the FAA must issue a license to a prospective operator for both launch and reentry. Before the FAA issues a license for an unmanned launch, the applicant must state that the launch is consistent with the United States’ national security interests and international obligations.\textsuperscript{48} The FAA has the authority to prevent launches and reentries if the launch vehicle operator will not comply with payload requirements.\textsuperscript{49} The Secretary of Transportation also establishes whether the operator has acquired all necessary licenses for a payload.\textsuperscript{50}

B. FCC’s Role in Companies Gaining Licenses for Radio Transmission

The FCC regulates radio frequency spectrum allocation for satellites in space.\textsuperscript{51} The United States implements radio frequency allocations from the International Telecommunications Union ("ITU"), a specialized agency of the United Nations.\textsuperscript{52} Since the enactment of the Communications Act of 1934 and the creation of the FCC, the government has assigned radio spectrum from the ITU to the public.\textsuperscript{53}

\textsuperscript{48} See id. § 50901(a)(7) (stating that the mission must not detrimentally affect "the public health and safety, safety of property, or national security or foreign policy interest of the United States").
\textsuperscript{49} See id. § 50904(b) (declaring that the launch vehicle must comply with all payload requirements).
\textsuperscript{50} See id. § 50904(c) ("The Secretary of Transportation shall establish whether all required licenses, authorizations, and permits [such as those from the FCC and NOAA] required for a payload have been obtained.").
\textsuperscript{51} See 47 U.S.C. § 301 (stating that a private entity needs a license to operate a satellite); see also 47 C.F.R. § 25.103 (2014) (defining the different types of satellite services—Mobile-Satellite Service, Broadcasting-Satellite Service, and Fixed-Satellite Services).
\textsuperscript{52} See also About ITU, INTERNATIONAL TELECOMMUNICATIONS UNION, http://www.itu.int/en/about/Pages/overview.aspx ("[The ITU] allocate[s] global radio spectrum and satellite orbits, develop[s] the technical standards that ensure networks and technologies seamlessly interconnect, and strive[s] to improve access to [information and communication technologies] to underserved communities worldwide."). See generally U.N. Charter art. 57 (giving the U.N. authority to create specialized agencies to deal with “economic, social, cultural, educational, [and] health” issues).
\textsuperscript{53} See 47 U.S.C. § 303(c)–(d) (2013) (allowing the FCC to assign radio frequencies and to determine orbital locations); see also 47 U.S.C. §§ 151–152 (2013) (declaring that the Commission was created for the purpose of regulating “all interstate and foreign communication by wire or radio . . . which originates and/or is received within the United
1. How the ITU Allocates Worldwide Radio Spectrum to the United States

As a matter of international law, the ITU coordinates the use of the radio frequencies by its member states to prevent harmful interference. To eliminate potential radio interference, it coordinates and registers frequency assignments made by national administrations, such as the FCC. The ITU regulations oblige satellite operators to only use those frequencies allocated to its particular satellite service.

2. ITU's Radio Spectrum Allocation for HAPs in the United States

Per the ITU Constitution, World Radiocommunication Conference members “can revise the Radio Regulations and any associated Frequency assignment and allotment Plans” and “address any radiocommunication matter of worldwide character.” In 2007, the meeting addressed the emergence of HAPs, and it noted that “the allocation to the fixed service in the bands 47.2–47.5 GHz and 47.9–48.2 GHz is designated for use by HAPs.” It also assigned in Region 2, the United States’ region, the bands 1885–1980 MHz and 2110–2160 MHz for use as base stations for those HAPs providing International Mobile Telecommunications (“IMT”).

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States ... as well as to license and regulate all radio stations ... "). See generally About ITU, supra note 52 (delineating the ITU’s responsibilities).

54. See Constitution and Convention of the International Telecommunication Union as amended by the 2010 Plenipotentiary Conference 2011, art. 33, [hereinafter ITU Constitution] (providing that all countries should have equitable access to radio frequencies).

55. See 47 U.S.C. § 303(c)–(d).

56. See id. § 152.

57. World Radiocommunication Conferences (WRC), INTERNATIONAL TELECOMMUNICATIONS UNION, http://www.itu.int/en/ITU-R/conferences/wrc/Pages/default.aspx (noting that a WRC meeting occurs every three to four years); see also ITU Constitution, supra note 54, art. 13 (allowing the ITU to review and to revise the Radio Regulations, which is the international treaty governing the use of the radio frequency spectrum).


59. ITU, Final Acts World Radiocommunication Conference (Geneva, 2007), at Resolution 221 (2008) http://www.itu.int/dms_pub/itu-s/oth/02/01/S0201000002C4006PDFF.pdf; see also id. Resolution 145 (developing criteria for allocations in the frequency bands 27.9–28.2 GHz and 31–31.3 GHz for HAPs in the fixed service for some countries in Regions 1 and 3); 47 C.F.R. § 2.106(5.388A) (“Their use by IMT–2000 applications using high altitude platform stations as base stations does not preclude
Outside of these bands, the FCC’s Table of Frequency Allocations does not show any other available bands for HAPs in the United States.60

C. FCC’s Control of Non-Radio Spectrum Internet Transmission

Currently, the FCC does not govern communications outside of radio and wire communications pursuant to Title 47 of the United States Code.61 This governance of only radio and wire communications may be problematic for the FCC since there are new communication mechanisms developing. Specifically, engineers can now build free space optics communications systems that use, inter alia, laser beams that operate at visible-light frequencies, above the radio spectrum, to communicate data.62 The World Radiocommunications Conference ITU-R Study Groups have been carrying out the preparatory studies on free space optical links.63 To summarize their findings so far, “no evidence has been provided that interference between free-space optical systems is a concern.”64

60. See generally ITU global standard for international mobile telecommunications IMT-Advanced, INTERNATIONAL TELECOMMUNICATIONS UNION, http://www.itu.int/ITU-R/index.asp?category=information&rlink=imt-advanced&lang=en (“IMT-Advanced systems support low to high mobility applications and a wide range of data rates in accordance with user and service demands in multiple user environments. IMT Advanced [sic] also has capabilities for high quality multimedia applications within a wide range of services and platforms, providing a significant improvement in performance and quality of service.”).

61. See 47 U.S.C. § 152(a) (2013) (revealing that the statute only applies to all interstate and foreign communication by wire or radio).


D. NOAA’s Role in Remote Sensing Licensing

If satellite operators use their satellites for commercial remote sensing purposes, they will also need to receive a license from NOAA. Remote sensing includes weather and meteorology imaging of the Earth in addition to reconnaissance or surveillance (i.e., missile tracking). Section 60122 of Title 51 of the United States Code states that a remote sensing system needs to comply with national security provisions and international obligations of the United States, along with other requirements listed in the same section.

III. THE FAA ALLOWS SOME BALLOONS TO FLOAT

The FAA also has regulations that allow unmanned free balloons ("unmanned balloons") to be in the air. In the United States, there are two sets of regulations governing the launching and tracking of unmanned free balloons. One set of rules comes from the FCC since it regulates radio spectrum usage, and the other set of rules comes from the FAA since it governs those apparatuses’ safety in airspace.

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66. See US Space Capabilities Doctrine, Roles and Systems, THE AIR UNIVERSITY, http://www.au.af.mil/au/awc/awcgate/grayspc/doctrine/doctrin.htm; see also 15 C.F.R. § 960.3 (2014) (stating that remote sensing "refers to any device, instrument, or combination thereof, the space-borne platform upon which it is carried, and any related facilities capable of actively or passively sensing the Earth’s surface, including bodies of water, from space by making use of the properties of the electromagnetic waves emitted, reflected, or diffracted by the sensed objects").

67. See 51 U.S.C. § 60122(b) (2012); see also id. § 60122(b)(5)–(6) (setting out operation, storage of data, and notification—of agreement(s) with other foreign entities—requirements when remote sensing).

68. See e.g., It's a Bird! It's a Plane! . . . No! It's a NOAA Weather Balloon!, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, http://www.noaa.gov/features/02_monitoring/balloon.html (showing that the National Weather Service uses radiosonde, a type of unmanned free balloon, to track weather data).

IV. UNITED STATES’ UAS REGULATORY REGIME

The FAA has jurisdiction over the United States National Airspace System ("national airspace"), but the FAA has not completely developed its UAS rules yet.70 As set forth in the 2012 FAA Modernization and Reform Act, UAS refers to “an unmanned aircraft and associated elements includ[ing] communication links and the components that control the unmanned aircraft.”71 In 2007, the FAA announced that “no person may operate a UAS in the National Airspace System without specific authority.”72 The agency has repeatedly stated that the reason it does not certify commercial UAS flights currently is because of safety concerns.73 However, the agency maintains a limited licensing regime to allow a select group of operators to fly each year.74

Within the United States, commercial UAS operators can currently circumvent regulations with the help of a waiver if they are either a public, civil, or model aircraft operation.75 The Secretary of Transportation has the authority to determine if certain UAS may operate in the national airspace before the completion of a comprehensive rulemaking for UAS.76 For UAS


71. See FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 331, 126 Stat. 11, 72 (Feb. 14, 2012) (stating in § 331 that “[t]he term ‘unmanned aircraft system’ means an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the pilot in command to operate safely and efficiently in the national airspace system”).

72. See Unmanned Aircraft Systems, FEDERAL Aviation ADMINISTRATION, https://www.faa.gov/uas/ (asserting that, as of 2014, the FAA has made some progress towards UAS integration).

73. See id. (detailing that the United States “has the busiest, most complex airspace in the world” and that “[t]he FAA is taking an incremental approach to safe UAS integration”).


75. See Unmanned Aircraft Systems, supra note 72 (listing the different types of waivers available to UAS operators); see also Will Butler, Can We Trust Google With the Stratosphere?, THE ATLANTIC (Aug. 20, 2013, 10:51 AM), http://www.theatlantic.com/technology/archive/2013/08/can-we-trust-google-with-the-stratosphere/278797/ (highlighting that the UAS waivers were controversial during the passage of the 2012 FAA Modernization and Reform Act).

operating as public aircraft, the authority is the Certificate of Authorization ("COA"). To operate a non-public aircraft, an operator can apply for a Section 333 exemption or for a Special Airworthiness Certificate. Finally, for model aircraft, Advisory Circular 91-57 gives operators guidelines to operate.

Each UAS has a need for radio spectrum usage since each will transmit data back to Earth while in the air. Currently, there are no radio spectrum bands specifically designated for UAS operation like there are for satellites. However, some domestic UAS operate in the bands called the ISM (Industrial, Scientific, Medical) bands; these ISM bands are unprotected airwaves.

V. THE PRESENCE OF THE INTERNATIONAL CIVIL AVIATION ORGANIZATION

The International Civil Aviation Organization ("ICAO"), another

77. See 49 U.S.C. §§ 40102(a)(41), 40125 (2013) (providing the definition of Public Aircraft and the qualifications for public aircraft status); Public Operations (Governmental), FEDERAL AVIATION ADMINISTRATION, https://www.faa.gov/uas/public_operations/ (describing the criteria to receive this particular Certificate of Waiver or Authorization waiver).


82. See also id. (showing that ISM bands are also very limited); Aeronautical Mobile Communications Panel (AMCP) Working Group C, The Use of Broadband Communications to Support Aeronautical Applications Paper, INTERNATIONAL CIVIL AVIATION ORGANIZATION (Oct. 11, 2000) (announcing particular concern at this meeting that ISM bands are unprotected).
specialized United Nations agency, codifies the international standards or rules for air navigation, and it promotes the safe and orderly growth of international air transportation. With the expansion of UAS technology, it follows that ICAO may be able to offer some expertise with respect to enhancing the safety of these Internet-providing HAPs.

VI. AIRPLANES VERSUS SATELLITES—THE ENSUING ADMINISTRATIVE AGENCY MESS?

Today’s federal government would not function if Congress could not broadly delegate powers to agencies. Time and resource restrictions, along with lower costs, make congressional delegation a “more desirable alternative.” Congress needs to delegate its policy-making authority because governing is complex and because it allows an agency with expertise in a field to implement a policy. Moreover, “if one agency has expertise in a field and a second agency in another, Congress should delegate power to the most-informed agency.” However, there are instances where multiple agencies may have overlapping jurisdiction. In such instances, Congress may make broad and ambiguous delegations of policy-making authority, so several agencies may have plausible claims that an issue arises within their jurisdiction. Moreover, multiple agencies may claim that addressing a particular issue or performing a particular function enables them to address


85. See U.S. CONST., art. I, § 8, cl. 18 (Congress shall have the power “...[t]o make all Laws which shall be necessary and proper for carrying into Execution the foregoing Powers, and all other Powers vested by this Constitution in the Government of the United States, or in any Department or Officer thereof.”).


88. Gersen, supra note 86, at 212.

89. See e.g., U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-05-213, OVERSIGHT OF FOOD SAFETY ACTIVITIES FEDERAL AGENCIES SHOULD PURSUE OPPORTUNITIES TO REDUCE OVERLAP AND BETTER LEVERAGE RESOURCES 4–15 (2005) (highlighting an instance of overlapping jurisdiction where the United States Department of Agriculture, the Food and Drug Administration within the Department of Health and Human Services, the Environmental Protection Agency, and the National Marine Fisheries Service all have responsibility for regulating food safety).

90. See Gersen, supra note 86, at 201, 210.
Legal scholars have determined some elements that an agency should look at when evaluating if there should be overlapping jurisdiction between or amongst agencies. The answer depends on many factors, some which include—

[the relationship between the overlapping agencies (are they collaborative or competitive, do they have complementary goals, or are their goals in tension with each other); the policy area (environmental law might require different structures than securities law); the internal dynamics of the agencies involved (different agencies may have different cultures and professional backgrounds); and the political context (different political pressures may shape how agencies act and react to each other). . . .]

Even when agencies may have their mutually exclusive jurisdictions, they still might not anticipate every scenario that may arise, as is the case here with the potential overlapping FAA, FCC, and NOAA in-air regulatory authority over the new Internet-providing HAPs.

A. The Government Has Some Catching up to Do

On one hand, the HAPs operate as floating airplanes for extended periods of time; but on the other hand, they also have communication and, perhaps, remote sensing capabilities. The FAA, FCC, and NOAA will want to regulate the HAPs while they are in the air. This uncertainty may provide some confusion regarding which regulatory agency should govern the HAPs. So, should all three govern, or should one agency have all the regulatory authority?

With reference to the criteria used to analyze whether there should be overlapping jurisdiction, these agencies have different policy areas, and the internal dynamics of all three are dissimilar. The FAA cares about the safety


94. See generally Biber, supra note 92 (applying the scholars’ test, it is noticeable that each agency specializes in a different type of policy and that the FAA has pilots and aviation experts whereas the FCC has communication experts and spectrum engineers for example.).
of these vehicles while they are in the air.\footnote{95 See 49 U.S.C. § 40101.} On the other hand, the FCC is concerned with communication transmissions in general: the management of radio spectrum and the prevention of harmful interference.\footnote{96 See 47 U.S.C. § 301.} Lastly, while NOAA does care for the safety of these vehicles in the air, it is more concerned with what these vehicles are remote sensing or imaging once they are in the air.\footnote{97 See 51 U.S.C. § 60122.} With three different duties and technical experts in-hand, all three agencies should have regulatory authority over the HAPs.

Congress has delegated these powers to each agency, so they can individually specialize in and not under-regulate a specific field.\footnote{98 See Buzbee, supra note 91, at 5.} Frankly, giving one agency complete reign over these vehicles would be inefficient and futile since each already licenses something completely different, and it would create unnecessarily redundant regulations.\footnote{99 See Marisam, supra note 91, at 222–23 (critiquing redundancy and explaining that the goal is to discover those areas where redundancies are cost-effective and build the redundancies there).} It will be satisfactory for there to be overlapping in-air jurisdiction amongst all three agencies. However, each of the three agencies will want to revise its respective licensing and monitoring requirements to accommodate the novel issues that these new vehicles present and to make sure that there is not redundant or under-regulation: problems that often arise when there is overlapping jurisdiction.

1. \textit{Project Loon May Have an Easier Time Taking Flight}

The Project Loon balloons may be problematic for the FAA to govern properly since the balloons are more sophisticated than the current unmanned free balloons that the agency regulates.\footnote{100 See Google Project Loon Frequently Asked Questions, GOOGLE, http://www.google.com/loon/faq (detailing that Project Loon balloons are higher in the sky, last longer, coordinate with other balloons, and go where they want to go); see also NOAA National Weather Service Radiosonde Observations, NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION, http://www.ua.nws.noaa.gov/factsheet.htm (depicting the characteristics of weather balloons, a type of unmanned free balloon).} The Project Loon balloons do not have a pilot on-board; instead, there is an operator on the ground who can guide the balloons through the air by controlling which layer of the stratosphere the balloons are in at any time.\footnote{101 See How Loon Flies, supra note 15.}

Presently, the FAA has regulations for the operation of unmanned free balloons known as the "Subpart D Regulations."\footnote{102 See 14 C.F.R. § 101.31 (2014) (defining the FAA's regulations for unmanned free balloons).} The FAA's regulations
are loose on balloons, as long as they operate safely and above 60,000 feet.\footnote{103} The agency can regulate these Loon balloons, if it chooses, under Subpart D, because the unmanned balloons will be flying above the 60,000 feet. To comply with the FAA’s requirements, Google would have to make certain pre-launch notifications.\footnote{104} Similarly, the company would need to give balloon position reports every two hours; however, this requirement could be slightly problematic because Google does not have complete control over these balloons outside of moving them up and down in the stratosphere.\footnote{105} Essentially, the operators would be able to move the balloons, but there would be no guarantee as to the exact future location of the balloons.

ICAO has articulated its view on balloons of this nature.\footnote{106} The international agency has gone so far as to specifically exclude unmanned free balloons from its early UAS regulations, qualifying balloons as aircraft which cannot be managed on a real-time basis.\footnote{107} But because the Loon is different from traditional unmanned free balloons and is somewhat maneuverable, it could qualify as an UAS under this definition.

Contrary to ICAO’s view, treating the more sophisticated Project Loon balloons as UAS rather than unmanned free balloons may make sense for the FAA because it will allow for the agency to follow its congressional mandate of ensuring public safety.\footnote{108} The 2012 FAA Modernization and Reform Act states that unmanned aircraft are aircraft that do not involve direct human intervention from within or on the aircraft.\footnote{109} Unlike typical unmanned balloons, these Loon balloons are capable of staying afloat for months.\footnote{110} Each Loon balloon is about fifty feet wide and forty feet high (roughly 15.24...
meters wide and 12.19 meters high respectively), relying solely on helium for lift.\textsuperscript{111} Since these are balloons, it is possible that a small pinhole could bring a balloon down. Google’s operators can pilot the balloons from the ground, but there is no certainty yet regarding a balloon’s route or where it will be. Considering that there are planes that fly not too far below the stratosphere,\textsuperscript{112} the FAA does not want potential debris from balloons affecting flights below or, even worse, inhabitants on the ground.

Moreover, if these balloons are using radio spectrum, then they could potentially interrupt communications for planes and other radio spectrum-using devices.\textsuperscript{113} For example, while testing Project Loon balloons in Oceania, the balloons have caused trouble by way of radio interference. Astronomers at the Square Kilometre Array (“SKA”)\textsuperscript{114} program, which has research facilities in both Australia and New Zealand, are upset that Google has been going ahead with its testing, supposedly in the ISM bands, of its Loon balloons in the region without considering the possible adverse effects on the scientific community.\textsuperscript{115} Not only does the FAA have a safety interest in making sure planes below can communicate properly, but the FCC also has the responsibility of preventing harmful radio interference like what is currently happening in Oceania.

The balloons pose multiple safety risks, and if any of the listed occurrences were to happen, they would go against the FAA’s congressional mandate of keeping the United States national airspace safe.\textsuperscript{116} Therefore, the agency will want to create more stringent Subpart D Regulations, or it

\textsuperscript{111} See How Loon Flies, supra note 15 (detailing the envelope, or “balloon” part of the balloon, is one-tenth of an inch-thick polyethylene fabric, lightweight and relatively delicate but strong enough to withstand the high-pressure differential of great altitudes).

\textsuperscript{112} See generally John Cox, Ask the Captain: How high can a plane fly?, USA TODAY (Feb. 2, 2014, 6:08 PM), http://www.usatoday.com/story/travel/columnist/cox/2014/02/02/maximum-altitude-airlines-concorde/5165635/ (stating most airliners are limited to 45,000 feet or less).

\textsuperscript{113} See generally Aviation Radio Bands and Frequencies, MARTEK, http://www.smeter.net/spectrum/aviation.php (listing different aviation communication bands and their respective altitudes).


\textsuperscript{115} See Richard Chirgwin, Google launches broadband balloons, radio astronomy frets, THE REGISTER (Jun. 17, 2013, 5:57 PM), http://www.theregister.co.uk/Print/2013/06/17/google_launches_broadband_balloons_astrophysics_frets/ (summarizing that SKA is a €1.5 billion space research telescope program run by a consortium of the world’s universities and stating that Google’s current usage of “lower ISM band sits squarely in the frequency range that astronomers want to scan to spot the formation of the universe’s earliest galaxies”).

\textsuperscript{116} Cf. 49 U.S.C. § 40101(a)(2) (2013) (stating that the Secretary of Transportation will evaluate the safety implication of those services before authorizing new air transportation services).
will want to classify these particular Loon balloons as UAS because of their sophistication and longevity in the air as compared to the current unmanned free balloons the agency regulates.

2. Google and Facebook’s UAS Will Need Domestic and International Help

Since Congress delegated the priority of keeping the United States national airspace safe to the FAA, the agency will have jurisdiction over Google and Facebook’s HAPs in-air. Particularly, the FAA provides the national requirements for registration, airworthiness certification, licensing of personnel, and air usage. As mentioned, the FAA’s regulations for UAS are very limited, exemplified by the fact that the agency has made all civilian use of UAS illegal with a few exceptions.

To avoid waiting for the FAA’s UAS regulations, Google and Facebook could both make arguments that their HAPs are satellites and that they should be governed under the traditional satellite regulations rather than the FAA’s forthcoming UAS regulations. For example, satellites are also unmanned aerial vehicles, just higher up in the sky. Additionally, the FAA does not regulate the satellites in-orbit, so conceivably, the operators could argue that the FAA only needs to regulate the launch and reentry of Google and Facebook’s HAPs.

So, why cannot HAP operators properly state that their Internet-providing HAPs are satellites? To answer that question, it will be necessary to look at where and how these HAPs will be operating.

117. See id. § 40101(a)(1) (assigning and maintaining safety as the highest priority in air commerce).

118. See generally History and Evolving Duties, FEDERAL AVIATION ADMINISTRATION, https://www.faa.gov/about/history/brief_history/.


120. See What is a Satellite?, THE FEDERAL COMMUNICATIONS COMMISSION SATELLITE LEARNING CENTER, http://transition.fcc.gov/cgb/kidszone/satellite/kidz/parts_of_sat.html (explaining that operators can move satellites once they are in space through the use of rocket motors, fuel tanks, battery, and solar panels on board the satellite); see, e.g., GPS World staff, Misplaced Galileo Satellite Moving to New Orbit, GPS WORLD (Nov. 10, 2014) available at http://gpsworld.com/galileo-satellite-set-for-new-orbit/ (alerting that a recent Galileo navigation satellite launch put a satellite in the wrong orbit and that the operators had to use on-board fuel and motors to move the satellite to the correct orbit).

According to Title 14 of the Code of Federal Regulations ("C.F.R.") Classes B, C, D, and E of the United States National Airspace System are below 10,000 feet (roughly 3050 meters), and these specific classes are designed to control lower traffic around airports.\textsuperscript{122} Class A includes the airspace between 18,000 and 60,000 feet (roughly eight miles or thirteen kilometers in difference).\textsuperscript{123} Though there is no point where space begins, the Kármán Line, 327,360 feet (roughly sixty-two miles or 100 kilometers), has typically served as that marker.\textsuperscript{124} Between where planes can fly in Class A airspace and the Kármán Line, there are almost 100,320 feet (roughly nineteen miles or thirty-one meters) of unregulated stratosphere.\textsuperscript{125}

There are two types of flight into space: orbital and suborbital. In the past, many believed that in order to achieve spaceflight, a spacecraft must reach an altitude higher than the previously mentioned Kármán Line.\textsuperscript{126} Orbital spaceflight happens "when a spacecraft is placed on a trajectory with sufficient velocity to place it into orbit around the Earth."\textsuperscript{127} Instead, suborbital spaceflight occurs "when a spacecraft reaches space but its velocity is such that it cannot achieve orbit."\textsuperscript{128} Altogether, the higher a HAP goes, the more likely it is that gravity will maintain the HAP in orbit without the assistance of an operator on the ground.

A satellite is an artificial object that has been intentionally placed into orbital spaceflight.\textsuperscript{129} In astronomy, an orbit is the gravitationally curved


\textsuperscript{123} See 14 C.F.R. § 91.135.

\textsuperscript{124} See Dr. S. Sanz Fernández de Córdoba, The 100km Altitude Boundary for Astronautics, FÉDÉRATION AÉRONAUTIQUE INTERNATIONALE (May 25, 2012, 10:09 AM), http://www.fai.org/icare-records/100km-altitude-boundary-for-astronautics (defining the Kármán Line).

\textsuperscript{125} See supra note 122.

\textsuperscript{126} See Sanz Fernández de Córdoba, supra note 124.

\textsuperscript{127} See What is the difference between orbital and suborbital spaceflights?, FEDERAL AVIATION ADMINISTRATION, http://www.faa.gov/about/office_org/headquarters_offices/ast/faq/#cl6 (distinguishing orbital and suborbital flight).

\textsuperscript{128} See id.

\textsuperscript{129} See Satellite, MERRIAM-WEBSTER ONLINE DICTIONARY, http://www.merriam-webster.com/dictionary/satellite (providing the definition of satellite as "a celestial body orbiting another of larger size"); see e.g., Satellite, UNIVERSITY OF TORONTO PHYSICS, http://www.physics.utoronto.ca/~aerler/ENV235/students/KaiYan.pdf (listing that some common types of satellites include military and civilian Earth observation satellites, communications satellites, navigation satellites, weather satellites, and research satellites).
path of an object around a point in space.\textsuperscript{130} Conversely, a HAP UAS is an aircraft that flies suborbitally and does not quite make it into orbit.\textsuperscript{131} These Internet-providing vehicles are not gravitationally orbiting Earth.\textsuperscript{132} Operators have mechanisms to maneuver these objects, which move between 70,000 to 110,000 feet in the air.\textsuperscript{133} In other words, these HAPs do not gravitationally orbit the Earth like satellites do.

There are issues of security and safety that come with the operation of these HAPs, and they are issues that satellites do not present to operators. First, since the HAPs are not gravitationally orbiting the Earth, an operator on the ground will be moving the HAPs more frequently than satellites.\textsuperscript{134} Second, these HAPs have shorter life spans than satellites.\textsuperscript{135} This means that they will have to reenter more often from a significantly lower altitude. This hyper-movement, in and out of the air, could pose greater harm to planes below and, more importantly, to those on the ground as well.\textsuperscript{136} The HAPs are the size of 747s, have many electronics on board to function, operate for periods of four to six years, and are only 35,000 feet (roughly

\textsuperscript{130} See Orbit, ENCYCLOPEDIA BRITANNICA, available at http://www.britannica.com/EBchecked/topic/431123/orbit; see also Low Earth Orbit (LEO), ACQNOTES, http://acqnotes.com/acqnote/careerfields/low-earth-orbit-leo (stating that the Low Earth Orbit (“LEO”) is between ninety-nine and 1,200 miles in the sky).

\textsuperscript{131} See High Altitude Platforms (HAPs) and Satellites: Projects, supra note 13 (revealing that these aircraft do not reach the LEO and do not gravitationally orbit the Earth).

\textsuperscript{132} See Ben Popper, Google's balloons versus Facebook's drones: the dogfight to send internet from the sky, VOX MEDIA (Mar. 7, 2014, 11:25 AM), http://www.theverge.com/2014/3/7/5473692/facebook-drone-titan-aerospace-project-loon (detailing that the altitudes that the Facebook and Google HAPs will reach is not close enough to the LEO); see also 47 C.F.R. § 2.1 (2014) (defining a satellite, used for communication purposes, as “[a] body which revolves around another body of preponderant mass and which has a motion primarily and permanently determined by the force of attraction of that other body”).

\textsuperscript{133} See Popper, supra note 132.

\textsuperscript{134} See id.

\textsuperscript{135} See id. (explaining that Loon balloons will last over 100 days and that the Solara Facebook drones could last over 1826 days); \textit{see also} Owen D. Curtin, Satellite Life Extension: Reaching for the Holy Grail, VIA SATELLITE (Mar. 1, 2013), available at http://www.satellitetoday.com/publications/2013/03/01/satellite-life-extension-reaching-for-the-holy-grail/ (highlighting geosynchronous satellites average fifteen years in the sky).

\textsuperscript{136} See Fast Facts on Space Debris, AUSTRALIAN SPACE ACADEMY, http://www.spaceacademy.net.au/watch/debris/sdfacts.htm (“The decay lifetime of a space object depends on its altitude, the level of solar activity, and its mass to cross-sectional area. Objects with a large mass to area ratio will remain in orbit longer as they are less affected by drag.”); \textit{see e.g.}, 47 C.F.R. §§ 25.114(d)(14)(i), (iv), 97.207(g)(1)(i), (iv) (emphasizing normal and amateur satellite operators need to include a description of the design and operational strategies that the space station will use to mitigate orbital debris).
eleven kilometers) above where today’s planes fly. Therefore, the FAA will want to make sure that it has in-air jurisdiction over these HAPs, unlike the limited jurisdiction it has when dealing with satellites.

In the United States, the FAA’s Office of Commercial Space Transportation (“FAA/AST”) regulates the launch and reentry of commercial vehicles that launch satellites. However, the agency only oversees the launch and reentry processes; it has no direct ability, or “on-orbit” authority, to regulate spacecraft, such as satellites, in between those two processes. Presently, “on-orbit authority,” during an orbital flight, is a gray area for commercial spacecraft, and FAA officials want authority over on-orbit activities for satellites. The FAA/AST’s duty is to protect the interests of the United States and to promote commercial space transportation, so it would make sense for the agency to have on-orbit governance. The FAA authorities argue that granting on-orbit authority for something like satellites would reduce regulatory uncertainty when operators service satellites and undertake other commercial activities in space.

In fact, even the FCC agrees that it is time to explore on-orbital safety of commercial space transportation.

So, it appears that the companies’ potential satellite argument will soon be moot because the FAA and FCC are already in the process of thinking about obtaining on-orbit authority to make commercial space activities safer for those in space and for those on Earth. The FAA should designate these HAPs as UAS since HAPs are closer to the Earth and not in-orbit, have shorter life spans, and are more mobile than satellites. UAS regulations will allow regulators, such as the FAA, to have the necessary in-air authority to keep the national airspace safe as Congress requires.


139. See 14 C.F.R. § 401.3.

140. See Jeff Foust, The quest for on-orbit authority, THE SPACE REVIEW (May 19, 2014), http://www.thespacereview.com/article/2514/1 (“The FAA believes it’s time to consider closing the current regulatory and safety gap between launch and reentry,” said George Nield, FAA Associate Administrator for Commercial Space Transportation. “Our goal would be to promote orbital space transportation safety, including for orbital debris mitigation, for spacecraft whose primary function is transportation.”).

141. See id.

142. See id. (reporting FCC International Satellite Bureau Deputy Division Chief Karl Kensinger’s belief that “[t]he idea of regulating on-orbit activities isn’t something that seems unnatural”).
3. The FCC May Have the Authority to Step in to Solve the Free Space Optics Dilemma

Facebook’s UAS HAP will use free space optics, as opposed to radio spectrum, for transmitting communications; however, there is no explicit language in C.F.R. Title 47 that details regulation of this new communications technology. Since the FCC’s authority extends only to “communication by wire or radio,” it appears that the free space optics systems, which these HAPs will use, currently fall outside of the FCC’s jurisdiction.

For continued FCC non-regulation of free space optics, Facebook can contend that it is the policy of the United States to encourage new technologies and services for the public. Specifically, it can claim that “[a]ny person or party, other than the FCC, who opposes a new technology or service proposed to be permitted shall have the burden to demonstrate that such proposal is inconsistent with the public interest.” Also, Facebook can argue that its HAP is consistent with the public interest, for as mentioned before, the ITU Study Group has not found any harmful implications of the technology. For example, the laser beam cannot be detected with a spectrum analyzer or radio frequency meter, and the laser beam is very narrow, making it almost impossible to intercept the data being transmitted. If the situation described were to happen, an alarm would go off because the receiving site would sense that it was losing connection. It appears as though the free space optics creators may have been able to make a product that does not require FCC regulation since there is not much potential for harmful interference and since the technology appears to be an “advanced telecommunications capability.”

143. See generally 47 U.S.C. §§ 151–152 (2013) (declaring that the FCC was created for the purpose of regulating “all interstate and foreign communication by wire or radio . . . which originates and/or is received within the United States . . . and to the licensing and regulating of all radio stations . . . ”).

144. See id. § 152.

145. See id. § 157 (highlighting the FCC’s take on new technologies and services).

146. See id.

147. See id.; see also supra note 64, at 16–18; cf. Alessandro Casagni, Radio spectrum: a limited resource, an infinite opportunity, NEW EUROPE ONLINE (Mar. 6, 2012, 11:40 PM), http://www.neurope.eu/blog/radio-spectrum-limited-resource-infinite-opportunity (revealing radio spectrum is a valuable and limited resource).


149. See id. (summarizing that one would have to be in the line of sight between the receiver and transmitter to be able to intercept the communication).

150. See id.

151. See 47 U.S.C. § 1302 (2013) (declaring that the FCC encourages the timely
Further, Facebook can point out that, as stated in 47 U.S.C. § 1301(2)-(3), the federal government should support the partnership of the public and private sectors in the continued growth of broadband services and information technology for the residents and businesses of the nation.\(^\text{152}\) The FCC and the state commissions, with regulatory jurisdiction over telecommunications services, are supposed to encourage the deployment of advanced telecommunications to all Americans on a reasonable and timely basis.\(^\text{153}\) Moreover, Facebook can assert that its HAPs will actually enable quicker and more accessible Internet, that the technology has little to zero public disapproval thus far, and that it has no real known harmful effects.\(^\text{154}\)

Though free space optics are not currently under the FCC’s jurisdiction, the agency could regulate it by making similar arguments to the ones the agency made when it started regulating satellite communications. In that instance, the FCC established jurisdiction over these satellites by finding that the satellites fall under the definition of a radio station as defined in Title 47.\(^\text{155}\) Further, the agency noted that one of the deciding factors, on whether to regulate satellites, was that these satellite communications were originated and/or received in the United States.\(^\text{156}\)

To further support its authority over satellites, the agency provided three additional arguments. First, the agency cited § 303(g), which states that the FCC may “[s]tudy new uses for radio, provide for experimental uses of frequencies, and generally encourage the larger and more effective use of deployment of “advanced telecommunications capability” and defining “advanced telecommunications capability” as “high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology”). See generally supra note 64.

2. See id. § 1301(2)-(3) (stating Congress encourages the advancement of broadband technology and that it is vital to the nation’s development).

153. See id. § 1302(a) (“The Commission and each State commission with regulatory jurisdiction over telecommunications services shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) by utilizing, in a manner consistent with the public interest, convenience, and necessity, price cap regulation, regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment.”).

154. See generally What is Free Space Optics?, supra note 149 (noting free space technology has been around since 1960).

155. See 47 U.S.C. § 153(42) (2013) (defining a radio station as a “station equipped to engage in radio communication or radio transmission of energy”). See generally id. § 153(40) (declaring radio communication means the “transmission by radio of writing, signs, signals, pictures, and sounds of all kinds, including all instrumentalities, facilities, apparatus, and services . . . .”).

radio in the public interest."

Second, the FCC cited previous courts' decisions that construed the Communications Act as "granting broad powers to the Commission which do not depend on a specific reference to the particular service, technology or practice in the statute."

Third, the agency cited the "public interest" standard as another reason why the FCC is able to govern satellites in space. The FCC uses this standard during licensing and rulemaking proceedings, and the courts have previously noted that the test has been construed as leaving "wide discretion [for] and calling for imaginative interpretation" from the FCC.

With the exception of two of its radio-related reasons, the FCC could establish its jurisdiction over free space optical communications by using some of the arguments it used when first establishing authority over satellite communications. Foremost, the FCC could argue that it needs to regulate the new technology because it is a form of communication being originated and/or received by entities in the United States; moreover, similar to when it first started regulating satellites, the FCC could claim that it does not matter that this new form of communication is not one that is explicitly stated in a statute. Finally, if the agency is to make rules regarding free space optics, it can point to the "public interest standard," which leaves the FCC with "wide discretion" to regulate communications.

To strengthen its "public interest" argument for free space optics regulation, the FCC could point to some of the potential disadvantages of free space optics technology. Safety can be a concern because the technology uses laser beams for data transmission. The proper use of lasers and their safety has been discussed since free space optics devices first appeared in laboratories more than two decades ago. The two major safety concerns involve eye exposure to light beams and high voltages within the light systems and their power supplies. The International Electrotechnical


158. See Domsat 1, supra note 157, at 129 (citing Nat'l Broad Co. v. United States, 319 U.S. 190, 217-19 (1943)).

159. See id. (citing FCC v. RCA Commc'ns, Inc., 346 U.S. 86, 90 (1953)).

160. See id.

161. Please, note that the FCC would not be able to argue that the free space optics HAP is a radio station since it does not use radio spectrum at all.

162. See generally Domsat 1, supra note 157, at 129 (citing Nat'l Broad. Co. v. United States, 319 U.S. 190, 217-19 (1943)).


164. See generally id.

165. See What is Free Space Optics?, supra note supra note 149 ("High-power laser
Commission ("IEC") has set safety and performance standards for eye safety and protection. Since there are potential voltage and eye safety issues with free space optics usage, the FCC could show that the agency has previously issued safety standards for earth stations transmitting to satellites through radio frequencies, and it could then adopt the IEC standards for proper protection from the free space optics.

Additionally, there is comparative law that the FCC could use as guidance if it were to adopt regulations for free space optics technology. The Telecommunications Regulatory Authority is the FCC's counterpart in the United Arab Emirates ("UAE"). The main articles of its free space optics regulations state that "the usage of any FSO [free space optics] link in the UAE is subject to a valid Authorization issued by the Authority." Also, the operator must submit an application that includes link planning and equipment approval. Third, and most importantly, free space optics link equipment must comply with the IEC standards for eye safety and protection. Altogether, Facebook could make viable arguments for the non-regulation of free space optics. However, similar to the arguments it made when the agency first started regulating satellites, the FCC can and should establish jurisdiction to protect the public from potential safety issues.

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166. See generally Who we are, INTERNATIONAL ELECTROTECHNICAL COMMISSION, http://www.iec.ch/about/profile/ (putting forth that the IEC is a non-profit, non-governmental international standards organization that prepares and publishes international standards for all electrical, electronic, and related technologies).


168. See Regulations for Free Space Optics, UNITED ARAB EMIRATES TELECOMMUNICATIONS REGULATORY AUTHORITY (imposing this regulatory scheme to increase the choice and plurality available for connectivity and to facilitate high data rate connectivity).

169. See id.

170. See id. (requiring an application charge and also an annual authorization renewal charge, which would be in accordance with the FCC Spectrum Fees Policy).

171. See generally Safety of laser products – Part 12: Safety of free space optical communication systems used for transmission of information, INTERNATIONAL ELECTROTECHNICAL COMMISSION (Feb. 12, 2004), https://webstore.iec.ch/preview/info_iec60825-12%7Bedl.0%7Den.pdf (putting forth steps entities can take to minimize harm while using free space optics for the transmission of information).
that may arise from the use of free space optics.

4. After Jumping Through All the Hoops, NOAA’s Requirements Could Prevent the HAPs from Complete Flight

If, as private HAP operators, Facebook or Google intends to observe or to remotely sense the Earth’s surface and/or its oceans, the operators need a NOAA license even though it may already have the requisite FAA and/or FCC license(s). Section 60122(b)(1) in Title 51 of the United States Code states that a licensee should “operate the system in such manner as to preserve the national security” of the United States and should observe “the international obligations” of the United States; likewise, subsections (b)(5) and (b)(6) of the same section require these systems to provide orbital and data collection characteristics to the Secretary and also to “notify the Secretary of any significant or substantial agreement the licensee intends to enter with a foreign nation [ . . . ]”\(^{172}\)

These particular license requirements may prove difficult for Google to follow if it chooses to use some of its balloons for remote sensing purposes.\(^{173}\) The operators’ lack of total control of the balloons is one factor that may greatly affect Google’s ability to receive a NOAA license. The balloons are fairly unpredictable once in the air, and their limited mobility might provide concern for the regulator since these HAPs might not be able to give adequate orbital notifications as prescribed under subsection (b)(5). Again, these balloons will be flying suborbitally, so NOAA will want to make this distinction in its rules. On the same hand, the balloon is a balloon; if there is a hole, it will cause the balloon to come back down to Earth, allowing for little to no control over the balloon at that time. Not only could these balloons be remote sensing sensitive material, but they could also wreak havoc on the United States’ and other countries’ airplanes below and cause potential radio interference; similarly, if the now-deflated balloon falls somewhere where it was not supposed to fall, who knows who can get their hands on the data, if indeed some of it is stored on-board the balloon. These instances can prevent the HAPs from making the “national safety” and “international obligation” requirements set forth in subsection (b)(1).

Similarly, Facebook, or other operators using free space optics UAS, may have trouble following some of the NOAA criteria for remote sensing licensing, particularly subsections (b)(1) and (b)(6). The FCC does not currently regulate this technology, so it allows for more uncensored usage of

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173. See also Butler, supra note 75 (highlighting that “scientific data collection, remote communications, GPS augmentation, intelligence gathering, persistent surveillance, reconnaissance, radar calibration, satellite simulation, incremental testing, and research and development of sensors” are mission possibilities for these balloons).
the technology and could lead to privacy issues whilst remote sensing within the country and outside of it. This reason could hinder the obligations of the United States in preserving its national security as set out in subsection (b)(1). Additionally, contrary to subsection (b)(6), companies could begin cutting agreements with other countries or other private foreign entities without notifying the United States because the companies realize that free space optics are harder to trace than radio frequencies (spectrum analyzers and radiofrequency meters cannot trace this light frequency), and this could push them to take part in activities that might not in the best national security interest of the United States. Unlike the FCC Table of Frequency Allocations, there is no domestic or international registry showing which free space optics frequency bands are available and who is allowed to use those bands.

For these reasons, NOAA will want to make sure that HAP operators make the same safety and notification disclosures that they will have to make during the FAA licensing process. Regardless of the FCC’s status on governing free space optics usage, NOAA will want to temporarily forbid free space optics communications for now because of the sensitivity related to remote sensing, but the agency could remove this restriction once there is more data out on the new communications mechanism.

VII. THE FAA, FCC, AND NOAA’S FUTURE RESPONSIBILITIES AND THEIR NEED TO ACT FAST

The technology is gearing up to go, and the law, along with its associated regulators, is still playing catch-up. First, the FAA will have to make critical decisions about how it wants to protect the United States’ national airspace and how, or if, it wants to involve ICAO and other agencies in the development of a regulatory structure for the unmanned balloons and UAS. Next, the FCC may have the authority to govern free space optics, and it should use precedent to govern this new communications technology to make sure it meets the same safety standards that radio satellites meet. Finally, to preserve the national security of the United States and other countries when remote sensing, NOAA may need to refine its regulations to better accommodate the new HAPs that, unlike traditional satellites, will fly closer to the Earth for shorter periods of time and may use a communications technology that the FCC does not regulate.

174. See, e.g., Where Loon is Going, GOOGLE, http://www.google.com/loon/where/ (noting that Project Loon did a pilot test in 2013). See generally Alistair Barr and Andy Pasztorg, Google Invests in Satellites to Spread Internet Access, WALL ST. J. (June 1, 2014, 7:48 PM), http://www.wsj.com/articles/google-invests-in-satellites-to-spread-internet-access-1401666287 (summarizing that both Titan and Ascenta—Google and Facebook’s UAS manufacturers respectively—have been able to test their UAS).
The FAA should regulate Google’s Project Loon balloons under its forthcoming UAS regulations. The FAA could apply its Subpart D Regulations to the Project Loon balloons, but that route might not be the best solution175 because the balloons pose a greater risk than normal balloons due to their size, close proximity to the Earth, usage of radio spectrum, and location unpredictability in the air. With those factors in play, the FAA needs to put together its UAS regulation as soon as possible to ensure the maintenance of air safety. If the FAA treats the Project Loon balloons as UAS, the agency will want to impose restrictions on areas where the balloons may function, how they will report, and how they will reenter the country—all in addition to the current unmanned free balloon in-air notification requirements.

Since HAPs provide novel problems that traditional satellites do not provide, the FAA, FCC, ICAO, and ITU should collaborate in the development of the regulations governing these vehicles. Currently, these HAPs, with many potential beneficial uses, present regulators with unique problems. The Project Loon balloons are generally unpredictable as to where they will float after an operator moves them. Facebook’s UAS are worrisome in that they are the size of 747s and in that they hover in the stratosphere for periods of four to six years. Lastly, there are very small chunks of specifically designated UAS frequencies and ISM bands; these bands, by themselves, will not suffice for UAS usage.176

To control some of these problems, the ICAO, the FAA, and the FCC can use a system similar to what the ITU and the FCC use to ensure satellites do not interfere with each other. Though airspace is not as precious of a commodity as radio spectrum, it is conceivable that more countries will want to include these HAPs, both UAS and balloons, in their airspace because of their many added benefits,177 so it is advantageous for both international and domestic agencies to start creating an effective structure for regulation.

It is advisable for the ICAO to collaborate with the ITU to make the airspace safe throughout the stratosphere and to avoid harmful radio interference in the same area. To complete this task, the two international agencies could work together to create “aerial slots” similar to satellite


176. See United States Radio Spectrum Frequency Allocations Table, supra note 81 (showing that ISM bands are very limited); see also 47 C.F.R. § 2.106 (5.552A), (5.388A) (2014); supra note 58.

177. See, e.g., Mack, supra note 14; Mirani, supra note 14; What is Loon?, supra note 20; Canterbury student to explain wider benefits of Project Loon, supra note 22.
orbital slots.\textsuperscript{178} These aerial slots would create a vertical altitude range, an enclosed horizontal boundary within that altitude range, and a radio frequency band requirement within a particular slot. Part of this aerial slot creation will also require the ITU to assign more radio frequencies bands for HAP usage—adding to the very few HAP-associated and ISM bands that exist currently. The ITU should be able to assign the necessary higher frequency ranges since there are not many other users currently utilizing them.\textsuperscript{179} It is a lot to ask an international organization, such as ICAO, to create a structure like this since there are not many countries that have HAP technology readily available. However, the FAA and FCC could still step up and establish these aerial slots in the United States national airspace. Taking these steps will allow the FAA to better maintain the safety of the United States national airspace.

Though many of the HAPs will be using radio spectrum to provide Internet, there will be some that use infrared light to deliver this same service. Free space optical communications may have many advantages, but the FCC should use its authority to govern this new technology and to protect the public interest. The FCC may need to amend its Title 47 regulations to include the free space optics into its language since the technology is another type of communication being received in and sent from the United States. The FCC has precedent to regulate new communications technologies, and it should step in to ensure the communications' safety standards. Moreover, free space optical links equipment should comply with International Electrotechnical Commission standards for eye safety and general protection, so the agency could find it in the “public interest” to regulate this new technology. The FCC could adopt language similar to the UAE’s free space optics regulations and to its own OET Bulletin 65 as starting points for its own regulation of free space optics.

Finally, with the HAPs having limited predictability while in the air and different communications methods onboard, NOAA should define its regulations in more detail if it plans on allowing HAPs to remotely sense the Earth suborbitally. To start, the agency could include more detailed application requirements such as launch, in-air, and reentry plans, and an emergency plan in case of disaster. Next, even though the FCC may choose not to regulate free space optics, NOAA might want to temporarily forbid

\textsuperscript{178} See, e.g., ORBITAL SLOTS, [sic] FREQUENCIES, FOOTPRINTS AND COVERAGE, https://docs.google.com/presentation/d/1DNhLjqAKC2vV28UIdTnigB73iP5dx_hMCi39D_aubTA/preview?slide=id.p13 (defining orbital slots and how they apply to satellite location in space); Mark Holmes, Hot Orbital Slots: Is There Anything Left?, VIA SATELLITE (Mar. 1, 2008), available at http://www.satellitetoday.com/publications/via-satellite-magazine/features/2008/03/01/hot-orbital-slots-is-there-anything-left/ (explaining that orbital slots are a limited resource).

\textsuperscript{179} See supra note 81; see also 47 C.F.R. § 2.106(5.552A), (5.388A) (2014).
remote sensing through the use of free space optics because the light is infrared and hard to trace, especially if the FCC is not regulating it. However, as more data and studies come out regarding this new technology, perhaps, then NOAA can allow these HAPs to remote sense through free space optical communications. For right now, NOAA will want to preserve the country’s national security and international obligations, and it can do this by restricting the use of free space optics users from the sensitive task of remote sensing the Earth.

CONCLUSION

Google and Facebook’s actions are quite benevolent, but flying dozens or even hundreds of aircrafts or balloons in airspace over different sovereign nations, or even just the United States, can raise many legal questions. Though these Internet-providing vehicles do not orbit the Earth like traditional satellites, they still fly high up in the sky. They emit radio waves, and in aggregation, they could be using large portions of radio spectrum when in operation. Furthermore, some HAPs will even forgo the usage of radio spectrum and will attempt to utilize unregulated infrared light for communications purposes. The FAA, FCC, and NOAA will all have a role to play in updating their respective rules to properly govern these new Internet-providing HAPs.