SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

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DEMOCRATIC QUESTIONS FOR THE RECORD
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COVER PAGE

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Federal Government Challenges in Oversight of Commercial Space Activities

The Pacific Northwest is a prime hub for commercial space activity, with a $4.6 billion space industry that has created over 13,000 jobs. A major challenge with space commercialization is understanding what the technological and workforce challenges are. Without this knowledge, it is difficult to determine the kind of support and oversight that is needed. Defining roles and responsibilities, increasing coordination, and improving knowledge sharing for agencies will allow the government to keep pace with rapid innovation.

This Committee played a very big role in a new aircraft certification program for the FAA to address workforce shortages and improve aviation safety through proactive approaches to managing risk. The same should be done to reduce technological risk for the commercial space industry. Technological challenges and other risk factors must be characterized and addressed from a safety perspective to ensure advancement of commercial human spaceflight.

1. What are the top three technological, operational, policy, or workforce challenges that your agency faces in your role supporting and overseeing the safety of commercial space activities?

   FAA Response:
   In our role to enable safe space transportation, the top three challenges our agency faces in supporting and overseeing the safety of commercial space activities are:

   (1) Keeping Pace with Licensing Demand (Operational): Since 1989, the FAA has licensed or permitted over 700 commercial space transportation operations, more than any other country in the world by far. In fiscal year 2023, the Office of Commercial Space Transportation (AST) licensed 113 operations, tripling the number of licensed operations since fiscal year 2020. Additionally, we have received a 186% increase in license applications since fiscal year 2020. Further, we have seen an increase in the number of pre-application consultations and license modifications from high-volume programs with large companies. To keep pace with this growth and free up licensing resources to ensure there are adequate resources for evaluating the safety of new operators, vehicles, sites, and technologies, we have undertaken process improvements, including work to incorporate automation, and efforts to streamline and improve our commercial space regulatory framework. As reflected in the President's budget request for fiscal year 2025, we have identified additional resource needs that would ensure we have the personnel in place to keep up with the growth in the demand for our services.

   (2) Staff Hiring and Retention (Workforce): To keep pace with increased demand for our licensing services, we have identified a need to grow our staff. Acquiring, training, and retaining talent in a competitive market continues to be a challenge, especially as the

demand for critical positions with a small talent pool, such as aerospace engineers, increases in both the government and industry.

(3) Ensuring a Smooth Transition to Part 450 (Policy): In December 2020, the FAA published a final rule to consolidate, update, and streamline all launch and reentry regulations into a single performance-based part, which is found in Title 14, Code of Federal Regulations, Part 450 (Part 450). We designed Part 450 to allow a commercial space operator to obtain a license for a portfolio of operations, which enables an operator to streamline and include different vehicle configurations, different mission profiles, and even multiple sites under one license. The FAA anticipates full implementation of Part 450 will reduce the number of times an operator will need to request a new launch or reentry license from the FAA. Ultimately, this will free up licensing resources and ensure there are adequate resources available for evaluating the safety of new operators, vehicles, sites, and technologies.

By March 10, 2026, all launch and reentry licenses issued by the FAA under legacy regulations will no longer be valid and launch and reentry vehicle operators must comply with Part 450. We are working to ensure that this transition is as smooth as possible. As Part 450 is a relatively new rule, to facilitate industry transition to Part 450, we have provided and continue to develop an assortment of aids, including license application checklists, advisory circulars, and virtual tutorials and workshops, for industry to have a full understanding of how to achieve compliance with Part 450 and how to take advantage of the intended benefits of this streamlined process and the performance-based rule. We will continue to evaluate Part 450 to determine the need for any future rulemakings, and we have tasked the Commercial Space Transportation Advisory Committee for its views on Part 450 as well.

Proposed National Space Council Regulatory Framework

This summer, I was joined by Administrator Nelson for our Space Summit in Washington State featuring many local space companies with plans for innovative commercial space missions. Gravitics, in Marysville WA, is designing and manufacturing large space structures for orbital human platforms and uncrewed on-orbit manufacturing. Starfish Space, in Kent, WA is developing an orbital space vehicle to provide orbit transfer and satellite maintenance services. The vehicles' on-board software and control system uses a combination of orbital mechanics and low-thrust electric propulsion, enabling satellite companies to relocate, deorbit and extend the life of satellites.

1. The space structures being designed by Gravitics appear to require an FAA license if occupied by humans and would fall under Department of Commerce licensing if used for automated uncrewed on-orbit manufacturing. Do you agree? If an operator purchases one of these platforms for multiple human and non-human applications, what type of novel space mission license do they apply for under the space council proposal?

   FAA Response:

Under the Administration's legislative proposal titled the "Authorization and Supervision of Novel Private Sector Space Activities Act" (legislative proposal), Gravitics would require only a single license from the Department of Transportation (DOT), as the space structures being designed by Gravitics are designed to be a human space flight vehicle. Under the legislative proposal, human space flight vehicles include launch or reentry vehicles, habitats, or other objects built to operate in a suborbital trajectory or outer space, including a celestial body, with a human being on board. In other words, an unoccupied vehicle may still be considered a human space flight vehicle if it is built to operate in outer space with a human being on board. Human space flight vehicles such as the structures being designed by Gravitics, whether occupied or unoccupied, would require only a single license from the DOT. The additional uncrewed or crewed on-orbit manufacturing would not alter the oversight needed for human-rated vehicles.

2. Do you have any suggestions for improving the efficiency of implementing the proposed National Space Council Regulatory Framework while maintaining safety?

FAA Response:
We believe the Administration's legislative proposal maximizes both efficiency and safety for novel space activities. The proposal will provide clear and predictable authorization and supervision for novel U.S. private sector in-space activities and help to ensure the U.S. remains the world's preeminent commercial space country of choice while imposing minimal regulatory burdens on U.S. private sector actors in space. Further, it builds upon the strengths of both the Departments of Transportation and Commerce and is a logical extension of both Departments' existing authorities.

Human Spaceflight Occupant Safety "Learning Period"

In 2021, we saw the first sub-orbital commercial flights from Virgin Galactic and Blue Origin, and the first successful orbital commercial flight with SpaceX's Inspiration4. The space economy is growing rapidly and the landscape for commercial human spaceflight will continue to evolve. Soon we will potentially see human-occupied commercial destinations in Low Earth Orbit, on-orbit manufacturing and R&D, and potential human habitation on the Moon and Mars. At the last hearing of this subcommittee focused specifically on promoting safety and competitiveness in U.S. commercial human space travel, our industry witnesses all urged Congress to once again extend the commercial human spaceflight occupant safety "learning period."

1. When do you believe the learning period moratorium should expire? What steps are needed to minimize disruption to commercial human spaceflight activities while maximizing safety for humans?

FAA Response:
We look forward to working with Congress to determine whether the learning period moratorium should expire and to ensure there is an environment where the FAA is able to

regulate commercial human space flight safety in a manner that does not stifle industry innovation and growth.

AST has been working to minimize disruption to commercial human spaceflight activities while maximizing safety for humans through numerous initiatives that will ultimately lead to a human space flight safety framework that will be designed to evolve with the industry. These initiatives include:

(1) Industry Recommendations on a Future Human Space Flight Safety Framework: In fiscal year 2023, AST chartered the Human Space Flight Aerospace Rulemaking Committee (SpARC), which is comprised of a cross-section of the commercial space transportation industry and other relevant stakeholders. The Human Space Flight SpARC allows us to engage with the commercial space industry on regulatory concerns related to human space flight and will provide consensus information, concerns, opinions, and recommendations to the Department of Transportation regarding the establishment of a commercial human space flight occupant safety framework. We expect recommendations from the Human Space Flight SpARC by the summer of 2024, which we will use to determine the appropriate scope and timing of future regulations and plan our efforts with the industry on a future human space flight safety framework.

(2) Development of Guidance and Recommended Practices: In September 2023, the FAA updated its Recommended Practices for Human Space Flight Occupant Safety document. This document provides a compilation of practices and recommendations that the FAA believes are important for commercial human space flight occupant safety, including design, manufacturing, maintenance, and operation considerations. Input from industry, academia, and other Federal agencies supported the development of this recent update. This document will support the continuous dialogue across the industry through standards development organizations to develop and publish standards that can be used to improve the safety of launch and reentry vehicles designed to carry humans. This document is currently being used by the Human Space Flight SpARC to guide discussions on the future human space flight safety framework. We will continue to make updates to the recommended practices document as well as develop guidance material in the form of FAA advisory circulars addressing human space flight safety.

(3) Development of Industry Consensus Standards: The FAA is working with standards development organizations, like ASTM Committee F47 on Commercial Spaceflight, to help drive industry voluntary consensus standards to publication and eventual industry adoption. As part of the design of any future human space flight safety framework, the FAA anticipates industry consensus standards as being foundational for industry adoption.

2. If the learning period moratorium is extended, how would that impact any new regulatory framework for in-space human activities implemented if the National Space Council proposal were to become law?

FAA Response:

In granting DOT additional regulatory authority for commercial in-space human space flight activities, we would rely on Congress to be explicit as to whether the learning period would also apply to in-space human spaceflight. However, an extension of the learning period would not hinder establishment of any new regulatory framework for in-space human spaceflight; at a minimum, informed consent requirements likely would be applied for in-space human spaceflight activities.

The legislative proposal unifies all human space flight oversight under a single agency, the Department of Transportation. After regulations are promulgated, in-space human space flight oversight would address public health and safety, safety of property, space sustainability, international obligations of the United States, and national security, foreign policy, and other national interests of the United States. While the learning period, which places limits on the Secretary's authority to issue regulations governing the design or operation of a launch vehicle to protect the health and safety of crew, government astronauts, and space flight participants, is in place, this oversight would also include overseeing informed consent requirements. Once the learning period sunsets, the FAA would work to promulgate regulations in continued cooperation with industry that would codify a safety framework for human space flight occupant safety.

Coordination on Regulatory Decision-making within the Executive Branch Interagency

Varda Space Industries, a U.S. company that launched its first payload into orbit in June 2023, is successfully demonstrating manufacturing pharmaceuticals in space, but is experiencing delays in receiving its reentry license from the FAA. This delay has led to a decision by Varda to enter a partnership with Southern Launch to use their spaceport range near Adelaide, Australia, rather than use the U.S. Air Force's Utah Test and Training Range. While Australia is obviously a strong U.S. partner, this seems like an example of a U.S. space company choosing to pursue opportunities in other counties that offer simpler and more flexible regulations.

1. In general, can you explain how interagency coordination works for launch and reentry licensing decisions?

   FAA Response:
   Both Title 51, United States Code, and Executive Order 12465, Commercial Expendable Launch Vehicle Activities, establish interagency requirements for an interagency group to advise and assist the Department of Transportation, through the Federal Aviation Administration, in performing its responsibilities for launch and reentry licensing decisions. In addition to meeting certain safety, environmental, and financial responsibility requirements, a license application evaluation must undergo up to two interagency consultations: a payload review if there is a payload and a policy review for the entire launch or reentry operation.

   During the payload review, the FAA consults with the Departments of Defense (DoD), State (DoS), and Commerce (DOC), the National Aeronautics and Space Administration (NASA), the Federal Communications Commission, and any other applicable federal agency to ensure

each payload's launch or reentry does not jeopardize public health and safety, safety of property, national security interests, or foreign policy interests of the United States.

During the policy review, the FAA consults with DoD, DoS, NASA, and any other applicable federal agency to determine whether a license application presents any issues affecting U.S. national security, U.S. foreign policy interests, or international obligations. In practice, the FAA sends a summary of the commercial launch or reentry activity to all relevant interagency stakeholders. If an interagency partner identifies an issue, the DOT coordinates with the partner agency and the operators to remedy the issue before issuing a license.

2. In implementing the National Space Council's proposed regulatory framework for novel space activities such as on-orbit processing and manufacturing, what is the best way to maintain U.S. competitiveness through a streamlined but safe regulatory framework?

FAA Response:
The legislative proposal's regulatory framework for novel space activities will provide clear and predictable authorization and supervision for novel U.S. private sector in-space activities and help to ensure the U.S. remains the world's preeminent commercial space country of choice while imposing minimal regulatory burdens on U.S. private sector actors in space. DOT and the DOC will work together, as well as with other stakeholders, to ensure the application of consistent standards. In the cases of the in-space activities cited above, on-orbit processing and manufacturing, these would be licensed by the DOC.

Addressing Federal Workforce and Technical Capacity Needs in Implementing Expanded Commercial Space Regulatory Authority

The Federal government must regulate the commercial space industry in a manner that both ensures the safety of the general public and human participants in specific activities. This means ensuring our regulatory agencies are well staffed, very knowledgeable, and experienced in the safety culture of the aerospace industry. Yet we have heard from stakeholders, including industry leaders, that the FAA does not have enough personnel with the right skill sets to move launch and reentry licenses along in a timely manner, or begin regulating commercial human spaceflight occupant safety when the learning period ends.

It is also clear government regulatory authorities are competing with industry for the same STEM-educated workers needed to maintain a pipeline of technical talent. In Washington State alone, we are anticipating a 60,000-person STEM workforce shortage in by 2026.

1. Would adding a key technology leader to your respective offices, such as a Chief Technical Officer with significant industry experience be an effective way to keep your workforce up to speed on the rapid technology changes taking place in the industry sectors you regulate?

FAA Response:

We do not believe a Chief Technology Officer alone will suffice to keep the workforce apprised of rapid technology changes. As reflected in the President's budget request for fiscal year 2025, we have identified additional resource needs that would ensure we have the personnel in place with the necessary expertise.

2. What do you believe to be the biggest impediments to recruiting needed talent, experience, and expertise? Do you have ideas this committee should consider that would enhance recruitment opportunities?

FAA Response:
As mentioned above, we have experienced significant growth in the demand for AST's licensing resources. Currently, approximately two-thirds of the AST organization is dedicated to working on license applications, including pre-application consultations with prospective applicants, license modifications, license renewals, conducting payload and policy reviews with our interagency partners, conducting an assortment of safety analyses, safety inspections, mishap investigations, and more.

To keep pace with the increased demand on our licensing resources and ensure there are adequate resources for evaluating the safety of new operators, vehicles, sites, and technologies, among our other initiatives to improve our processes and streamline and improve our commercial space regulatory framework, we have identified a need to grow our staff, and this need was reflected in the President's budget request for fiscal year 2025. We have found that acquiring, training, and retaining talent in a competitive market continues to be a challenge, especially as the demand for critical positions with a small talent pool, such as aerospace engineers, increases in both the government and industry.

We are using a variety of available tools to enhance our workforce recruitment, hiring, and retention strategies. Some examples of the hiring strategies we've used to ensure we have a team in place to meet the growing demands that have been placed on AST include veterans hiring authorities, mission-critical direct hiring authority, reemployed annuitants, other than full-time employment opportunities, and internship programs. In addition, in anticipation of the continued surge in demands for our licensing services, we are working on revising our internal recruiting strategy for the next three fiscal years to enhance our recruitment efforts for highly competitive specialized positions in the public and private marketplace. Further, we have extended our hiring efforts to other office locations besides Washington, D.C., to expand our talent pool.

Finally, AST is exploring the use of non-engineer positions, which tend to have a larger talent pool, that require technical skills and support certain engineer job functions to assist in our license evaluation, safety oversight, and regulation, policy, and guidance activities. This may have the effect of freeing up critical licensing resources.

We continue to look into ways to utilize the FAA's hiring and personnel authorities to expand our hiring pool and acquire and retain talent.

GAO Report on FAA Mishap Investigations

In just over a year, there have been several mishaps with launch vehicles intended for human spaceflight. On September 12, 2022, the Blue Origin New Shepard suborbital rocket suffered a failure shortly after launch and the FAA and Blue Origin worked together to create a mishap report that resulted in 21 corrective actions. It is expected the New Shepard launch vehicle will return to flight very soon. On April 20, 2023, SpaceX's first attempt to launch Starship resulted in the catastrophic loss of the vehicle and damage to the launch pad that sent debris as far as five miles from the Boca Chica, Texas launch site. The FAA and SpaceX worked together to create a mishap report that resulted in 63 corrective actions, and Starship flew again on the 18th of November.

The GAO just released a report examining the roles and responsibilities of federal agencies involved in investigating commercial space mishaps and found that of the 50 mishaps between 2000 and 2023, all but one of the investigations was led by the launch operator. The report recommends the FAA "comprehensively evaluate the effectiveness of its mishap investigation process," and develop criteria for determining when the agency will authorize a launch operator to lead a mishap investigation on FAA's behalf. The Department of Transportation has concurred with these recommendations.

1. How does the FAA currently ensure operator-led mishap investigations are thorough and applied consistently across the commercial launch industry?

   FAA Response:
   FAA currently ensures operator-led mishap investigations are thorough and applied consistently across the commercial launch industry, as the FAA oversees all aspects of the mishap investigations in data reviews and analysis. Through the course of mishap investigations, the FAA applies consistent public safety standards and ensures the operators have met the standards prior to closing any mishap investigation. The FAA issued Advisory Circular No.450.173-1, Part 450 Mishap Plan – Reporting, Response, and Investigation Requirements, which provides guidance to operators on developing a mishap plan, responding to a mishap, and conducting a mishap investigation. This advisory circular presents operators with an acceptable means of compliance with regulatory requirements related to mishaps. In the event of a mishap, an operator must identify and implement preventive measures to avoid the recurrence of the mishap prior to the next flight, unless otherwise approved by the FAA. In general, the FAA will not allow a return to flight operations until the agency determines that any safety-critical system, process, or procedure related to the mishap does not affect public safety or any other aspect of the operator's license. This is standard practice for all mishap investigations. This process is followed for each investigation and confirms the public safety regulations, such as those pertaining to a safety critical system, process, or procedure, are satisfied before determining the closure of a mishap investigation. More information can be found here: https://www.faa.gov/space/compliance_enforcement_mishap.

2. Do you believe the current mishap investigation process is well suited to the incremental flight test approach SpaceX is taking with Starship, requiring a mishap investigation and new launch license for every flight? Is there an alternative approach that would maintain safety as effectively or even more effectively?

FAA Response:
The current mishap investigation process is well suited to the incremental flight test approach SpaceX is taking with Starship. During the mishap investigation of SpaceX's Starship Super Heavy integrated flight test 1, the FAA ensured SpaceX identified the failures contributing to the mishap and implemented appropriate corrective actions to reduce the likelihood of a repeated failure. While the integrated flight test 2 ended in a mishap, the same failures did not occur, which validates the FAA model of operator-led mishap investigations. We are actively looking for ways to further increase efficiencies while maintaining safety. For example, the FAA may allow an operator to return to flight during an ongoing mishap investigation if the FAA is able to make a favorable public safety determination that the issues related to the mishap will have no effect on public safety. Furthermore, the FAA is exploring a new approach to mishap investigations by embedding more reviewers within the investigation to work iteratively on the investigations and the subsequent license modification evaluations.

When the FAA determines that the implementation of corrective actions is necessary, based on the nature and extent of the corrective actions, an operator may be required to submit an application for a license modification or new license.

International Considerations for Novel Space Activities

Setting norms of behavior and safety standards for operating in space through international engagement is critical to the continued access and use of space for scientific advancement and economic prosperity. 32 countries in addition to the United States have now signed the Artemis Accords, a set of common principles, guidelines, and best practices focused on safe and sustainable space exploration.

Regarding the Artemis program itself, the United States and its partner nations intend to pursue future space cooperation in partnership with commercial industry. Within Washington, more than 40 companies are working to supply Artemis. 15 companies supply the Space Launch System rocket, 14 deliver goods and services used for the Orion crew capsule, and Blue Origin will supply NASA with a second lunar lander, creating competition, and redundancy. Other NASA initiatives such as the Commercial Lunar Payload Services or CLPS program have created the potential for private sector activities on the lunar surface operating on a purely commercial basis.

1. Given differing regulatory approaches to overseeing private sector space activities among spacefaring nations, how do you assist U.S. commercial space companies in both collaborating internationally on novel space activities, and competing with non-U.S. commercial entities for markets and customers?

FAA Response:
The U.S. commercial space transportation industry currently leads the world in launch and reentry capabilities, making it highly sought after by foreign private and government customers. Since 1989, the FAA has licensed or permitted over 700 commercial space transportation operations. Among those, as of March 25, 2024, 80 occurred internationally. And of those 80 operations that occurred internationally, 19 occurred in the last two years, or 24%. We expect the number of licensed operations occurring internationally to continue to increase.

The FAA has strong bilateral partnerships with many countries, including the United Kingdom (U.K.), Canada, New Zealand, Australia, Sweden, Norway, Italy, Japan, and Brazil. The FAA has over 30 years of experience licensing and permitting commercial space launch and reentry activities. During this time, the FAA has leveraged its licensing and regulatory capabilities and other various programs and initiatives to enable the growth of the U.S. commercial space industry in a manner that has resulted in an impressive safety record for this rapidly growing industry. No FAA-licensed launch or reentry operation has resulted in a fatality or injury to a member of the public, nor has there been any significant property damage to the public. Because of this, the FAA is routinely approached by other countries seeking to partner on regulatory or spaceport development. At the present time, U.S. companies are in discussions with spaceports in many countries, including Japan, Australia, Norway, the U.K., Sweden, and Brazil, in support of future launches from these countries.

Multilateral discussions are needed to ensure global consistency for safety during launch and reentry, and the FAA will strive to continue to serve as an example for global safety for commercial space transportation activities. The growth of U.S. launch activity globally also signals the need to consider recognition arrangements to reduce duplication of licensing approvals. Dual licensing between foreign governments for a single U.S. launch or reentry activity does not increase safety and will stifle the growth of the U.S. launch industry in the global markets.