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Hearing on Promoting Safety, Innovation, and Competitiveness
in U.S. Commercial Human Space Activities
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Chair Sinema, Ranking Member Schmitt, and members of the Subcommittee, thank you for the opportunity to speak with you today about commercial human spaceflight, a topic that is fundamental to Blue Origin's near and long-term vision.

THE FUTURE OF HUMAN SPACEFLIGHT AT BLUE ORIGIN

Blue Origin is building a road to space for the benefit of Earth. Our team is focused on radically reducing the cost of access, harnessing its vast resources, and inspiring future generations. We build and operate reusable rocket engines and launch vehicles, in-space systems, and lunar landers. Blue Origin has grown into a company of more than 10,000 employees, with facilities in seven states and a nationwide supply chain. The vehicles and in-space systems we create will enable our vision of millions of people living and working in space, a vision that relies on the principles of safety, innovation, and competition. Blue Origin's astronauts return to Earth forever changed by their experience and share this with the rest of the world as champions of space for the benefit of Earth.

NEW SHEPARD – SUBORBITAL LAUNCH

On July 20, 2021, Blue Origin's New Shepard suborbital rocket completed its first commercial human spaceflight, safely carrying four humans above the Kármán line and back to Earth. Since then, New Shepard has flown 5% of the world's astronauts above the Kármán line, 9% of the women, and many firsts for humans in space. We expect to fly more than 1,000 humans to space in the coming years.

Safety is—and always will be—Blue Origin's highest priority. These milestones in human flight were preceded by years of a deliberate, step-by-step test and verification program with a singular focus on safety. Blue Origin has been flight testing the New Shepard rocket and its redundant safety systems since 2012. The program has had 22 successful consecutive missions, including three successful escape tests, showing that the crew escape system can activate safely in any phase of flight. This safety system was activated during the most recent uncrewed New Shepard mission in an unplanned event and performed flawlessly.

The foundation of New Shepard's safety architecture is a design and verification process that incorporates best industry practice from aerospace and other safety-critical industries. New Shepard's crew capsule was designed with numerous redundant safety systems that provide layers of protection to our astronaut crews. For example, the capsule can land with only one of its three parachutes deployed, as the landing deceleration system, crushable ring on the bottom of the capsule, and seats designed to absorb g-forces all act as back-up systems to slow the capsule and allow it to land astronauts safely. This attention to detail in our safety system design is a result of our culture, which puts safety at the forefront of all our operations.

NEW GLENN – ORBITAL LAUNCH

As the New Shepard program gains experience through design, build, test, and operation, lessons learned have been and continue to be applied to New Glenn, Blue Origin's orbital launch vehicle. These lessons have been particularly beneficial in the areas of autonomy, guidance, vertical landing architecture, powerful and throttleable liquid engines, and lean operations. New Glenn's reusable first stage is built for a minimum of 25 missions and though early operations are devoted to payload launch, the vehicle is also engineered with the safety and redundancy required to fly humans. New Glenn is purpose-built to deliver high volume and mass to orbit and is a key to unlocking our long-term vision — a future where people and heavy industries can work in space to preserve Earth, humanity's blue origin.

ORBITAL REEF – COMMERCIAL SPACE STATION

Orbital Reef will revolutionize human spaceflight in low Earth orbit (LEO). This unique destination will provide the essential infrastructure needed to scale economic activity and open new markets in space. The next era of the space station will go beyond research to include entertainment, tourism, and so much more. Attached modules of many types can experiment with any type of business, including: government-sponsored space research; industrial operations ranging from entertainment and advertising to filmmaking, sports, and gaming, to applications research and manufacturing; passenger travel starting with adventure travel, then evolving to tourism and orbital living.

In the near future, LEO will be the logical place to mature technology, train astronauts, conduct science, and inspire students. This means we need to assure access for crew and cargo, preserve a sustainable working environment free of orbital debris, and prioritize investments in next-generation research capabilities.

LUNAR LANDER

Lunar permanence has been core to Blue Origin's vision since the beginning. We are a proud partner with NASA on the Artemis program, building the Sustaining Lunar Development lander to take astronauts back to the Moon and create a sustainable human presence.

Blue Origin's lunar lander and supporting systems are the foundational elements of our broader architecture to enable our vision of building a road to space for the benefit of Earth. To realize the value of the Moon's potential, secure a sustained lunar presence, and achieve Blue's goal of lunar permanence, we need reliable, recurring lunar transportation.

GOVERNMENT STAKEHOLDERS IN HUMAN SPACEFLIGHT

LAUNCH

The Federal Aviation Administration's (FAA) Office of Commercial Space Transportation (AST) is responsible for regulating the U.S. commercial space transportation industry, "to ensure compliance with international obligations of the United States, and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States."[1]

[1] 51 U.S.C. § 50901(a)(7). *See also "About the Office of Commercial Space Transportation" https://www.faa.gov/about/office_org/headquarters_offices/ast*

Human Spaceflight Regulation

In 2004, the Commercial Space Launch Amendments Act (CSLAA) was passed by Congress and granted the Secretary of Transportation the authority to regulate launch and reentry of commercial spacecraft carrying humans.[2] This legislation provided limitations to ensure that a nascent industry and its regulator were able to build experience in human spaceflight safety. These limitations, known as the 'learning period,' require that no safety regulations for design features or operating practices can be promulgated unless they are created after an event resulting in a serious or fatal injury (or the risk of such an injury). In response to this congressional action, the FAA published Title 14 of the Code of Federal Regulations (CFR) Part 460.

Part 460 does address some aspects of occupant safety, including requirements to protect crew members who are essential to a vehicle's flight safety system and therefore public safety. These include training and environmental controls that guard the crew's ability to carry out safety-critical tasks, as well as additional requirements for pilots and remote operators.[3] Space flight participants (SFPs) are required to be trained for emergency conditions and are informed in detail as to the risks of spaceflight.[4] This process, known as 'informed consent,' requires operators to communicate safety records throughout the history of spaceflight, including all known hazards and risks associated with their mission, and acknowledge there are unknown hazards associated with spaceflight. Written documentation is followed by an opportunity to ask oral questions to ensure risks are well understood.

Launch & Reentry Regulations

All launch activity, regardless of humans on board, requires a license from the FAA. Licensing is performed under the regulations found in 14 CFR Part 450, though legacy operators may hold active licenses under the legacy requirements of Part 431 (Reusable Launch Vehicles) and Part 415 (Expendable Launch Vehicle). Part 450 is a result of Space Policy Directive-2 (SPD-2)[5] published in 2018 which directed a review and revision of launch and re-entry licensing for the purpose of streamlining. The policy requires a single license for all operations and the use of primarily performance-based criteria.

Blue Origin and many other industry stakeholders were, and continue to be, extremely supportive of the goals of SPD-2. After an accelerated rulemaking process, the FAA published the Part 450 regulations which became effective in March 2021. As of July 2023, only four licenses have been granted.[6] The implementation of these regulations is discussed in the policy recommendations of this testimony.

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[2] Pub. L. 108-492

[3] 14 C.F.R. § 460.5 through § 460.5-13

[4] 14 C.F.R. § 460.45 and § 460.51,

[5] *See "Space Policy Directive-2, Streamlining Regulations on Commercial Use of Space",* May 24 2018 https://trumpwhitehouse.archives.gov/presidential-actions/space-policy-directive-2-streamlining-regulations-commercial-use-space/

[6] *See "COMSTAC Regulatory Working Group Report, Part 450 – Challenges and Recommendations" July 11, 2023* https://www.faa.gov/media/68016

IN-SPACE ACTIVITY

Article VI of the Outer Space Treaty states that "[t]he activities of non-governmental entities in outer space…shall require authorization and continuing supervision by the appropriate State Party to the Treaty."[7] The United States currently does not vest a single agency with that authority.

Activities in space are currently monitored and licensed by numerous US government agencies to satisfy this obligation. The Federal Communications Commission (FCC) licenses satellites and earth stations for space-based services and is responsible for allocation of spectrum for all public and private actors. The National Oceanic and Atmospheric Administration (NOAA) Commercial Remote Sensing Regulatory Affairs Office (CRSRA) licenses operations of commercial imaging satellites. The Department of Defense (DoD) currently provides monitoring and Space Situational Awareness (SSA) services for commercial operators on orbit. The Office of Space Commerce (OSC) has begun work on a parallel SSA service in anticipation of transitioning these responsibilities from the DoD. Lastly, FAA commercial space launch licenses require advanced review of all payloads for potential impacts to national security, international obligations, and foreign policy through an interagency process known as a Payload Determination.

NASA

The National Aeronautics and Space Administration (NASA) does not have regulatory authority over commercial human spaceflight, but NASA plays an important role as a stakeholder in US space activity. NASA's Commercial Crew Program has successfully utilized commercial services for launch to the International Space Station (ISS) since 2020. While these launches are licensed by the FAA, NASA maintains responsibility for Crew Safety outside of the FAA's Part 460 Regulations.

NASA is also engaging with commercial industry's suborbital vehicle programs through an effort known as Suborbital Crew (SubC). For this program, NASA has changed its approach to managing the safety of their personnel.[8] Rather than requiring formal certification programs, companies must present a "safety case" that explains their internal safety processes, which NASA will evaluate to make a determination.

POLICY RECOMMENDATIONS TO ENABLE CONTINUED SAFETY, INNOVATION, COMPETITION

EXTEND THE LEARNING PERIOD

The learning period has had a positive impact on the development of commercial human spaceflight, including at Blue Origin. This provision is set to expire on January 1, 2024 and Congress should act with urgency to provide an extension that will allow industry and the FAA to demonstrate readiness for potential next steps.

Industry Learning & Readiness

The human spaceflight learning period has been in statute since 2005, but the first FAA-licensed launch with a paying customer on board was New Shepard's first human flight in July 2021. As of October 18, 2023, only 22 commercial human flights have been licensed for three providers, along with seven NASA

[7] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967), 610 U.N.T.S. 205, 18 U.S.T. 2410.
[8] *See "Commercial Programs" NASA Advisory Committee Meeting, May 2023 Slide 14*
https://www.nasa.gov/wp-content/uploads/2023/10/csd-nac-briefing-may-2023-tagged.pdf

human spaceflight missions.[9] Blue Origin is proud to be a part of this onset of activity, but it does not by itself demand further regulation. Instead, gathering invaluable flight data and experience from multiple providers and technologies begins a critical phase of learning under the learning period.

Safety frameworks for spaceflight can be robust while also evolving. As flight and test experience grows, new data can validate requirements or identify areas for improvement. The ability to react to new information and iterate within tools, processes, and criteria, strengthens the commercial industry's contributions toward innovation. Gains in both efficiency and safety are the spirit of innovation that can open access to space and maintain US leadership.

FAA Learning & Readiness

A dynamic, evolving industry needs to be supported by an equally agile regulator. Congress made it clear that the FAA has a responsibility to use the learning period to prepare:

> "Nothing in this subsection shall be construed to limit the authority of the Secretary to discuss potential regulatory approaches, potential performance standards, or any other topic related to this subsection with the commercial space industry, including observations, findings, and recommendations from the Commercial Space Transportation Advisory Committee, or its successor organization, prior to the issuance of a notice of proposed rulemaking."[10]

The FAA, through the Commercial Space Transportation Advisory Committee (COMSTAC) and their exposure to commercial operations, has begun to engage with industry, but Congress should continue to encourage and support these actions. Blue Origin advocates that the following two forums for should be leveraged further by the FAA.

First, the FAA should continue to increase its engagement in the industry consensus standards process as required in statute.[11] While operators, academics, and associations develop content, the FAA can facilitate discussions on how standards might be used in the future, and where they have successfully been used in the past. The FAA has insights into safety procedures across the industry, giving them an opportunity to nudge industry in the most helpful directions. This could have a powerful impact on prioritization of efforts for the commercial space voluntary consensus standards.

Second, the FAA AST recently chartered an Aerospace Rulemaking Committee ("SpARC") to request industry guidance on occupant safety.[12] Blue Origin is proud to be a member of this committee and looks forward to contributing our thoughts. The charter is open for 24 months, and initial industry recommendations are due after the first year. We recommend that the FAA take advantage of the full charter duration, review report content, ask questions, debate with industry, and conclude the process with a well understood path forward. Recommendations from the SpARC should feed into measurable

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[9] *Number of licensed flights updated for recent activity, See Report to Congress "U.S. Department of Transportation Evaluation of Commercial Human Space Flight Activities Most Appropriate for New Safety Framework"* Sept. 2023, https://www.faa.gov/sites/faa.gov/files/PL_114-90_Sec_111_7_Commercial_Human_Spaceflight_Activities.pdf

[10] 51 U.S.C. § 50905(c)(5)

[11] 51 U.S.C. § 50905(c)(3)

[12] *See "Human Space Flight Occupant Safety Aerospace Rulemaking Committee Charter"* March. 24, 2023 https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/Final-ARM-220523-001_S1%20Signed.pdf

FAA AST plans for future regulatory action. These plans should include workforce needs, tool improvements, and a roadmap for guidance documents, including industry standards and Advisory Circulars (AC).

The three US commercial human spaceflight launch providers operating today have three fundamentally different architectures: suborbital and orbital; piloted, autonomous, and hybrid; vertical and horizontal takeoff and landing. There is no one-size-fits-all criteria for safety in a market as diverse as human spaceflight. A prospective regulatory framework needs to be results-oriented rather than prescriptive because the means of compliance to meet the requirement are likely to vary by mission profile and design choices.

As more operators apply for, or transition to, licenses under the newest regulations in Part 450, the FAA AST has an opportunity to demonstrate success of a flexible, performance-based regime. Metrics from this process can be regularly reported to Congress to evaluate readiness for the sunset of the learning period. The learning period should remain in place until reports show decreasing review timelines, increasing throughput in all licensing phases (i.e. pre-application, complete enough, final review), increasing cadence of AC publication and AC updates, and increasing transparency into the licensing process.

CONDUCT STREAMLINING EFFORTS FOR LAUNCH LICENSING

The FAA faces near-term challenges with implementing these critical public safety regulations given the increasing volume of prospective launch providers and cadence of launches. During the December 2022 COMSTAC meeting, it was indicated there was a backlog in licensing and that the FAA AST will need to prioritize work and put some license applications in a queue prior to assessment.[13] Difficulties in implementing Part 450 regulations only exacerbate this workload. The FAA requested specific feedback from the COMSTAC on potential improvements to the Part 450 regime in May of 2023. [14]

Blue Origin greatly appreciates FAA's desire to continuously improve processes, eliminate duplication and inefficiencies, and appropriately allocate limited resources. Congress can support these efforts by allowing the FAA to invest in and develop a suite of tools to automate the most cumbersome manual tasks done today by license evaluators. These tools could be the fastest way to realize a reduction in processing timelines and provide transparency to applicants. Further review of Part 450 implementation should include identification of key roles and expertise required to evaluate license applications in a performance-based framework. Solutions must consider a strategy for hiring and training of these roles while considering attrition estimates and availability of personnel with the requisite qualifications in the larger workforce.

Innovation needs to exist in our vehicles and our regulatory processes if the US is to maintain our competitiveness in the global launch market. Blue Origin looks forward to continuing to work with Congress and the FAA to identify these opportunities.

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[13] *See summary of remarks made by Associate Administrator Coleman, "Meeting Minutes"* Dec. 15 2022 https://www.faa.gov/sites/faa.gov/files/COMSTAC_Meeting_Minutes_Fall-2022.pdf

[14] *See "COMSTAC" May 15 2023, p. 55-63* https://www.faa.gov/space/additionalinformation/comstac/May_15_2023_PM.pdf

DEFINE MISSION AUTHORIZATION & APPLY LESSONS LEARNED

Despite the need for continued streamlining and modernization of their role, the FAA's launch and reentry authority has been clear for over 30 years, providing commercial entities clarity and certainty as they enter the market. The same cannot be said for the growing body of capabilities being developed for orbital, cislunar, and lunar ecosystems, which go far beyond transportation. The lack of a single authority over space objects and activities other than launch, telecommunications, or remote sensing has led to several challenges as executive agencies attempt to exercise partial authority in the absence of congressional clarity. Where interagency processes have been used to compensate, they have failed to create approval processes that are transparent and have meaningful deadlines.

Blue Origin's human-centric vision of space will require clarity as we pursue initial capabilities in LEO and on the Moon. We urge Congress to define the authorization framework for in-space activities and ensure that every effort is taken to eliminate duplicative requirements, limit unstructured interagency processes, and draw clear boundaries between agencies with related authorities. Any in-space activity authorization regime should have a single government owner and include the following three key aspects:

1) Strict Timelines. An activity should be automatically authorized within 180 days unless a specific procedural, regulatory, treaty or national security prohibition is found. This provides a permissive system for innovation and can be scaled more readily than overly restrictive or prescriptive requirements. Where a proposed activity requires inter-agency review to ascertain impacts or overlaps with the regulating authority of another agency, these dependencies should be identified to the operator within a short interim deadline.

2) Self-certification. Mission authorization should be granted for categories of potential activities rather than specific instances, where appropriate. Non-governmental entities would file an outline of their proposed activities and the authorization under which they fall, not unlike a flight plan. Each operator would be responsible for updating this register as needed to satisfy continuing supervision requirements.

3)Transparency. Maintaining transparency to the authorization process is important for commercial service providers to build confidence in an industry that necessitates long lead planning. Clear and expedient deadlines should be implemented so that non-governmental entities are not caught in regulatory limbo indefinitely. Active communication paths between operators and the authorizing agency should be encouraged during a review period as each new proposed activity will present a unique challenge.

RESOURCE AGENCIES WITH AUTHORITY IN SPACE

A competitive and innovative regulatory framework for commercial space activities will need resources that support scaling with the industry. We encourage Congress to provide appropriate funding to agencies with authorities in-space. Congress and the FAA helped accelerate the development of the commercial space launch industry, and now the FAA is struggling to scale with the cadence of operation. Streamlining regulations and administrative processes and exploring the possibility for increased training opportunities will help utilize resources more efficiently, but more funding is required to get the right

people and process in place. Similarly, as mission authorization requirements are clarified, Congress should ensure that resources match the scope of activities.

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Thank you again for the opportunity to testify before the committee today. The United States is a global leader in human spaceflight. Blue Origin is proud to be a part of this legacy.