

**STATEMENT OF  
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**BEFORE THE  
SUBCOMMITTEE ON AVIATION  
TRANSPORTATION & INFRASTRUCTURE COMMITTEE  
UNITED STATES HOUSE OF REPRESENTATIVES**

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Mr. Chairman, Ranking Member Larsen, and Members of the Committee,

Thank you for the opportunity to participate in today's hearing on commercial space transportation regulatory reform. We appreciate the Committee's interest in exploring how regulatory reform can facilitate the continued growth of the commercial space industry. Given the increase in the cadence of U.S. launches, ground-breaking technological advances like rocket reusability, and the expanding scope of commercial space activities, regulatory reform is timely and necessary. The recommendations discussed in my testimony today are borne of practical experience, and offer an opportunity to streamline processes while fulfilling the government's responsibility to ensure that missions are carried out in a manner that protects public safety.

Founded in 2002, SpaceX's mission is to dramatically improve the reliability, safety, and affordability of space transportation and, in so doing, to make humanity a multi-planetary species. Since 2010, we have successfully launched the Falcon 9 rocket 55 times and, earlier this year, we successfully conducted the inaugural mission of the Falcon Heavy rocket. SpaceX's diverse set of launch customers include NASA, the Department of Defense ("DOD") and national security space community, commercial satellite operators, and allied international governments.

For NASA, SpaceX routinely conducts critical uncrewed cargo resupply missions to and from the International Space Station (ISS) with our Dragon spacecraft. Later this week, we will launch the 15<sup>th</sup> operational Dragon mission to the International Space Station ("ISS") under our Commercial Resupply Services ("CRS") contract with NASA. SpaceX is also working to restore U.S. human spaceflight capability in partnership with NASA. Later this year, SpaceX is scheduled to launch NASA astronauts to space from U.S. soil for the first time since the Space Shuttle retired in 2011.

SpaceX's Falcon 9 and Falcon Heavy rockets are also certified to launch critical national security satellites for the U.S. Air Force and the intelligence community. SpaceX has already conducted several successful national security space launches, and we have a number of such missions on contract in the coming years.

Commercially, SpaceX is the largest launch services provider in the world, with more than 100 missions on manifest representing \$12 billion in signed contracts. Having entered the commercial satellite launch market in 2012, SpaceX has restored the U.S. as a market leader, reversing a troubling trend in American competitiveness. Prior to SpaceX's entry into the market, U.S. market share in commercial satellite launch had collapsed from 100 percent in 1980 to zero percent in 2010, with the existing domestic launch suppliers ceding the market to French and Russian competitors. In 2017, SpaceX conducted over 60 percent of all U.S. launches with 18 completed missions—12 of those missions were for commercial satellite customers.

We are exceeding this cadence in 2018, and plan to launch 50 percent more this year. In 2018, as with 2017, SpaceX will launch the majority of the world’s commercial geostationary satellites.

SpaceX has significantly increased its launch cadence while reducing launch costs due to advances in the design and manufacturing process and, importantly, rocket booster reusability. In December 2015, SpaceX’s Falcon 9 first stage successfully delivered its payload to orbit and then returned to a landing site at Cape Canaveral Air Force Station (“CCAFS”)—the first time an orbital-class booster had ever been recovered intact following a launch. Since then, SpaceX has successfully launched and landed 25 first-stage boosters. Thirteen of those boosters have since launched a second time for operational missions.

The onset of launch vehicle reusability—now being adopted by others in the industry, and increasingly embraced by purchasers of launch—represents a significant shift in technology that will further lower launch costs and make space launches more reliable. Reusing boosters provides invaluable insight into the reliability and safety of launch vehicle design and build, including inspection and analysis of hardware after it has flown.

In May of this year, SpaceX launched the final iteration of the Falcon 9 rocket—Falcon 9 Block 5. Highly and rapidly reusable, Block 5 will be SpaceX’s workhorse vehicle for years to come; it has the capability to be re-flown up to 10 times following a thorough inspection, and without refurbishment.

The rapid pace of innovation in the U.S. commercial space industry is redefining access to space for commercial and government customers, unleashing new scientific and technological advancements in space, and creating high-tech, high-paying manufacturing and engineering jobs in America. The U.S. should continue to lead in this area to stay at the cutting edge of space innovation. To do so, it is critical that federal regulations governing space launch are updated to keep pace with the speed of this innovation, while maintaining public safety and ensuring the efficient and fully integrated use of the National Airspace (“NAS”) through modern technology.

Although the commercial space industry is undergoing significant growth and activity, it is important to keep in perspective that the launch industry continues to be a very small overall user of the NAS. As a point of comparison, for example, FAA’s Air Traffic Organization (“ATO”) “provides service to more than 42,000 [commercial] flights and 2.5 million airline passengers across more than 29 million square miles of airspace” *every day*.<sup>1</sup> By contrast, there were only 90 orbital space launches *globally* in all of 2017; in the U.S., the FAA issued a *grand total* of 23 commercial launch licenses that year, the highest ever granted.<sup>2</sup> Equally importantly, the duration of an orbital space launch is exceedingly brief compared to a standard airline flight; during launch, SpaceX’s rockets are propelled beyond 60,000 feet—the demarcation of the NAS—in approximately 90 seconds.

My testimony today will focus on SpaceX’s recommendations for updating the FAA’s commercial space launch regulations, including the following areas:

- 1) Revise FAA regulations governing the licensing of launch and reentry vehicles by adopting performance-based regulations;
- 2) Streamline regulations to facilitate a single license structure for launch and reentry;

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<sup>1</sup> [https://www.faa.gov/air\\_traffic/by\\_the\\_numbers/](https://www.faa.gov/air_traffic/by_the_numbers/)

<sup>2</sup> [https://www.faa.gov/about/office\\_org/headquarters\\_offices/ast/media/2018\\_AST\\_Compedium.pdf](https://www.faa.gov/about/office_org/headquarters_offices/ast/media/2018_AST_Compedium.pdf)

- 3) Allow for licensing a launch vehicle from multiple launch sites;
- 4) Eliminate conflict between US Air Force range requirements and FAA space regulations; and
- 5) Ensure effective and efficient utilization of the NAS by updating analytical and technology tools.

The FAA Office of Commercial Space Transportation (“AST”) is responsible for encouraging, facilitating, and promoting commercial space launches and reentries.<sup>3</sup> Under this authority, AST is the office that grants launch and reentry licenses, as well as licenses for launch and reentry sites. Notably, AST’s responsibility is to ensure that launch and reentry activities are conducted in a manner that protects the public and certain government interests; the operator, contractors and customers are responsible for mission success and accept the risk of spaceflight.

Reforms should focus on creating a licensing regime that efficiently regulates launches, reentries, and spaceports in a manner that prioritizes public safety without limiting technological or operational advances. SpaceX strongly recommends that regulations be performance-based rather than prescriptive processes, techniques, or procedures, as has historically been the case. Performance-based regulations result in successful public safety outcomes while enabling the best, most innovative, and least burdensome tools for achieving regulatory ends. Such a regime promises immediate, long-term safety and economic benefits, and will help attract more commercial space activities to the U.S., and result in more efficient use of the NAS.

The FAA’s launch licensing regulations in Title 14, Chapter III were published three decades ago when commercial launch activities were exceedingly rare, and when reusable rockets were an unrealized hope.<sup>4</sup> As such, the regulations are struggling to accommodate the type and frequency of current commercial launch operations. In some instances the regulations actually conflict with modern operations that result in greater safety. For example, FAA regulations specifically prescribe that launch vehicles use a traditional flight termination system (“FTS”), which is radar-tracked system that terminates the mission if the launch vehicle strays from its planned trajectory, a technology as old as rockets themselves. To enhance safety and streamline operations, SpaceX developed an autonomous flight safety system (“AFSS”), and worked in tandem with the U.S. Air Force to certify this new technology for our missions. Rather than use expensive and antiquated radars to track a rocket’s trajectory from the ground and manually terminate a stray rocket, AFSS leverages new, safer technology through which the rocket tracks itself against its trajectory and will self-command destruct, if necessary. The Air Force Range Safety Office (“RSO”) was able to quickly update its regulations to accommodate this technological advancement, while the FAA was unable to do so as a result of its regulatory structure and lengthy regulatory timetables. Here, a performance-based regulatory approach would have enabled SpaceX to demonstrate to the FAA the enhanced safety of AFSS and how it exceeds safety requirements.

### **Overall Framework**

Two recent efforts hold promise for making needed reforms and updates to the launch and reentry licensing regime. On May 24, 2018, President Trump issued Space Policy Directive 2 (“SPD-2”), which calls for the Secretary of Transportation to review Department of Transportation (“DOT”) regulations governing launch and reentry licensing. During this review process, the Secretary is directed to consider: 1) requiring a single license for all types of commercial space flight launch and reentry operations; and, 2) replacing prescriptive

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<sup>3</sup> 51 USC § 50903

<sup>4</sup> 53 Fed. Reg. 11004, April 4, 1988

requirements in the commercial space flight launch and reentry licensing process with performance-based criteria. Additionally, SPD-2 calls for DOD and DOT, as well as NASA, to coordinate in order to minimize U.S. Government requirements related to commercial space launch and reentry from Federal launch Ranges, except where necessary to protect public safety and national security.

These proposed reforms are a positive first step, and SpaceX strongly supports streamlining the licensing process to make it more flexible for operators. Doing so will enhance public safety and make the regulatory structure more efficient and effective. These efforts will help refocus regulatory efforts on the Government's core mission of protecting public safety. SPD-2 also specifies that the Secretary of Transportation shall rescind or revise the DOT launch and reentry regulations, or initiate a notice and comment rulemaking to revise or rescind these regulations by February 1, 2019. We believe this timeline is feasible, and encourage the FAA to fully implement this direction.

As part of this process, the FAA sought recommendations throughout the spring of 2018 for launch and reentry licensing reform through the Streamlined Launch and Reentry Licensing Requirements Aviation Rulemaking Committee ("ARC"). The ARC's aim was to develop recommendations for a performance-based regulatory approach in which the regulations state safety objectives and leave design or operational solutions up to the applicant. SpaceX supports the recommendations issued in the Committee's Final Report, and we recommend that launch safety requirements be performance-based and flexible, with the AST licensing and inspecting based on the operator's individual means of compliance.

SpaceX and other commercial launch companies are also working with the FAA and other airspace users on improving integration in the NAS. SpaceX, for its part, recognizes that increasing the frequency of launch to once a week or less will have an impact on other uses of the NAS. We are working with the FAA through a separate ARC process to recommend and advance new technologies that will enable launch activities to be seamlessly integrated into the NAS by leveraging real-time data that optimizes our usage of the NAS. This can and should be achieved without prioritization of particular use cases.

## **Policy Recommendations to Reform FAA AST's Commercial Launch Regulations**

### **1. Revise and Streamline FAA's launch licensing regime**

As the FAA undertakes regulatory reforms that balance the interests of protecting public safety and encouraging innovation, an important step should be modernizing and streamlining the launch licensing process. Launch licensing is currently fragmented between several regulatory sections including 14 CFR Parts 415, 417, and 431, which take different regulatory approaches for expendable and reusable launch vehicles. This distinction between expendable and reusable launch vehicles is inappropriate given modern space technology and operations. Further, the launch licensing Parts contain numerous inefficiencies, duplications and ambiguities that do not promote public safety.

Consolidation of these Parts should create one set of governing launch-licensing regulations that can accommodate all vehicle types, mission profiles and launch sites. The regulations should impose a performance-based review of the applicant's System Safety Program, as well as the applicant's design, manufacturing, operations systems, and processes, rather than an onerous, piece part review. The FAA should supplement the updated regulations with agency-developed guidance that can be updated more readily as the industry expands and evolves.

SpaceX has joined other members of industry in promoting a revision of AST's launch regulations that creates a flexible framework for licensees, avoids detailed, prescriptive requirements and provides for timely, transparent reviews.

## **2. Revise License Application Requirements**

Another challenge with the current regulatory structure is the timeliness of decisions on licensing, which has a significant impact on launch companies. Currently, 51 U.S.C. § 50905 establishes a deadline for a license review of "not later than 180 days after accepting an application," and allows 60 days for reviewing the application before it is accepted. A 180-day review period cannot accommodate the launch tempo commercial companies are under contract to undertake in the near-term.

The regulations should also be updated to consolidate the application procedures in Part 413 and clarify that the pre-application process is not mandatory. The process is described as helping an applicant "identify possible regulatory issues as the planning stage" for an application. It should be up to an applicant whether to utilize the pre-application process for assistance or to submit an application in pursuit of a license. The pre-application process should not be a means for preventing an applicant from having its application accepted to begin the official review process. Should an applicant choose to submit an application without pre-application discussions, the regulations define a process for dealing with an application that is not complete enough for the FAA to be reviewed.

For SpaceX, launches currently are occurring on average every two weeks or less, with that rate likely to increase in the coming years. For example, we plan to launch more than 25 times in 2018, and each launch that requires a new license or a modification to an existing license may be subject to a 180-day clock. Taken together, the 180 days to review an application and the 60-day timeline to accept an application for review can result in an 8-month wait for an applicant on top of the time the FAA imposes for the pre-application consultation. This is clearly impractical and will, over time, degrade the viability of the commercial space sector. SpaceX recommends that FAA implement a new standard with a 60-day timeframe for granting a license, and a 15-day review period to determine if an application is complete. Orbital launches tend to be relatively similar to each other with well-understood trajectories and orbital insertion parameters, so a more streamlined and timely review process will not impact the FAA's ability to protect the uninvolved public.

## **3. FAA AST's Regulations Should Allow for Licensing Launch Vehicles for Multiple Launch Sites**

FAA regulations governing commercial space launch should be revised to allow for licensing a launch vehicle from multiple launch sites under a single launch operator's license. For example, SpaceX's Falcon 9 should be able to operate from Space Launch Complex 40 ("SLC-40"), located within Cape Canaveral Air Force Station, and Launch Complex 39A ("LC-39A"), located within NASA's Kennedy Space Center, under the same license. These sites are effectively on the same premises. Launch operators that utilize multiple launch sites should have the flexibility to move launches between sites, particularly sites as proximate as LC-39A and SLC-40 are, without having to apply for a new or modified license. This would not change the underlying safety calculus or analysis of the FAA, and it makes practical sense.

The long-term goal of these revisions should be to implement a process through which applicants can receive multi-launch operator licenses through a less burdensome application process. Licensed operators could then file a "flight plan" within a reasonable period prior to launch. A "File & Fly" framework would

become increasingly feasible as launch vehicles become more reliable, fly more frequently, and flight plans and trajectories are repeated and standardized.

#### **4. Allow Launch Providers to Comply with USAF Range Requirements**

The U.S. Air Force is able to regularly revise, update, and improve its Range requirements—as it did with AFSS—since it is not subject to the Administrative Procedures Act (“APA”). In instances where a launch operator demonstrates compliance with USAF requirements, the FAA should accept the USAF’s requirement in place of the FAA regulatory requirement as an equivalent level of safety, regardless of whether the launch is operated on a Federal or non-Federal range. 14 CFR Chapter III should not create a competitive disadvantage for commercial launch operators that invest in non-Federal range locations. Conversely, FAA regulations should be updated and the U.S. Air Force should move quickly to accept that launch operators in compliance with FAA regulations are also in compliance with Air Force Range safety requirements—in other words, there should be reciprocity between FAA and the Air Force in order to avoid duplication in licensing requirements, which creates regulatory confusion, adds costs, and does not enhance safety.

#### **5. Enhance Integration of the NAS**

Today’s commercial space launch operations require airspace to be cleared and traffic rerouted based upon prelaunch trajectory analysis and debris modeling assumptions that have not been optimized for this purpose. Current FAA operations do not use real-time information regarding the actual position and trajectory of the space vehicle, and debris propagation software used today must be run well in advance of the mission, resulting in larger volumes of airspace being closed than is necessary with greater impact to commercial air traffic. The FAA tracking and display systems used to manage air traffic were never designed to manage integrated air and space operations. As a result, ATO personnel today lack the necessary tools to effectively integrate commercial space operations that are occurring in the NAS.

To successfully integrate launch and reentry operations into the NAS, the size and duration of normal launch and reentry hazard areas must be significantly reduced. This will require:

- 1) Real-time tracking information for space vehicles being made available to ATO operators through En Route Automation Modernization (“ERAM”), Standard Terminal Automation Replacement (“STARS”), and Traffic Flow Management System (“TFMS”); and
- 2) Real-time debris response capability for ATO operators.

Simply put, the ability to track the space vehicle and calculate a debris hazard area in real-time will enable airspace closures to be substantially reduced in both size and duration. Additional airspace would only be closed in the event of an actual space vehicle failure.

FAA has demonstrated the capability to handle these inputs in order to optimize use of the NAS. For example, AST has demonstrated the ability to gather real-time telemetry from commercial space operators, although the critical next step is to transfer this data to ATO real-time systems using the technology tools outlined above. Additionally, the FAA’s Office of NextGen has demonstrated the ability to generate optimized real-time debris hazard areas through the Hazard Risk Assessment and Management (“HRAM”) prototype.

In order to successfully integrate commercial space operations in the NAS, the critical capabilities of space vehicle tracking and debris hazard management must be fully integrated into systems used by the NAS operators. To this end, as noted, SpaceX and other commercial space companies are currently engaged in another ongoing ARC process related to NAS integration specifically. We look forward to concluding this process in a way that advances the most efficient and fair use of the NAS.

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Mr. Chairman, I appreciate your invitation to testify before the Committee today. This is an exciting time for the commercial space industry, and we are on the cusp of realizing the promise of rapid technological and scientific advances. SpaceX looks forward to being part of the solution to ensure that regulations keep pace with industry advances, and facilitate a future where space launch is increasingly safe, reliable, and affordable.