STATEMENT OF
DAVID GOLDMAN
SENIOR DIRECTOR, SATELLITE POLICY
SPACE EXPLORATION TECHNOLOGIES CORP. (SPACEX)

BEFORE THE
COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON COMMUNICATIONS AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES

February 8, 2023

Chair Latta, Ranking Member Matsui, Chair McMorris Rogers, Ranking Member Pallone, and Members of the Subcommittee, SpaceX appreciates the opportunity to join this timely and important hearing on several of the Committee's satellite-related legislative initiatives.

America is once again leading the way in space. But the aging rules meant to regulate this fast-growing industry are relics from a previous era and they are putting the United States at a disadvantage globally. SpaceX therefore commends the Subcommittee for its leadership in prioritizing early in the 118th Congress reform and modernization of U.S. regulations for satellite authorization and licensing. The work this Subcommittee is doing here today is a national imperative if America is to maintain its lead in space technology against determined, state-backed enterprises in China and elsewhere. As the Subcommittee considers how to modernize the regulatory structure under which next-generation satellite systems are licensed, SpaceX encourages the Subcommittee and the rest of Congress to move quickly to ensure that regulatory processes keep pace with innovation, licensing is tied by explicit statutory authority, and regulations are applied equitably among both U.S. and foreign-licensed systems.

SpaceX appreciates the important work done every day by the Federal Communications Commission ("Commission") and its staff. Due to rapid technology advances in this sector Commission staff currently apply rules and processes designed for entirely different types of satellite networks. At the same time, the Commission has seen an influx of satellite applications not yet matched by an increase in personnel and technical resources. The Commission recently has undertaken unilateral, bipartisan actions to begin addressing some of these challenges and has, on a bipartisan basis, expressed support for legislation like the Satellite and Telecommunications Streamlining Act.

Given this strong bipartisan support, SpaceX is hopeful that procedural improvements can be implemented quickly, whether by Commission action or in legislation. Specifically, SpaceX recommends particular focus on the following areas:

(1) *Adopt firm timelines on federal agencies, particularly the Federal Communications Commission ("Commission").* These timelines to complete satellite system license authorizations, including specific timelines to issue applications for public comment and deadlines to complete review should be the rule, not the exception. Decisions exceeding statutory deadlines should only occur under pre-defined, extraordinary circumstances. Under the aging regulatory regime currently in place, Commission decisions for satellite authorizations take 2.5 years on average. Worse, as the industry accelerates, decisions under the current framework are slowing down.

(2) *Bind agency decisions to explicit statutory authority*. By ensuring decisions are directly tied to statutory authority, Congress can provide regulatory certainty to companies committed to satellite system deployment that requires massive up-front capital investment.

(3) *Ensure the efficient use of spectrum*. Rules should create incentives to better share spectrum and reward operators who design spectrally efficient systems, rather than protecting inefficient systems that are built on yesterday's technology.

(4) *Protect shared spectrum bands that are the backbone of next-generation satellite constellations, like the 12 GHz band*. The 12 GHz band is the workhorse for next-generation satellite systems for consumer downlink. No other country in the world is threatening to pull this band out from under their next-generation satellite operators. To maintain American leadership in space, the Committee should direct the Commission to end its ongoing proceeding that would upset the careful balance safeguarding this band—which has been underway for over three years—with no change to interference rules. Otherwise, process reforms proposed by this Committee will be for naught.

(5) *Level the playing field by eliminating preferential regulatory treatment for satellite operators who elect to license in foreign jurisdictions*. Satellites operate in a global market, which means operators simply need to license overseas to evade regulatory requirements imposed only on U.S. authorized systems. The current approach drives companies' operators out of the U.S. by imposing asymmetric burdens on U.S.-authorized systems, like Starlink, while creating a loophole with a far less burdensome set of rules for foreign-licensed systems that seek U.S. market access.

(6) *Invest in resources at the Commission to accelerate hiring of qualified personnel*. The Commission needs more satellite engineers with specific expertise in satellite technologies who can more efficiently address the increasing workload from next-generation satellite systems.

Next-generation satellite technologies like Starlink are already bringing lifechanging capabilities to Americans across the country in the form of high-speed broadband internet, and in communities across the globe. SpaceX applauds the Subcommittee for its leadership on introducing the Satellite and Telecommunications and Streamlining Act, the LAUNCHES Act, and the other pieces of legislation under consideration today. As the Subcommittee undertakes this slate of reform initiatives, SpaceX encourages the Subcommittee to comprehensively revise the existing regulatory regime and build one designed for the future.

I. SpaceX in 2023

SpaceX was founded in 2002 with the express goal of dramatically improving the reliability, safety, and affordability of space transportation. SpaceX today is the world's largest launch services provider, having successfully launched the Falcon 9 and Falcon Heavy rockets over 200 times, including eight launches so far in 2023 alone. In 2022, SpaceX successfully conducted 61 Falcon launches, and deployed well over half of all mass launched to space worldwide.[1] In 2023, SpaceX plans to conduct 100 Falcon launches.

In addition to commercial satellite launch operations, SpaceX supports a diverse set of satellite and space customers, including NASA, the Department of Defense, and allied international governments. Under one of the most successful public-private programs ever undertaken with NASA, SpaceX supports the nation's civil space program through critical cargo resupply missions with our Dragon spacecraft to the International Space Station ("ISS"). In May 2020, in partnership with NASA, SpaceX launched the first crewed Dragon mission to the ISS, restoring U.S. human spaceflight capability. Dragon has to-date carried 30 NASA and private astronauts to space and returned them safely to Earth. SpaceX is also a certified provider to the Department of Defense ("DOD") for the National Security Space Launch program, providing assured access to space for the Nation's most critical defense and intelligence missions.

[1] Based on SpaceX analysis and BryceTech reporting through Q3 0f 2022., accessed at https://brycetech.com/reports

Leveraging our experience in space launch system and spacecraft design, development, production, and on-orbit operations, SpaceX developed an innovative non-geostationary satellite orbit ("NGSO") constellation—Starlink. Operating in low Earth orbit ("LEO"), SpaceX's high-speed, low latency internet network Starlink began initial commercial service in 2020 and now serves over one million households. Starlink is licensed to operate on all seven continents, providing service to customers in more than 46 countries, as well as additional markets worldwide, and connecting communities that previously never had access to the internet. SpaceX's Starlink is designed to reach directly to end users, and provide global broadband services at speeds, latencies, and prices on par with terrestrial alternatives available in metropolitan communities.

To achieve revolutionary reductions in launch costs and enable a high cadence of launch, SpaceX focused on making our rockets reusable. Since the first successful recovery of a Falcon first stage in December 2015, SpaceX has now successfully landed first stage rocket boosters 169 times, and re-flown our rockets 142 times, with some boosters achieving more than 15 flights. The reliability, cost efficiencies, and cadence enabled by reusability are critical to the deployment of large satellite constellations like Starlink.

In addition, SpaceX also continues development of Starship, the largest, most powerful launch system in history. Selected by NASA to land the next two American astronauts on the Moon, Starship will also enable greater capability for launching satellites and other spacecraft to orbit through full and rapid system reusability.

SpaceX maintains manufacturing and engineering facilities in Hawthorne, CA; Starlink satellite system design and manufacturing facilities in Redmond, WA; a rocket development and test Facility in McGregor, TX; and launch pads at Cape Canaveral Space Force Station, NASA Kennedy Space Center, Vandenberg Space Force Base; and production, test, and launch facilities at Starbase in South Texas. SpaceX maintains a network of more than 6,000 American suppliers and vendors in all 50 states.

II. The Arrival of Next-Generation Satellite Technologies

Satellite communications is not a new endeavor, but satellite internet has historically been hampered by high latency, limited throughput, complex and finicky equipment, and high costs. Traditional geostationary orbit ("GSO") satellite systems operate at very high altitudes—nearly 22,000 miles from Earth's surface—which results in high latency due to the distance the signal must travel, which typically makes this technology unsuitable for modern internet uses like streaming, video conference calls, and internet gaming. Additionally, GSO satellites have lengthy development and build cycles, are not manufactured at scale, and are designed to last for 20-25 years on orbit—timelines which do not comport with rapid technology iteration and innovation, or an efficient regulatory system.

By contrast, low Earth orbit systems, by their very design, provide much faster speeds and lower latency than GSO systems. Technology iteration cycles are much faster, indeed continuous, and per-satellite costs are substantially lower, allowing for shorter satellite lifetimes. LEO systems allow for a much-enhanced user experience due to their proximity to Earth.[2] While more satellites are required due to this proximity, LEO systems like SpaceX's Starlink will always have multiple satellites in view of any given users, providing a highly resilient network connection through path redundancy. Because LEO networks are comprised of hundreds or thousands of satellites, networks are able to scale to grow with user demand, and to continuously improve throughput and quality of service. Perhaps most importantly, LEO systems can be manufactured at a scale previously unseen in the space sector, resulting in lower costs, more rapid deployment, faster technology iteration cycles, and non-linear innovation in consumer services and quality. The faster speeds, lower latencies, better reliability, and lower costs—coupled with

[2] Starlink, for example, operates at an altitude of approximately 200 miles.

huge unmet demand for millions of Americans who have been left out of broadband deployment—have resulted in huge demand for LEO broadband services, and a surge in investment in the sector.[3] This investment is expected to continue and increase in the coming decade, with the global satellite communications market estimated to reach $40 billion by 2030.[4]

The U.S. currently leads the world in the development, manufacture, launch, and deployment of LEO broadband services, which is directly responsible for job creation and economic growth throughout the supply chain.[5] Moreover, U.S. leadership in LEO has paid enormous dividends domestically and globally, connecting previously unserved areas in America and around the world. But this competitive edge could be fleeting. Without quick and decisive reforms to U.S. regulatory processes, the U.S. could ultimately cede this high ground to foreign competition. As the Center for Strategic and International Studies ("CSIS") recently noted, "For U.S. companies that compete against foreign firms facing different national regulatory structures, requirements, and enforcement capabilities, comparatively stringent domestic requirements are costly and dampen U.S. firms' first-mover advantage."[6]

III. SpaceX's Starlink System

SpaceX filed an application with the FCC in November 2016 to launch and operate a next-generation satellite system to provide high-speed, low latency broadband in the United States and around the world. The FCC granted SpaceX a license nearly a year and half later in March 2018, to operate this system, and SpaceX began launching satellites as part of its Starlink network shortly thereafter in May 2019. Since this initial launch, Starlink has grown rapidly as SpaceX has raced to keep up with surging demand for connectivity in vast swaths of America and abroad, particularly to people who remained unserved, and to outpace competitive risks primarily from state-backed foreign operators. At this point, SpaceX now provides Starlink service to more than one million locations (typically households) in more than 46 countries, as well as additional markets worldwide. Of the 4,408 Starlink satellites the FCC authorized in 2018, SpaceX has already deployed well over 3,800 onboard Falcon 9, with additional launches now occurring at least every week, with a current pace of every 3.8 days for Starlink and SpaceX's other launch customers. Consistent with continuous improvement, SpaceX also received in December of last year FCC authorization for the second generation Starlink network, or "Gen 2."[7] This new authorization enables SpaceX to launch additional, much-improved spacecraft with significantly more throughput per satellite than the first-generation system. For the end consumer, this means more bandwidth and increased reliability. For the U.S. Government, it means millions more Americans will have access to high-speed internet no matter where they live.

What this experience means on the ground is a seamless broadband connection with speeds that enable high-resolution streaming, video messaging, telehealth, remote learning and disaster response. Starlink is also authorized for mobile services, including on airplanes, RVs, and boats. Soon, low-performing airplane wi-fi will be a distant memory. With hundreds of thousands of users across the U.S., including

---

[3] See for instance Ryan Brukardt et al., "Space: Investment shifts from GEO to LEO and now beyond", McKinsey & Company, January 27, 2022. Accessed at https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/space-investment-shifts-from-geo-to-leo-and-now-beyond and Washington Post, Why Low-Earth Orbit Satellites Are the New Space Race, July 10, 2020, accessed at https://www.washingtonpost.com/business/why-low-earth-orbit-satellites-are-the-new-space-race/2020/07/10/51ef1ff8- c2bb-11ea-8908-68a2b9eae9e0_story.html

[4] Thibault Werlé et al., "LEO Satellites: A Technology to Revolutionize Global Connectivity?", Boston Consulting Group, June 1, 2021, accessed at https://web-assets.bcg.com/b8/b6/43002b934a23a63516a1dd45ca7a/leo-satellites-a-technology-to-revolutionize-global-connectivity-final.pdf

[5] Laura Odell et al., "U.S. Low Earth Orbit Dominance Shifting with Gray Zone Competition", Institute for Defense Analyses, June 2021, accessed at https://www.ida.org/-/media/feature/publications/u/us/us-low-earth-orbit-dominance-shifting-with-gray-zone-competition/d-22676.ashx

[6] Makena Young and Akhil Thadani, "Low Orbit, High Stakes: All-In on the LEO Broadband Competition", Center for Strategic and International Studies, December 2022, accessed at https://www.csis.org/analysis/low-orbit-high-stakes

[7] *Federal Communications Commission,* IBFS File No. SAT- LOA-20200526-00055 and SAT-AMD-2-21-818-00105, released December 1, 2022.

in urban, suburban, rural, and Tribal communities, Starlink is connecting the underserved and unserved areas that terrestrial networks and legacy satellite providers have been unable or unwilling to serve. Next-generation satellite systems like SpaceX's Starlink are changing the economics of broadband deployment. With Starlink, for example, the capital cost of a network occurs at the beginning of deployment, with infrastructure principally deployed in space, eventually obtaining global coverage, or access. Unlike fiber and other terrestrial solutions, the cost of adding consumers is marginal. Additionally, with ubiquitous access, Starlink deployment to a particular end user (i.e. household) occurs in a matter of days where capacity is available—simply the time it takes for shipping to arrive at your door. Permits, project costs, the risk of stranded investments, and per-mile consumer uptake rates are not relevant for the deployment of Starlink and systems like it. And people no longer have to live with their streets being dredged up for months to get the quality broadband they deserve. In short, LEO systems—by their very nature—directly address many of the challenges associated with broadband *access.*

Ubiquitous Broadband Access

To highlight the profound reach of LEO systems like Starlink in addressing the otherwise intractable issue of broadband access, SpaceX offers several examples of some of the most far-flung locations where we have delivered service, and others where terrestrial telecommunications had become unavailable:

1. **Tribes and First Nations.** Starlink is reaching unserved Tribal communities, and doing so affordably relative to project costs associated with fiber build-outs. For example, the Hoh Tribe in Washington State had struggled for years to get reliable high-speed internet to their community on the Olympic Coast in Washington. SpaceX provided Starlink to the Tribe as part of the initial beta testing phase of the network. One member of the Hoh Tribe noted that "It seemed like out of nowhere, SpaceX came up and just catapulted us into the 21st century."[8] Since that time SpaceX has provided connectivity to additional Tribal communities across the United States, including in New Mexico, where Starlink connected 150 Navajo Nation households with K-12 students who didn't have reliable access to high-speed internet before Starlink became available.[9]

2. **Rural America.** With the built-in advantage of not needing to dig or lay fiber to reach single locations, Starlink has proven a game-changing technology for rural parts of the country. SpaceX's Starlink is an ideal solution for years of underinvestment in getting broadband to rural communities, and connecting the nearly 15 million Americans from rural areas who do not have access to high-speed internet.[10] Starlink has provided access to high-speed internet in places like Wise County, Virginia, where an early Starlink project will be expanded to serve 438 students in the area.[11] Starlink is providing critical connectivity in Eastern Kentucky as well, with an expanding program that is connecting residents to telehealth services and education services in the Appalachia region.[12]

---

[8] Jon Brodkin, "Remote tribe says SpaceX Starlink 'Catapulted' them into the 21st century", *Ars Technica*, October 12, 2020, accessed at https://arstechnica.com/information-technology/2020/10/remote-tribe-says-spacex-starlink-catapulted-them-into-21st-century/

[9] See "Coconino County makes leading effort to bring Starlink to Navajo Nation students", Navajo-Hopi Observer, August 9, 2022, accessed at https://www.nhonews.com/news/2022/aug/09/coconino-county-makes-leading-effort-bring-starlin/

[10] Laura Bedard, "How Starlink is a Reliable Internet Service for Rural America", *Successful Farming*, December 22, 2022, accessed at https://www.agriculture.com/technology/computers/how-starlink-is-a-reliable-internet-service-for-rural-america

[11] Slater Teague, "Grant will help fund Starlink expansion in Wise County", October 6, 2022, accessed at https://www.wjhl.com/news/local/grant-will-help-fund-starlink-expansion-in-wise-county/

[12] See " Kentucky, SOAR, and SpaceX: 30 Homes in Eastern Kentucky to Receive Starlink High-Speed Internet", accessed at https://soar-ky.org/starlink-eastern-ky/

3. **Alaska and Antarctica.** SpaceX completed the initial deployment of the polar shell of the Starlink constellation at the end of 2022, providing coverage to the highest-latitude regions and achieving global coverage. While additional polar deployments continue to improve capacity, Starlink is now providing service to all of Alaska, the most remote regions of Northern Canada, and even to Antarctica, where the U.S. expedition at McMurdo station has already made use of Starlink broadband in the service of their scientific endeavors.

4. **Ukraine.** Shortly after Russia launched its invasion of Ukraine, SpaceX received an urgent request from the Ukrainian government to help with providing internet connectivity through Starlink. The Starlink network has proven vital in keeping the country online since the Russian invasion. One Ukrainian platoon commander noted that "Without Starlink, we would have been losing the war already," and Ukrainian President Volodymyr Zelensky has noted how critical the network has been for the Ukrainian population.[13]

5. **Disaster Response and Recovery.** SpaceX has repeatedly deployed Starlink to areas where terrestrial telecommunications services have been disrupted by natural disasters. For example, Starlink has provided connectivity in the aftermath of wildfires- (Washington state, California, Spain), floods (Germany), volcanic eruptions (Tonga), and hurricanes (Louisiana, Florida), among others. In each case, because of Starlink's global reach, SpaceX was able to make Starlink kits available to emergency responders, often within hours, to restore critical communications services to assist in disaster response and recovery. In the future, in partnership with T-Mobile, Starlink will deploy a direct-to-cell capability, enabling users with a compatible cellphone to receive service even when they are outside the range of a cell tower. This groundbreaking capability will enable emergency communications "off the grid," and eliminate cell dead zones.

Space Safety and Sustainability

With Starlink, SpaceX is leading the world in responsible space operations that ensure continued and sustainable orbital access, as well as mitigate impacts on optical and radio astronomy. As the first private company to have taken astronauts to the International Space Station ("ISS"), as well as the first and only company to launch an all-civilian crew into orbit, SpaceX is deeply committed to maintaining a sustainable orbital environment, and protecting astronauts in orbit as well as the uninvolved public on the ground. SpaceX has demonstrated this commitment through action. Notably, SpaceX uniquely includes sustainability as a critical design element for its satellite operations, ensuring that no debris remains in space longer than five years should a satellite become non-maneuverable.[14] Additionally, SpaceX's space safety approach includes, but is not limited to:

- **Design and build reliability.** SpaceX satellites are designed and built with high reliability, with reliability around 99% after the deployment of nearly 4,000 satellites.
- **Operations below 600 km.** SpaceX has chosen to operate at an altitude below 600 km, since this altitude is essentially "self-healing," meaning that objects will decay out of orbit due to atmospheric drag within a short period of time in rare off-nominal scenarios, eliminating the risk of persistent orbital debris. By contrast, several other commercial satellite constellations are designed to operate above 1,000 km, where it will take hundreds to thousands of years for spacecraft to naturally deorbit if they fail on orbit.[15]

---

[13] As quoted in "Ukraine Leans on Elon Musk's Starlink in Fight Against Russia", *Wall Street Journal*, July 16, 2022 https://www.wsj.com/articles/ukraine-leans-on-elon-musks-starlink-in-fight-against-russia-11657963804 and "Volodymyr Zelensky on War, Technology, and the Future of Ukraine", *WIRED*, June 2, 2022. Available at: https://www.wired.com/story/volodymyr-zelensky-q-and-a-ukraine-war-technology/

[14] The non-maneuverable rate is trending towards 0% with Starlink satellites.

[15] Here, the 2021 National Science Foundation JASON report on *The Impacts of Large Constellations of Satellites* ("the JASON report") found that : " [d]ue to the impacts on ground-based astronomy and concerns about debris generation and longevity, JASON's highest priority recommendation is to eliminate or highly regulate large satellite constellations in orbits higher than

- **Deployment into an extremely low insertion orbit below 300 km.** At this low altitude, any SpaceX satellites that do not pass initial system checkouts are quickly deorbited actively, or by atmospheric drag.
- **Radical transparency and data sharing with the U.S. Government and other satellite owners/operators to ensure full space situational awareness.** SpaceX openly shares high-fidelity future position and velocity prediction data for all SpaceX spacecraft. SpaceX was the first operator to share both ephemeris and covariance data and calls on all other operators to do so. In addition, SpaceX volunteered to publicly provide routine system "health reports" to the Commission, something no other operator has ever offered or does.
- **Advanced collision avoidance systems protect SpaceX and other satellites.** Every SpaceX satellite is equipped with an autonomous collision avoidance system that ensures it can maneuver away from any other tracked object that could approach it. SpaceX's autonomous collision avoidance system has been scrutinized by NASA's Conjunction Assessment and Risk Analysis (CARA) program, which deemed it sufficiently trustworthy to rely on it to avoid collisions with NASA spacecraft.
- **Post-mission disposal.** In nominal scenarios, SpaceX satellites are propulsively deorbited within weeks of spacecraft end of mission. This vastly exceeds the international standard of 25 years.
- **Starlink spacecraft are 100% demisable**. At end of life, SpaceX satellites are designed to vaporize upon atmospheric reentry, eliminating the risk of falling debris.
- **Best Practices.** SpaceX's approach to space safety relies on extreme transparency in operations, and SpaceX has collaborated with other operators and experts in developing an "Industry Best Practices" document that is based on operational lessons learned. SpaceX encourages all operators to implement these best practices to ensure the sustainability of the space environment.

The United States currently has the most robust orbital debris requirements in the world. As one of the few remaining U.S.-licensed systems, SpaceX adheres to and significantly exceeds these requirements, and operates with full transparency as required by U.S. regulations. SpaceX's actions stand in stark contrast to nearly every other satellite system, in every orbital regime, which have obtained license authorizations outside of the U.S. and do not comply with U.S. requirements. This forum shopping is purposeful. SpaceX wishes to emphasize that U.S. leadership on space sustainability and orbital debris prevention, mitigation, and remediation requires the U.S. Government to apply its requirements consistently across operators, irrespective of where a system is authorized, if it wishes to provide service in the U.S. market.

SpaceX has also prioritized collaboration with astronomers and scientists to mitigate the impact of Starlink on their work. After early observations showed satellites that were brighter than expected—which no one at the time anticipated—SpaceX began proactively collaborating with astronomers and the U.S. government, and dedicated engineers and resources to design and deploy mitigations and run experiments to test their efficacy. Initially, for example, SpaceX experimented with a dark paint to absorb sunlight, but when in-space experiments showed this mitigation was less effective than desired, SpaceX pivoted to development of a visor—VisorSat—to block sunlight from hitting the satellite and reflecting back to the Earth, and implemented flight configuration changes to minimize the surface area of the spacecraft from which a reflection could result—both highly effective mitigations. SpaceX continues development, with additional technologies, including a combination of dielectric mirror film (developed and made by SpaceX, and made available to other constellation operators at cost), which reflects sunlight away from the Earth, and a SpaceX-developed low-reflectivity black paint, which reduces lower specular peak by a factor of five compared to the darkest available space stable paint.

600 km." The report further stated that "SpaceX Starlink is to be strongly commended for abandoning 1200 km in favor of a constellation at 550 km. In these uncertain, initial phases this is an extremely good and wise decision."

Importantly, SpaceX proactively requested from the Commission two license modifications to reflect two different deployment phases to lower the operating altitude of the satellites, which is a crucial mitigation for astronomers and one endorsed by the American Astronomical Society to reduce impacts on astronomy, as well as improve space safety with respect to orbital debris mitigation.[16] Notably, nearly every other satellite operator—most of which are licensed in foreign jurisdictions—opposed this modification for spurious reasons, delaying its approval for more than a year. This episode in anti-competitive regulatory triage by incumbent and aspirational satellite operators acutely demonstrates the problematic nature of the Commission satellite licensing process, as it opens the door for foreign interference even in circumstances when a license application is meant to *improve* safety and sustainability.

More recently, the National Science Foundation ("NSF") and SpaceX announced an updated coordination agreement to protect astronomy and continue collaboration on mitigation practices.[17] As discussed below, SpaceX called upon the Commission to impose similar conditions on other satellite operators. These include:

- filing semi-annual reports on collision avoidance maneuvers and satellite disposal, including any difficulties or failures related thereto;
- applying a new performance-based method for assessing disposal failures that accounts for both the number of failed satellites and their entire passive decay time;
- communicating and collaborating with NASA to promote space safety and sustainability; and
- taking all possible steps to assess and mitigate collision risk after receiving a conjunction warning from the 19th Space Defense Squadron or other source.

IV. Lengthy FCC Licensing Timelines and Regulatory Asymmetry

Increasing timelines for decisions. While the pace of space innovation is speeding up, the speed of regulatory decisions is too slow. This Subcommittee has the opportunity to reverse this trend to maintain American leadership in space. For example, SpaceX not only designs, builds, and launches from the United States, but is licensed by the Commission to operate the Starlink system for residential, business, and mobile uses. The high demand for Starlink in the United States is testament to the large geographic areas that have not been served by terrestrial systems or legacy satellite networks. This large market of unserved users has driven the increase in satellite license applications at the Commission in recent years. But this increase in applications—accompanied by the proliferation of competitor comments to the record—has contributed to the increased time it takes for the FCC to process applications.[18] For companies seeking licenses in the United States, the average processing time now takes over two and a half years, with the trend line pointing in the wrong direction.[19]

Just recently, SpaceX filed the original application for our Gen 2 system in May 2020,[20] but the Commission was not able to put this application out for public comment until approximately 18 months later. The Commission ultimately granted SpaceX its license nearly 30 months after SpaceX filed the Gen 2 application.

---

[16] See American Astronomical Society reply to IBFS File No. SAT-MOD-20200417-00037 (citing Constance Walker et al., Impact of Satellite Constellations on Optical Astronomy and Recommendations Toward Mitigation, at 3 (2020)) (stating that satellites orbiting at or below 600 km do appear brighter than satellites at higher altitudes, but they are in sunlight for less of the night, which is "one of the leading benefits to science."

[17] See "NSF statement on NSF and SpaceX Astronomy Coordination Agreement", January 10, 2023, accessed at https://beta.nsf.gov/news/statement-nsf-astronomy-coordination-agreement

[18] OSSTP analysis, "U.S. Market Access Authorization Timeline Analysis for Megaconstellation Networks", April 2022, accessed at https://www.osstp.org/fcc-analysis

[19] Ibid.

[20] *Space Exploration Holdings, LLC,* Application for Orbital Deployment and Operating Authority for the SpaceX Gen2 NGSO Satellite System, IBFS File No. SAT-LOA-20200526-00055

These timelines create an impossible situation for American operators in the domestic and global marketplaces. The extreme demand to connect unserved Americans quickly, coupled with a rush of foreign competitors, drive U.S. licensees to begin work on these complex satellite constellations years before a license is granted. If they did not, no U.S. system would be able to compete with foreign, often state-backed competitors. As a result, U.S. operators are forced to build at risk, exposing themselves and investors to significant capital risk. Worse, each satellite license has its own unique operating conditions, meaning the operator generally is not aware of what restrictions will be placed on its system—or whether those conditions will be debilitating to their operations—until the license is issued.

Not only does this regulatory asymmetry place U.S. companies at a competitive disadvantage, it undermines the U.S. as a regulatory venue of choice, and it needlessly delays critical services to consumers. The case-by-case nature of satellite licensing in the U.S. has made it an unfortunate target for gaming by foreign competitors and late comers to the market with legions of lawyers and lobbyists. These competitors "fill the docket" at the Commission with spurious and repetitive filings in a deliberate effort to overwhelm Commission resources. Commission staff, in turn, incorrectly view themselves as bound by the Administrative Procedure Act to respond to every filing, no matter how late in the process those filings are received. Typically—and with a flamboyant lack of self-awareness—foreign-licensed operators will call for the Commission to impose conditions and requirements on U.S. operators that would not apply to them and that they could not meet themselves. As just one example, a company licensed in a foreign jurisdiction filed hundreds of pages in a SpaceX docket *8 months* after the comment cycle closed, yet the FCC felt obligated to respond to each new argument dumped on it. Every argument in that filing was eventually rejected by the FCC and later by the courts, but only after years of litigation and after Commission staff spent months sifting through pages of the frivolous claims.

Regulatory asymmetry. Meanwhile, these same operators that game the U.S. process to slow down decisions for U.S. licensees rely on a glaring loophole that exempts foreign-licensed systems from the U.S. regulations. Specifically, while the Commission defers to foreign jurisdictions to regulate their own licensees, virtually none of the countries has comparable regulatory requirements, nor the transparency associated with American public notice and comment. As a result, while many foreign jurisdictions employ protectionist regimes to support their domestic licensees, the U.S. uses an asymmetric set of rules that benefit foreign-licensed systems over U.S.-authorized systems. This legacy loophole has been a leading cause for most satellite operators to license overseas—outside the reach of U.S. oversight—while still taking advantage of the U.S. market.

To help correct this imbalance, SpaceX recently filed at the Commission seeking equitable application of the conditions that it placed on SpaceX's Gen 2 system for all other systems serving the U.S. market. These conditions include robust space safety requirements and reports, as well as a requirement to coordinate with NSF with respect to radio and optical astronomy protections. To be very clear, SpaceX supports these conditions. Indeed, what is good for the Starlink system should also be good for other satellite constellations. Commission license conditions should be equitably applied to all systems hoping to serve the U.S. market.

SpaceX commends the Subcommittee for seizing this opportunity to update this aging framework to the modern era. Asymmetric regulatory treatment of U.S. systems, unbounded anti-competitive regulatory triage against U.S. licenses, and long delays have a cost. As noted, they introduce enormous amounts of risk for investment and innovation, especially in a sector as capital intensive as satellite communications. Many innovative companies may simply not have the wherewithal to accept these risks and delays. With technological developments happening every day, the months and years it takes to gain authorization means that other operators and foreign, often state-backed companies gain a critical advantage, especially in countries like China, as clearly articulated by the recent CSIS report. And, perhaps most importantly, consumers in critical need of broadband services are left to wait, once more.

Protecting spectrum from speculators. But any reforms to Commission processes can only succeed if the carefully-balanced spectrum rules for key spectrum bands authorized for use by next-generation satellite operators remain intact. For example, the 12 GHz band has been a U.S. success story, leading to millions of Americans relying on the band for high-speed, low latency broadband internet connectivity and satellite television. These customers are in urban, suburban, and rural areas, often in locations where no alternative service is available. Recognizing the promise of LEO systems in bridging the digital divide, the Commission authorized numerous next-generation satellite systems to use 12 GHz for their consumer downlink. In fact, following the FCC's lead, this band has become the tent pole supporting next-generation systems in China, in Europe, and around the world.

But as this Subcommittee has recently recognized in other contexts, spectrum licenses must mean something. On the basis of its licenses, satellite operators, including SpaceX, have invested and continue to invest billions of dollars in satellite systems using the 12 GHz band to deliver service. Current operators carefully share the spectrum with each other and other users today. Proposals to change the rules in this band have been met with extensive technical and engineering studies that conclusively demonstrate that any changes to the delicate balance in the band would result in widespread interference with GSO and NGSO systems, making the band effectively unusable for satellite operators and abruptly ending critical services for millions of Americans. The Commission must therefore close down a proceeding that has been ongoing for more than three years that threatens American leadership in the 12 GHz spectrum.[21] SpaceX asks this Committee to encourage the Commission to complete its work on the lower 12 GHz band, and thanks the many bipartisan Members of this Committee who have already done so.

V. The Satellite and Telecommunications Streamlining Act, LAUNCHES Act, and Secure Space Act

Commission staff and Commissioners on a bipartisan basis have acknowledged the challenges of the outdated rules they inherited, and have taken preliminary steps to address some concerns. Both the Commission and this Committee have recognized not only the current benefits of next-generation satellite systems, but the enormous potential on the horizon. SpaceX enthusiastically supports the efforts to modernize the U.S. approach to processing satellite applications. The Commission is in the process of standing up a Space Bureau, and the reorganization should in theory help to prioritize and expedite the satellite review process. SpaceX is encouraged the Commission and this Committee agree on the need to address some of these licensing delays, and to specifically impose deadlines for satellite license reviews.

The Satellite and Telecommunications Streamlining Act is an important part of the solution to maintain U.S. leadership in the satellite communications sector. By providing regulatory certainty and introducing clear, mandatory timelines for when the Commission must act on applications, operators will no longer be faced with an uncertain process that takes years to resolve. SpaceX has additional recommendations to further enforce these deadline requirements, including a mandatory 30-day period to notice a satellite application for public comment, as well as clear statutory language imposing strict requirements with respect to when tolling the overall timeline required in the legislation could be allowed. SpaceX also strongly supports the establishment of expedited procedures for U.S.-authorized systems.

SpaceX also supports the bill's proposed revision of the Part 25 rules to allow the FCC to examine what parts of satellite license application process can be streamlined, while allowing the Commission to defer to expert agencies on highly technical matters like orbital debris and space safety. The inclusion

[21] Federal Communications Commission, Notice of Proposed Rulemaking, "Expanding Flexible Use of the 12.2-12.7 GHz Band", released January 15, 2021, accessed at https://www.fcc.gov/document/fcc-seeks-comment-maximizing-efficient-use-12-ghz-band

of timelines for major and minor modifications is also a welcome step, as is the timeline for acting on earth station applications.

The Leveraging American Understanding of Next-generation Challenges Exploring Space ("LAUNCHES") Act would modernize unwieldly current processes for licensing spectrum used during commercial space launch and reentry operations. The LAUNCHES Act would permit these activities to be licensed on a secondary basis instead of under the current Special Temporary Authorization (STA) regime, eliminating redundant and cumbersome paperwork while protecting current and future federal users in the identified bands. And, it would require the Commission to issue new regulations to streamline the approval process, including improving interagency spectrum coordination and allowing for blanket licensing for identical missions. These improvements and others contained in this important legislation would enable the U.S. to keep pace with the rapid growth of the commercial space industry, while maintaining important oversight.

The Secure Space Act would address the same security risks that threatened terrestrial communications networks that are quickly migrating to space. The importance of U.S. leadership in satellite technology cannot be overstated. Other countries are moving forward with significant investment in LEO space systems, and are clearing regulatory obstacles to allow for their state-backed networks to rapidly launch and deploy. China is aggressively pursuing a satellite constellation called "Starnet" with plans to launch approximately 13,000 satellites in the coming years.[22] The European Union is also pursuing its own Secure Connectivity LEO system, as are Russia and India. Beyond the clear benefits to the U.S. government in having U.S. companies lead in LEO broadband, ceding U.S. leadership in the race to provide satellite internet globally creates significant geopolitical risks.[23] While the U.S. has blocked the installation or use of Chinese hardware for telecommunications networks domestically due to security concerns, many nations have few options when it comes to telecommunications infrastructure and must rely on whoever can provide connectivity. The Secure Space Act seeks to address some of these concerns, and in conjunction with the Satellite and Telecommunications Streamlining Act will help maintain U.S. leadership in this sector.

VI. Conclusion

Thank you again for the invitation to testify before the Committee today. SpaceX looks forward to working with the Committee to modernize the U.S. regulatory approach to satellite system authorization, leveraging next-generation technologies like Starlink to help close the digital divide, and support continued U.S. leadership in space.

[22] See "China is developing plans for a 13,000-satellite megacosntellation", *Space News*, April 21, 2021, accessed at https://spacenews.com/china-is-developing-plans-for-a-13000-satellite-communications-megaconstellation/

[23] Makena Young and Akhil Thadani, "Low Orbit, High Stakes: All-In on the LEO Broadband Competition", Center for Strategic and International Studies, December 2022, accessed at https://www.csis.org/analysis/low-orbit-high-stakes