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BEFORE THE
COMMITTEE ON COMMERCE, SCIENCE, & TRANSPORTATION
SUBCOMMITTE ON SPACE AND SCIENCE
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Chair Cantwell, Ranking Member Cruz, Chair Sinema, Ranking Member Schmitt, and Members of the Subcommittee, thank you for the opportunity to testify about modernizing and improving America's commercial spaceflight regulatory framework. The Committee's efforts and this timely hearing are critical particularly now as they relate to the Federal Aviation Administration (FAA) Office of Commercial Space Transportation's (AST) current approach to managing launch and reentry activities. This is a pivotal time for the commercial spaceflight industry and for American leadership. Your efforts in overseeing human spaceflight regulations and the transition to the new launch and reentry regulatory environment are critical. National policy for spaceflight must correctly recognize where the industry is, where it's going, and the role of regulators in this emerging and rapidly developing industry. Most of all, the pace of regulation must match the pace of American innovation.

As the world's leading space transportation and services provider, SpaceX maintains safe operations and public safety as our top priority. We share the Committee's commitment to ensuring the United States remains the world's leader in space. Unfortunately, under AST's present regulatory framework, serious problems are quickly mounting that will undermine American innovation while doing nothing to enhance public safety. Further, development of human spaceflight regulations also requires careful thought. Continuing the current learning period while smartly preparing for the eventual future of more expanded commercial human spaceflight activity is critical. At the same time, we must acknowledge the shortcomings of the present system and the volume of work coming, while reforming the regulatory process to move more efficiently. We urge the Committee to move quickly to address these challenges and facilitate an improved licensing framework and provide additional resources for AST.

I. Introduction

As Vice President for Build and Flight Reliability at SpaceX, my job is to ensure that SpaceX conducts its operations across the Falcon, Dragon, Starship, and Starlink programs safely and reliably for all of our U.S. Government and commercial customers. Prior to joining SpaceX in 2020, I served as the Associate Administrator of NASA's Human Exploration and Operations Mission Directorate (HEOMD), where I oversaw all of NASA's human spaceflight efforts, including the International Space Station (ISS), the Space Shuttle Program, Commercial Crew and Cargo, and many others, with a career in public service spanning over 40 years.

Today, I am privileged to lead the outstanding safety and reliability engineers who enable SpaceX to successfully launch our Falcon rockets every four days on average; to operate Dragon, the only operational orbital U.S. human spaceflight system, multiple times per year—enabling continued U.S. and

International Partner presence in orbit without having to rely on Russia; and to help lead the next-generation of space launch technology development with Starship to land the next American astronauts on the Moon in the coming years. At SpaceX, safety and reliability is not just the responsibility of one organization; each employee carries a responsibility for safe and reliable operations. My organization's primary responsibility is to provide tools and a framework that the company's employees can use for safe and reliable spaceflight operations. Safety is at the core of SpaceX's ethos, and no company could successfully execute at our cadence and reliability without a fundamentally robust safety and mission assurance culture. Reliable system development and operations enable our current flight rate and diverse portfolio of activities.

We bring this culture and expertise to bear in our partnerships across the Government, including with AST. As a general matter, AST should be recognized for its hardworking, dedicated, and professional staff that work diligently to protect public safety during space launches and reentries. AST has an outstanding record of success in its core mission to protect the uninvolved public, and for this it should be commended. Its role in commercial space launch and reentry is critical to the success of the industry. If the U.S. is to continue to lead the world in space innovation; outmatch aggressive, state-backed Chinese competition; and enable new revolutionary technologies like Starship, the regulatory framework and AST will need to fundamentally change. The current system cannot match the pace of technological leadership required by the private sector to keep the U.S. a leader in space exploration and national security. Innovation has returned launch capability to the U.S. and has provided new technologies that benefit national security. Starship has the potential to revolutionize launch, but regulations must be amended to allow for Starship to be successful. The technical challenges for Starship are significant, and the regulatory environment needs to enable technical innovation and not add undue burden to development that does not contribute to public safety. To be clear, SpaceX has an outstanding relationship with AST and highly respects the work it does for the industry and the country. However, much improvement is needed if the U.S. is to remain a leader.

Indeed, AST is the "gate" through which all U.S. commercial space launches and reentries must pass to achieve operational success. The line at this gate has become unsustainably long, and AST is now facing the very real prospect that it is slowing rather than enabling U.S. progress in spaceflight capability. As such, it is imperative that Congress take quick action to address very specific challenges inhibiting AST's ability to more efficiently perform its core function. It should be quickly provided with the necessary resources to do its job more efficiently and in keeping with industry progress. And AST itself must embrace responsible improvements to its processes in order to meet its growing mandate. Otherwise, the United States faces regulatory paralysis that will stifle the abundant innovation and capability that the private sector is bringing to market. This paralysis will harm programs of national significance like Artemis and threaten the current U.S. leadership in launch and reentry capabilities.

II. SpaceX in 2023

SpaceX was founded in 2002 to expand space access and to improve the reliability and affordability of space transportation. Today, SpaceX is the world's most active launch services provider, having successfully launched spacecraft to orbit and beyond 270 times, including 73 launches in 2023 to-date. SpaceX has also conducted 41 orbital reentries with our Dragon spacecraft and 235 successful first stage landings. At present, we launch a rocket roughly every four days from U.S. soil. This is an unprecedented pace in the history of rocketry. The recent Falcon Heavy launch of NASA's Psyche mission to a metallic asteroid with both boosters returning to safely land at Cape Canaveral continues to inspire. Reusability is a key enabler for SpaceX. Starship's fully reusable first and second stages will be a significant advancement in reusability. Starship needs both reusability and reliability to be

successful. In order to gain reliability, a rapid flight pace is needed.

SpaceX is proud to serve the Nation's space enterprise with satellite launches for NASA, DOD, the IC, and other federal agencies, and is certified to conduct 100 percent of U.S. Government mission requirements under the NASA Launch Services Program (LSP) and the National Security Space Launch (NSSL) Program. In close partnership with NASA, SpaceX developed the Dragon spacecraft to support crew and cargo transportation to and from the ISS. Since 2012, we have performed 28 un-crewed cargo resupply flights to and from ISS. In 2020, SpaceX restored America's human spaceflight access after nearly a decade of national reliance on Russia. We have successfully conducted seven crewed missions for NASA to and from ISS since then, with another six-month mission underway today and more planned in the years to come.

All of SpaceX's innovation occurs in the United States, creating tens of thousands of direct and indirect jobs, advancing technology, and generating substantial economic activity. SpaceX invests billions of dollars across the country in development, test, operations, and supplier purchasing from crucial (and largely small business) vendors across America. We maintain 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 and rocket processing facilities within Cape Canaveral Space Force Station, NASA Kennedy Space Center, and Vandenberg Space Force Base; and production, test, and launch facilities at Starbase in South Texas. SpaceX maintains a network of more than 7,000 American suppliers—supporting 150,000 small business jobs—and vendors in all 50 states.

To advance the next generation of space transportation technology, SpaceX is developing Starship, the largest, most powerful space vehicle system in history. With its unique, revolutionary design, Starship will be fully and rapidly reusable, capable of delivering astronauts and more than 100 tons of usable cargo to orbit, the Moon, and Mars. This capability is an order of magnitude more than any other launch system previously developed. The Starship program is ambitious, by design. To prove out the system, SpaceX has conducted 12 low- and high-altitude test flights since 2019 from our Starbase development, production, and launch site near Brownsville, Texas, including the first fully integrated flight in April 2023. We are prepared to conduct Starship's second integrated test flight as soon as the end of this month, pending only FAA license approval, which includes the reviews of supporting agencies. Critically, the vehicle has been ready to fly since mid-September. The current regulatory process is not keeping up with the pace of innovation.

In 2021, NASA competitively awarded SpaceX the Human Landing System (HLS) contract to help return American astronauts to the Moon as part of the Artemis Program, and subsequently awarded a follow-on crewed lunar mission in 2022.[1] SpaceX is diligently working to maintain schedule for NASA in the face of global competition with China. NASA Administrator Bill Nelson has urged expediency, noting: "[i]t is a fact: we're in a space race [with China]."[2] Though these launches are for NASA, the FAA is responsible for licensing all test and operational launches. SpaceX is also under contract with the U.S. Air Force to use Starship to support the Vanguard Rocket Cargo Program.[3] Starship represents an area where the U.S. Government does not appear to be aligned across agencies with its own objectives. While NASA and DOD are rightly focused on development schedule and national need, SpaceX faces continual and

[1] "NASA Awards SpaceX Second Contract Option for Artemis Moon Landing," *NASA.gov*, November 15, 2022, accessed at https://www.nasa.gov/humans-in-space/nasa-awards-spacex-second-contract-option-for-artemis-moon-landing/

[2] "We better watch out: NASA boss sounds alarm on Chinese moon ambitions," *POLITICO*, January 1, 2023, accessed at https://www.politico.com/news/2023/01/01/we-better-watch-out-nasa-boss-sounds-alarm-on-chinese-moon-ambitions-00075803#:~:text=So%20says%20NASA%20Administrator%20Bill,astronaut%20said%20in%20an%20interview.

[3] "Rocket Cargo - FA8650-22-9-9301," SAM.gov, January 14, 2022, accessed at https://sam.gov/opp/1bd5d826c1e74a4abee083dde1652348/view

increasing test and operational headwinds as it relates to AST and other federal agencies. Various regulatory agencies must be aligned on mission to truly enable critical and timely advancements in space technology that are required for the U.S. Government to be successful in reaching its own objectives.

Starship is further critical to the deployment of next-generation Starlink and Starshield capability, which are crucial to expanding broadband access and to U.S national security and foreign policy objectives abroad. Starlink and Starshield build on the company's experience in launch vehicle and spacecraft design, development, production, and on-orbit operations. Operating in low Earth orbit (LEO), Starlink provides high-speed, low latency broadband to commercial users in all 50 states and around the world, and today serves over two million households and businesses. By focusing service on households that previously lacked access to reliable broadband service, Starlink is helping to rapidly address the digital divide. And with Starshield, SpaceX is applying Starlink technology and launch capability to support vital national security efforts for the DOD.

By operating in LEO, systems like Starlink provide much faster speeds and lower latency than traditional satellite communications systems operating in higher orbits, and can support far more users. However, this closer altitude necessitates deploying thousands of satellites over hundreds of launches to provide consistent global coverage, which requires a regulatory regime capable of consistently and efficiently licensing launches at unprecedented scale. 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. For example, China is aggressively pursuing a satellite constellation with plans to launch approximately 13,000 satellites in the coming years.[4] The European Union is also pursuing its own Secure Connectivity LEO system, as are Russia and India. Launch licensing regulatory challenges are not "top of mind" for these countries as they race to compete with U.S. commercial technology—regulatory challenges only appear to be an obstacle for launch companies in the U.S. To be clear, the United States does not need to set aside its regulatory obligations or its commitment to public safety; a smart, appropriately resourced system can both meet these needs *and* facilitate innovation.

In order to successfully execute on its commitments, SpaceX plans to conduct at least two more Starship flights this year, with a higher flight rate in 2024 and beyond, plus an estimated 30 more Falcon flights for various customers, including the U.S. Government, before the end of the year. This test and flight cadence across multiple vehicle families for SpaceX alone is almost certainly not possible if Congress does not provide AST with additional resources, direction, and legislative guidance. Unnecessary overhead will delay the technology advances needed to keep the US as a leader in space. The public needs to be protected, but the private sector needs to be enabled to explore, learn, and develop new technologies at a rapid pace. As the human spaceflight industry emerges, care must be taken to not overburden development with new regulations. The U.S. public needs to protected both by regulation and innovation. If the U.S. loses it technological advantage to other countries, the public is also at risk. The nation that leads in technology sets the standards for all others to follow. We cannot risk loss of technical leadership because of an antiquated regulatory environment. An innovative and agile approach to regulations is as important as technological advancement.

III. AST Modernization and Change

The Committee is taking on important work across the full range of space policy issues from establishing a balanced, responsible mission authorization process to maintaining a sustainable orbital environment. SpaceX strongly supports all of this work and looks forward to working with the

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

Committee as it formulates policy. As noted, however, the Committee must first place its focus on AST and launch and reentry licensing reforms, which is the *sine qua non* for every other regulated activity related to U.S. space activities.

While nearly the entire rest of the world relies on state-owned or state-sponsored entities, the United States derives nearly all of its competitiveness in space from the domestic commercial sector. Indeed, U.S. Government launch capability for NASA, DOD, and the IC is almost exclusively provided by commercial launch providers as a service. The Commercial Space Launch Act of 1984 established the Nation's launch and reentry regulatory framework, which appropriately prioritized protecting public safety while maximizing innovation:

> "the United States should encourage private sector launches and associated services and, *only to the extent necessary*, regulate such launches and services in order to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security interests and foreign policy interests of the United States."[5]

Congress has consistently recognized over several decades that "there is an inherent risk in spaceflight."[6] Accordingly, it has directed that the regulatory regime for commercial space launch and reentry focus on protecting public safety, rather than attempting to perform mission assurance or otherwise ensure the success of a space launch or reentry. To be clear, it is expressly *not* the purpose of AST to prevent launches or reentry from failing. Commercial space regulations *are not* akin to aviation regulations and have been developed purposefully to limit AST's role in this respect. The fact that commercial space is regulated by FAA versus any other federal agency is incidental, but the comingling of AST within FAA's broader priorities of regulating commercial aviation—where FAA must regulate to ensure the success of airline flights—creates undue confusion regarding AST's role.

While AST has achieved admirable success ensuring public safety, it is reaching a breaking point as it relates to timely license issuance, even for "routine" missions on mature launch vehicle systems like the Falcon 9. With respect to innovative systems in development, including those that are critical to key national objectives like NASA's Artemis program, AST licensing is now the critical path watch item that is at risk of slowing the pace of innovation and program execution. For example, the Starship Flight 2 launch vehicle has been ready to fly since mid-September in order to test critical systems needed to meet NASA objectives, and is simply awaiting AST licensing approval. This is the consequence of several concurrent challenges, including:

(1) AST's transition to "streamlined," performance-based regulations under Part 450 has resulted in delayed agency guidance, confusion, and uncertainty both for the regulated entity and the regulator. In September 2020, AST updated its regulations in an attempt to reform the licensing process and keep pace with the growth of the launch industry. While well-intentioned, the Part 450 effort has not succeeded in accomplishing a streamlined process. AST's ability to process licenses in a timely fashion has declined rather than improved—indeed, as evidenced by licensing for the handful of applicants under Part 450, approval timelines are not improving. For example, the Starship license for Flight 1 took

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[5] Emphasis added. "H.R.3942 - 98th Congress (1983-1984): Commercial Space Launch Act," *Congress.gov,* October 30, 1984, accessed at https://www.congress.gov/bill/98th-congress/house-bill/3942

[6] "H.R.5382 - 108th Congress (2003-2004): Commercial Space Launch Amendments Act of 2004," *Congress.gov*, December 23, 2004, accessed at https://www.congress.gov/bill/108th-congress/house-bill/5382; "H.R. 2262 – 114th Congress (2015-2016) Spurring Private Aerospace Competitiveness and Entrepreneurship Act of 2015: Report," *Govinfo.gov*, May 18, 2015, accessed at https://www.govinfo.gov/content/pkg/CRPT-114hrpt119/pdf/CRPT-114hrpt119.pdf

nearly three years. These delays are contrary to the intent of Part 450 itself, and this situation is untenable.

AST's delay in issuing clear guidance results largely from resource constraints—its overburdened staff have rightly focused on the growing pile of license applications, and have little time to think cohesively about implementation and policy development with respect to Part 450. The Commercial Space Transportation Advisory Committee (COMSTAC) issued consensus recommendations to AST on this issue, and Congress should encourage AST to move forward on those recommendations.

(2) AST as a whole—and particularly its Licensing Division—is substantially under-resourced. With its limited staff, the AST Licensing Division is often constrained as to how it allocates its resources and must pull qualified analysts from one application or internal program to focus on another—resulting in delays for both. Currently, AST is only able to review license material sequentially (rather than in parallel). A license applicant is forced to "pick and choose" which of its programs should be prioritized in order to help manage AST's workload. This places both AST and its licensees in an impossible position, particularly for licensees who work multiple programs important to the Government—what should be prioritized? Vehicle operators should not be in a position of deferring license work or disrupting business operations in order to alleviate AST workload.

(3) AST's regulatory approach is often non-agile and inflexible, contrary to national policy which requires both. Indeed, the National Space Policy mandates that agencies must "[c]reate transparent regulatory processes that minimize, consistent with national security and public safety, the regulatory burden and uncertainty for commercial space activities and that are flexible..."[7] AST must do more to enable flexibility in its regulations, particularly for mature launch and reentry systems and launch sites. In many cases, both have been otherwise approved by NASA or the United States Space Force (USSF), but AST's interpretation of its regulatory compliance obligations forces duplicative and unnecessary paperwork that does not contribute to public safety and is not in the national interest.

The above reflect status quo challenges. But, as AST transitions licenses for vehicles previously approved under legacy regulations to Part 450 over the next two years, the entire regulatory system is at risk of collapse. AST is struggling to fulfill its responsibilities today and simply does not have the bandwidth to process the significant additional paperwork of this transition without materially reducing its responsiveness to applicants. This is not a hypothetical—AST's workload over the next 12-24 months could result in the grounding of U.S. space launch capability if action is not taken immediately.

SpaceX recommends Congress take steps immediately to modernize the current launch and reentry licensing regime and provide additional resources and tools to aid AST in its mission.

IV. Rapid Technology Development

America's greatest strength against well-organized, state-sponsored foreign competition that has no respect for intellectual property is its entrepreneurial system that enables and encourages rapid, continuous private sector innovation. Here, SpaceX takes a spiral development approach across all of our programs, which prioritizes rapid design, early test article build, and frequent real-world flight testing early in the development process. SpaceX uses this approach across all of our complex space

[7] "National Space Policy of the United States of America," *Office of Space Commerce*, December 9, 2020, accessed at https://www.space.commerce.gov/policy/national-space-policy/

system development programs, including Falcon 9, Dragon, Falcon Heavy, Merlin and Raptor engine development, and Starlink. And it has yielded unprecedented successes. In every case, this approach proved to be less expensive, faster, and more successful than any comparable aerospace development approach, in most cases by orders of magnitude.

Testing development hardware in a flight environment enables our teams to quickly learn and execute design changes and hardware upgrades necessary to improve the probability of success in the future. At all phases of development and operation, SpaceX takes every precaution to ensure public safety, but we will take programmatic risk during testing to advance technology—just as the United States did through much of the Space Race. Public risk and programmatic risk are not the same and are not in conflict—*we* (and our customers) are responsible for programmatic risk. AST is responsible for ensuring that our efforts to protect public safety are verified and appropriate. Both are achieved with success simultaneously.

SpaceX works closely with federal, state, and local agencies, including AST, to protect public safety and the safety of the SpaceX workforce. This philosophy has proven highly successful. Our Falcon family of launch vehicles are now the most flown in the United States by far and the most reliable space vehicles in history.[8] Globally, Falcon is the only vehicle system able to keep pace with a similar high cadence of launch in China. And, from a mass-to-orbit perspective, which is the most important metric when evaluating capability, Falcon alone outperforms China three to one. Without this speed of innovation, China would outperform the United States by far today. Excluding SpaceX, China launched nearly three times more than the rest of U.S. industry *combined* in the first half of 2023, and carried *almost eight times* more mass to orbit than all other U.S. launch operators.[9]

Most recently, however, this paradigm seems to be failing. AST's approach to Starship appears out of family with its general approach for both SpaceX and other vehicle licensing among U.S. systems that SpaceX is aware of. For example, with Falcon, the iterative design process was aptly demonstrated by SpaceX's approach to *learn* how to recover and reuse rockets, which is a huge advantage to the United States. Here, from 2012 to 2015, SpaceX undertook a development effort to prove out orbital vehicle reusability, a capability long held to be impossible for an orbital-class rocket stage. This development campaign, which progressed from suborbital to orbital experiments (much like Starship) included at first many low and high-altitude flight tests in quick succession across several hardware versions of the launch system, some of which resulted in a loss of vehicle, and then recovery attempts following successful orbital launches of Falcon 9. At every stage of the process, we widely publicized and celebrated these tests—including failures—which we used to learn and then apply those learnings to the vehicle.[10]

SpaceX conducted all of these tests safely. We were permitted to *learn through flight.* We implemented learnings quickly, returned to flight quickly, and learned more. And then we achieved success with Falcon. Today, since the first successful recovery of a Falcon first stage in December 2015, SpaceX has now successfully recovered a Falcon booster 235 times and re-flown our rockets 207 times, transforming the economics of space access. The United States is the *only* country that has this capability today—not China, not Russia, not Europe. This success would not have been possible without rapid development, rapid flights, and timely licensing from AST. SpaceX is following the same approach with Starlink and Starship today, but we are not experiencing the same licensing approach from AST.

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[8] "The Falcon 9 may now be the safest rocket ever launched,"*Ars Technica*, February 3, 2022, accessed at https://arstechnica.com/science/2022/02/spacexs-falcon-9-rocket-has-set-a-record-for-most-consecutive-successes/

[9] "Global Orbital Space Launches Q1 2023," *BryceTech*, n.d., accessed at https://brycetech.com/reports/report-documents/Bryce_Briefing_2023_Q1.pdf; "Global Orbital Space Launches Q2 2023," *BryceTech*, n.d., accessed at https://brycetech.com/reports/report-documents/Bryce_Briefing_2023_Q2.pdf

[10] "How Not to Land an Orbital Rocket Booster," *SpaceX,* September 14, 2017, accessed at https://www.youtube.com/watch?v=bvim4rsNHkQ

V. Launch and Reentry Licensing

To address these challenges, SpaceX proposes specific improvements to the regulatory process for launch and reentry that are vital to ensuring America's continued global leadership and competitiveness in space. Specifically:

(1) Provide AST with significantly more resources (at least 2x) and expedited hiring authority to move quickly to bring onboard additional, qualified technical experts to keep pace with license review. These resources should be *specifically (and only)* authorized and appropriated for the AST Licensing Division. Additionally, more resources will be for naught if AST is unable to timely and efficiently hire—Congress should empower AST to use expedited hiring authorities to rapidly grow its workforce.

(2) Provide AST with new authorities to enable license applicants to self-fund qualified, third-party technical organizations to bolster and expedite AST license review where needed.

(3) Provide AST with additional resources and direct AST personnel to travel to launch operator locations to conduct in-person Technical Interchange Meetings (TIM) on-site with license applicants. In-person TIMs are a highly productive and efficient mechanism to clarify technical matters associated with license applications, and to see hardware and launch infrastructure in order to gain an understanding of proposed activities and verifications.

(4) Establish shorter mandatory timelines to initiate review, conduct interagency consultations, and complete license applications, and eliminate the tolling loophole. The license application process should be electronic and automated to the maximum extent possible.

(5) Direct clarity updates to Part 450 and establish standard, expedited processes for regular and routine license application review, especially for mature vehicles that launch or reenter frequently. Each license application review today is a bespoke effort, even for vehicles and profiles that have flown many times previously. AST should have tiers of review based on operator and vehicle experience and maturity. AST's advisory circulars (ACs) relating to Part 450 are intended to provide guidance to both applicants and reviews, but in many cases they either do not exist or simply reincorporate processes from legacy regulations—which are overly conservative and prescriptive. The regulatory uncertainty associated with Part 450 implementation is driving unnecessary burden for both industry and AST. And, the prescriptive and conservative nature of the Part 450 ACs that have been published render them inapplicable when evaluating unique, innovative vehicle features that companies are introducing to add capability, reduce costs, and improve safety. Properly structured regulations should instead encourage technical progress by laying out a clear, responsible path to applicants in advance to achieve compliance.

(6) Direct AST to focus only on public safety, not mission success. This is an absolutely critical element of space launch and re-entry licensing that has been lost in interpretation. As noted, AST is *not* responsible for mission assurance, nor is it qualified to perform this function. Congress has specifically identified public safety as the sole objective of launch and reentry licensing, but the vague and interpretive nature of Part 450 has led to regulatory over-reach, where reviewers now devote significant time and resources to consider factors unrelated to public safety and outside the scope and intent of Part 450.

(7) Provide authority to expediently issue waivers to outmoded requirements that do not impact public safety.

(8) Accelerate environmental reviews by extending existing authority used for airports to space launch and reentry infrastructure, and to provide expedited review for projects of national

interest and national security.

(9) Establish an accelerated regulatory path, potentially independent of AST, for development and for experimental missions that support national requirements like the Artemis Program. This option would align AST's mission with that of broader national priorities. AST's current experimental authorities should be enhanced to capture innovative system development, particular for those under contract to perform work for the U.S. Government.

(10) Align external regulatory timelines and reviews. Under the National Environmental Policy Act (NEPA) and other relevant laws, AST is often responsible for conducting environmental consultations relating to its licensed activities with other federal and state agencies. Here, review timelines and requirements are misaligned and incongruent. Congress should implement common sense procedural changes to align inter-agency review schedules, enforce deadlines, and provide expedited review for commercial space projects of national interest or national security.

VI. Human Spaceflight Regulations

Following the first SpaceShipOne flights in 2004, Congress passed the Commercial Space Launch Amendments Act (CSLAA) of 2004.[11] This legislation appropriately established a comprehensive framework intended not to regulate for mission success, but rather "to put in place a clear and balanced regulatory regime that promotes the development of the emerging commercial human space flight industry, while protecting the public health and safety."[12] This structure, which remains in place today, incorporated three key elements:

- **An informed consent regime.** The bill affirmed the "inherent risk" of any type of spaceflight—commercial or Government—in acknowledgement of the fundamental differences between space launch and reentry and any mode of common carriage transportation (e.g., commercial aviation). Space vehicle operators must provide significant information to prospective space flight participants about general risks, the vehicle in question, and the operator's safety record. Space flight participants must accept these risks in writing. Informed consent is a common legal practice, and it is in use for many adventure sports, including skydiving with more than 3.9 million jumps in the United States in 2022.[13] The informed consent regime has been very effective in both ensuring public safety and allowing industry development.
- **Occupant safety regulations intended to protect public safety.** The 2004 CSLAA requires DOT to issue regulations to ensure safe operation of a vehicle in order to protect public safety. To-date, AST has published regulations relating to training and medical condition, environmental control and life support systems, fire suppression and smoke detection, and various other human factors. AST's approach has been appropriate to date based on regulatory authority and industry development.
- **Learning Period.** The CSLAA properly established the human spaceflight "learning period," often colloquially (and incorrectly) referred to as a "moratorium," that appropriately limits AST from promulgating additional regulations relative to occupant safety during launch and reentry until

[11] H.R.5382 (108th)
[12] Id.
[13] "How safe is skydiving?," *United States Parachute Association,* n.d., accessed at https://www.uspa.org/discover/faqs/safety#:~:text=Skydiving%20is%20a%20popular%20sport,of%2092%20jumps%20per%20member).

both industry and AST have sufficient experience and data to consider whether a different safety framework is required. The learning period originally ran through 2012, but has been subsequently extended several times and now is set to expire January 1, 2024. Even with the learning period in place, the law permits AST to promulgate regulations to restrict or prohibit design features that resulted in a serious or fatal injury or that posed a high risk of causing a serious or fatal injury during a licensed or permitted commercial human spaceflight. The law also does not require AST to promulgate human spaceflight regulations on any particular timeline, or at all for that matter.

SpaceX recommends that Congress extend the human spaceflight learning period. The current learning period expiration date of January 1, 2024 is premature by several years, and the same factors that led Congress to extend the learning period in 2012 and 2015 remain true today. As an initial matter, based on the above, AST is simply not in a position to effectively regulate in this area, nor should it. Both the scope of the industry and the number of flights with private individuals remain very low, and the existing occupant safety requirements under FAA Part 460 effectively protect the public. At this stage of development, informed consent is appropriate and protects the occupants since spaceflight today is completely unlike commercial passenger aircraft transport. Industry is still developing concepts and hardware with orbital, sub-orbital, and balloon systems.

Additionally, not only does AST lack specific expertise in human spaceflight systems, it is completely overwhelmed in executing its core launch and reentry mission. AST has neither the resources nor the expertise to develop regulations in the near-future, and transferring funds or personnel from its public safety obligations would serve only to compound the challenges AST is facing in licensing launch and reentry operations and would not improve safety. If anything, Congress should reiterate and reinforce that AST must exclusively focus on protecting the public during launches and reentries, and hold AST accountable for doing so. Congress should approve a multi-year extension of the learning period and support the consensus standards development effort underway today on human spaceflight safety.

Even if AST were adequately processing applications for launches and reentries in a timely fashion, it is unprepared to implement human spaceflight regulations today or in the next several years. DOT only just formally established an Aerospace Rulemaking Committee (SpARC) designed to *initiate* consultation with industry and other experts in this area. The process to produce a report alone is expected to take at least two years, and most likely longer, plus additional time for Congress, AST, and stakeholders to evaluate any recommendations. The very reason DOT convened a SpARC is to *learn* what it should potentially do as it relates to human spaceflight, which could include extending the learning period further. A lapse in the learning period at the very time this SpARC is conducting its work would be the wrong policy outcome.

The Committee should understand that AST's execution of its public safety obligations for launch and reentry licensing is *totally dissimilar* from FAA's implementation of aircraft safety statutory obligations under a completely unrelated set of statutes, regulations, and mission objectives. While FAA has technical authority in aviation safety and the protection of airline passengers, it does not have similar expertise in spaceflight technical systems beyond public safety. It has never been AST's job to evaluate the flightworthiness of space systems—nor should it be. AST's job is to ensure that, if a failure with a spaceflight system occurs, it does not harm the uninvolved public, either persons or property. The differences from aircraft worthiness in one case to public safety in the other are vast and will remain so for many years.

Regulations on commercial space were very deliberatively constructed in this way. The accompanying bill report to the 2015 CSLCA noted that "[w]ithout launching and operating commercial human

spaceflights, industry. and regulators have limited data to inform safety regulations, which could lead to uninformed or unnecessary regulations that would stifle the growing industry."[14] This remains true today—indeed, not much has changed since 2015 except a handful of flights from a total of three operators, only one orbital.

- While SpaceX has conducted many uncrewed satellite launches for commercial customers, the broader U.S. launch industry is primarily still developing new systems, which have only recently begun launches or may begin to do so over the coming years.
- There have been very few commercial human spaceflight missions without government astronauts—a total of three to orbit, and all on a system (Dragon) certified by NASA. While Congress and industry anticipated many missions with paying private customers to occur in the years immediately following the passage of the 2004 CSLAA, this did not occur. In reality, there were zero private human spaceflights to sub-orbit or orbit between 2005 and 2021. SpaceX remains the only domestic provider of operational human spaceflight to orbit and has conducted three total missions with a total of 12 space flight participants since 2021. There are only two operational providers of sub-orbital private missions (Blue Origin and Virgin Galactic), who collectively have conducted 11 missions with spaceflight participants since 2021.[15] This is the very definition of a nascent industry. By comparison, there are more than 45,000 commercial aviation flights in the United States *every day* that collectively carry 2.9 million passengers, and evidently 3.9 million sky dives annually that remain regulated under an informed consent regime.[16]
- Human spaceflight vehicle designs remain fundamentally different from each other—including capsules, winged vehicles, lifting bodies, balloons, automated systems, manually-piloted systems, and others. Unlike aircraft, there is no consensus on space vehicle design or operation, making any common regulatory approach untenable today to both the operator and the Government.
- Both launch vehicles and spacecraft are early in their design cycles and continue to see significant changes in design and operational concepts. This rapid iteration is necessary to eventually get to a future with airplane-like operations. Otherwise, premature occupant safety regulations risk freezing the industry in an early stage, slowing or inhibiting the development of technologies that would materially improve safety.
- There are no accepted metrics to evaluate the readiness of either FAA or industry to proceed to a different regulatory structure, as noted by COMSTAC.
- The 2015 CSLCA encouraged the commercial space sector, with AST facilitation, to develop voluntary industry consensus standards. This development has been far slower than Congress anticipated due to limited market, operational experience, and vehicle systems, including zero flights with space flight participants until six years after the law was passed. However, development has accelerated over the past year. There are now 10 published human spaceflight standards, and others that are in development. A comprehensive set of consensus standards may be available by the end of the decade. Congress should allow this process to unfold before providing AST with preemptory authority that would be ill-informed without the completion of this process.

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[14] H.R.2262 (114th)
[15] "List of human spaceflights, 2021–present," *Wikipedia*, n.d., accessed at https://en.wikipedia.org/w/index.php?title=List_of_human_spaceflights,_2021%E2%80%93present&oldid=1178938297
[16] "Air Traffic by the Numbers," *FAA.gov*, April 2023, accessed at https://www.faa.gov/air_traffic/by_the_numbers

Continued industry development, completion of consensus standards, and the ongoing work of the Part 460 SpARC, and AST's fundamental lack of resources all demonstrate the need for Congress to pass a multi-year extension of the learning period.

VII. Conclusion

SpaceX respectfully urges the Committee to take action to keep the U.S. as the world's leader in spaceflight during this pivotal time. Action is important not only to SpaceX, but to the industry as a whole. U.S. leadership and the well-being of all Americans hinge on appropriate action. The private sector is working hard to support the Nation, but it needs the help of Congress and regulatory agencies. AST can be both an enabler of safe spaceflight and one of innovation. Its role in executing its licensing functions and promoting the U.S. commercial launch industry has never been more important, and it is at a crossroads. SpaceX respectfully urges the Committee to help AST perform its statutory obligations given the rapid pace of growth in this industry. Given the challenges of its limited workforce and inflexible interpretation of regulatory requirements, U.S. leadership in space will suffer without action. SpaceX thanks the Committee for convening this hearing. We stand ready to help the Committee take productive action on these issues in the remaining months of this year.

Please contact Michael.Lapidus@spacex.com with any questions or if we can provide any additional information.