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Hearing on Commercial Space Transportation Regulatory Reform – Stakeholder Perspectives
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Chairman LoBiondo, Ranking Member Larsen, Chairman Babin, and members of the Subcommittee, thank you for the opportunity to speak before the committee today on Commercial Space Transportation Regulatory Reform – a topic that Blue Origin has been heavily focused on for the past two years.

Blue Origin’s vision is to enable a future where millions of people live and work in space. Our passionate workforce of over fourteen hundred employees work tirelessly to make this future a reality, every day. We recognize that this vision demands higher flight rates, lower cost access to space, and an unwavering attention to safety. This can only be achieved with full operational reusability of our launch vehicles. You can imagine what the cost of air-travel would be if new aircraft were discarded after every flight, so you can appreciate the prohibitive cost of space launch without reusability. Blue Origin has made great strides with our fully-reusable *New Shepard* suborbital launch vehicle, which has flown to space and back seven times – achieving five of those flights in less than 12 months. *New Shepard* launches and lands at our site in West Texas. While the booster lands vertically on landing gear, our capsule separates from the booster in space – 100 km altitude – and offers the six astronauts in our capsule four minutes of weightlessness. For reference, *New Shepard* traverses the National Airspace System and exceeds 60,000 feet altitude within 90 seconds of liftoff, and the full flight duration is about 11 minutes.

We also are developing our next-generation reusable rocket, *New Glenn*, which will launch people and payloads to low Earth orbit and beyond. We have agreements in place for nine commercial launches with a number of leading commercial satellite operators.

We are ready to help end the nation’s reliance on Russian engines for national security launches with our BE-4 engine, and we are prepared to bring private capital to partner with NASA for a return to the lunar surface. We are committed to building the next generation of space transportation infrastructure, providing reliable, affordable, and frequent rides to space for people, satellites, and deep space exploration.

Expendable versus Reusable Launch Vehicles

Traditional launch vehicles are expendable launch vehicles, or “ELVs” for short. They launch vertically and are aptly named for the first booster stage which is expended when it falls into the ocean after burning its fuel to lift a payload into space. Conversely, reusable launch vehicle, or “RLV,” architectures vary in design - some RLVs launch and land vertically, allowing the booster stage to be reused. Other RLVs are horizontal launch and landing vehicles that operate akin to an aircraft; others are high altitude balloons. These vehicle architectures and operations can vary widely, as do their performance characteristics and safety systems. While these innovative designs and reusable systems have only recently been realized in the mainstream launch market, the regulations governing their operation were created when reusability was largely limited to the Space Shuttle.

Commercial Space Industry's Regulatory Environment

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." AST was created by the Commercial Space Launch Act of 1984, as amended and re-codified in 51 U.S. Code Chapter 509, and AST implements this statutory authority through regulations under Title 14 Code of Federal Regulation Parts 400 – 460.

The FAA rules specific to ELVs are a voluminous set of prescriptive and detailed regulations. FAA promulgated these ELV regulations almost 15 years ago by codifying United States Air Force (USAF) requirements governing launch vehicle operations at Federal Ranges.¹ FAA's ELV regulations and their corresponding USAF requirements impose great oversight on vehicle programs. For example, these requirements allow FAA and Range officials to define the design of flight safety systems, and then to review and approve every step of test and verification procedures that an operator executes on those systems. They also require that the regulating authority approve production procedures and observe the installation of certain safety-related components. They must review and approve design changes or changes to test or operations procedures. Such oversight is not appropriate for the cadence of operations today's commercial operators are trying to achieve. Furthermore, these regulations were created for expendable, vertical launch vehicles using a specific type of flight safety system that requires human activation from the ground. Recent commercial launch industry successes in reusability, autonomy, and alternative vehicle architectures necessitate reform of the current rules.

Nearly 20 years ago, the FAA developed a separate set of regulations for RLVs. These take a different approach to review and licensing, using system safety to evaluate the hazards posed by the vehicle and the mitigations undertaken by the operator to lessen those risks.² Instead of telling the operator how to design, test, manufacture, and operate a vehicle, the operator presents a comprehensive safety case founded upon the process of identifying and controlling hazards. This performance-based approach allows the operator to present their design and describe the methods used to control the risks posed by the design, in order to meet the required risk limits set by FAA. In short, the RLV regulations impose risk limits that an operator must meet, and the operator can choose any number of acceptable approaches to meet those limits. While the RLV regulations offer an alternative approach to review of a launch vehicle system, safety requirements are not compromised.

The FAA's RLV regulations are the more appropriate way to regulate a growing commercial space industry, as opposed to the ELV approach, which will not support the increasing cadence of launch activities. A prescriptive process cannot operate that fast, and therefore will act as a restraint to operations. Furthermore, FAA and the USAF do not and should not have the resources required to support the ELV process at the launch rates the industry is driving towards.

¹ FAA's Expendable Launch Vehicle Regulations are contained in 14 C.F.R. Parts 415 and 417. The USAF requirements for launch operations on a Federal Range is Air Force Space Command Manual 91-710 and Range Commanders Council commonality standards (*e.g.*, RCC-319).

² FAA's reentry vehicle regulations, found in 14 C.F.R. Part 435 are nearly identical to the RLV regulations.

Blue Origin currently operates our *New Shepard* vehicle, licensed by the FAA under the RLV regulations, from our private launch site in West Texas. FAA's RLV regulations allow FAA to focus on the aspects of the *New Shepard* vehicle design that pose risks to public safety, and to scrutinize Blue Origin's management of those risks. While there are outdated and inflexible aspects of FAA's RLV regulations that require updating, we view these regulations as the best general approach to regulatory oversight of launch vehicle programs.

The more difficult situation for Blue Origin comes with our development of the *New Glenn* orbital reusable launch vehicle, which we will operate from Cape Canaveral Air Force Station (CCAFS). *New Glenn* must be both licensed by FAA and authorized by the USAF for launches from CCAFS. As described above, FAA's RLV regulations differ significantly from the current USAF Range requirements for launch. This means RLV operators lose the benefit of the FAA's performance-based approach to regulating RLVs because we must meet the USAF's prescriptive requirements. This renders FAA's RLV regulations ineffectual for any reusable vehicle launching from a Federal Range.

Blue Origin fundamentally disagrees with the approach that FAA's ELV regulations and USAF requirements take to review and authorize a launch vehicle program. In recent regulatory reform efforts undertaken by industry members with FAA, we recommended using FAA's RLV regulations as a basis for developing a new modernized set of performance-based regulations. This would offer the flexibility to address novel or controversial technical issues within a launch license process while meeting the overall intent of legacy requirements and maintaining the same level of safety. It would also appropriately use FAA and USAF resources to apply an appropriate level of review to the increasing numbers of operators building programs at Federal Ranges and elsewhere.

More importantly, the National Space Council and the Administration in Space Policy Directive-2 (SPD-2) specifically direct the Secretary of Transportation to "replace prescriptive requirements in the commercial space flight launch and re-entry licensing process with performance-based criteria." Blue Origin's difficulty in pursuing an RLV launch license for *New Glenn* to operate at CCAFS has confirmed that this directive cannot be met without also addressing the prescriptive USAF Range requirements, or the entire effort will be done in vain.

Regulatory Reform Engagement & Recommendations

Both as a member of industry coalitions and on its own, Blue Origin has been an extremely active participant in regulatory reform efforts. As such, Blue Origin is particularly grateful for the increased awareness and action being brought to the topic by this Administration and the National Space Council.

Recently, Blue Origin and a host of operators participated in the FAA's Streamlining Launch and Reentry Regulations Aviation Rulemaking Committee (ARC), which was tasked with addressing the following:

1. How should the FAA modify its current launch and reentry licensing regulations?
2. What performance-based regulations are needed to streamline launch and reentry licensing?
3. What standards are needed to demonstrate compliance with recommended performance-based regulations for launch and reentry licensing?

As part of the ARC, Blue Origin and other operators coalesced around seven characteristics of new regulations that would solve significant difficulties with the current rules. Capturing these characteristics

in new rules will result in initial and recurring safety and economic benefits through increased flexibility, reduced paperwork burden, and an expansion of commercial activities. These characteristics are:

1. *Performance Based* – All commercial launch and reentry operators should be regulated using regulations that are performance based rather than mandatory, prescriptive, and overly burdensome technical solutions.
2. *Flexibility* – New architectures and technological advancements should not be stifled by the regulatory environment. A single license structure to accommodate a variety of vehicle types and operations and launch/reentry sites will reduce uncertainty and allow operators to better predict costs and optimize interactions with FAA. A licensing regime that enables operators to meet regulations without waivers will also increase efficiencies and reduce costs for operators and FAA.
3. *Reform Pre-Application Process and Requirements* – Criteria for entering application evaluation should be clearly defined and completion of a pre-application process should not be a requirement for application acceptance or determination of completeness. Additionally, the FAA should give consideration based on operator experience level and vehicle heritage.
4. *Defined Review Timelines* – Reduced application review timelines and improved processing of applications will support the launch cadence commercial operators are striving to achieve.
5. *Continuing accuracy requirements* – A licensee should only be required to submit updated information to FAA about a licensed vehicle program if a change to the vehicle design or operations impacts public safety.
6. *FAA Jurisdiction* – Oversight should be focused on activities that meet a predefined criteria for hazard to the public. Further, vehicle and site inspection criteria should be clearly set.
7. *Eliminate Duplicative Jurisdiction on Federal Ranges* – One of the most important aspects of any regulatory reform is the elimination of duplicative authorities for commercial operations at Federal Ranges. As explained above, FAA's ELV regulations codified preexisting USAF regulations. Additionally, FAA's RLV regulations are entirely different from FAA and USAF's ELV requirements. Subsequent oversight at Federal Ranges results in commercial ELV operators answering to two authorities – FAA and the USAF – who impose largely similar requirements, while RLV operators answer to two authorities imposing different requirements. The result is an onerous approval process for launch operators pursuing reusability that is based in ELV requirements. RLV regulations are rendered useless in these cases.

FAA AST, informed by the ARC, is now working on an accelerated timeline to produce a Notice of Proposed Rulemaking (NPRM) with one set of draft rules that contain licensing requirements for all launch and reentry vehicles by February 2019. Understanding that there are important procedural rules to adhere to during rulemaking, a path was not developed for industry to remain involved either through a negotiated rulemaking model or further interaction with the ARC industry members. The accelerated rulemaking timeline recommended by the National Space Council was intended to rapidly effect change in commercial space regulations to the benefit of both industry and FAA. Blue Origin believes that continued engagement between FAA and industry is critical during FAA's efforts to draft new rules for proposal next year. Without the practical insights of launch license applicants and operators, the NPRM may lead to protracted comment submissions and a consideration period lasting several years, and ultimately fail to achieve the desired reforms.

It is imperative that FAA not work in a vacuum to achieve the new performance-based set of regulations directed by the National Space Council and SPD-2. As described above, this result will not solve the issue of duplicative authorities for operations from Federal Ranges, and the vast majority of launch vehicles operate from Federal Ranges at this time. Without reform to the USAF's prescriptive requirements (which are the basis for FAA's prescriptive ELV regulations), operators at Federal Ranges will be required to continue meeting rules that may not offer consideration for their vehicle designs, without hope of negotiation or resolution within the launch license process. This is why SPD-2 specifically directed:

"The Secretary of Defense, the Secretary of Transportation, and the Administrator of the [NASA] shall coordinate to examine all existing U.S. Government requirements, standards, and policies associated with commercial space flight launch and reentry operations from Federal launch ranges and, as appropriate and consistent with applicable law, to minimize those requirements, except those necessary to protect public safety and national security, that would conflict with the efforts of the Secretary of Transportation in implementing the Secretary's responsibilities under this section."

Any improvement to FAA's regulations must be a coordinated effort with the USAF and Federal Ranges or there will be no net benefit to operators. The duplicative authority will remain and the Ranges will continue to impose their prescriptive, and outdated requirements. Disregarding the USAF in this effort will ultimately negate any progress made as a result of FAA regulatory reform efforts. The right solution to today's overbearing regulatory environment, and the solution that answers the direction of the National Space Council and the Administration, is establishment of DOT as the sole authority for commercial space launches, even from Federal Ranges, and that DOT implements that authority through a new set of performance based regulations.

Conclusion

The increasing cadence of launch operations and the rapid entry of varied reusable vehicle architectures into the mainstream launch market requires a serious reevaluation of the existing regulatory structure. Reform efforts must account for the unique performance characteristics and safety systems across these varied architectures and operations – whether a reusable first stage booster or a high altitude balloon. We are confident that safe operations can remain the paramount focus even with a new, modernized approach to regulating this industry.

The cumbersome ELV regulations that exist today as well as the duplicative authorities associated with operations from a Federal Range threaten commercial progress as existing operators increase their launch cadence and new companies begin operations with reusable vehicle architectures. In the near term, ensuring incorporation of the aforementioned seven characteristics of new regulations into the FAA's rulemaking would solve significant difficulties with the current rules. Further, active and ongoing engagement with the USAF as well as industry partners during the accelerated rulemaking process would increase transparency and benefit the ultimate NPRM.

The right solution to improving today's regulatory environment, and the solution that answers the direction of the National Space Council and the Administration, is reform of all regulations that apply to launch activities to a performance-based approach. Blue Origin is eager to continue working with the National Space Council, the FAA, the USAF, as well as other industry operators to ensure that new rules

and regulations promote safety above all, while also supporting the expansion of this new and varied set of commercial reusable systems.

Thank you again for the opportunity to speak with you today and for your attention to this important matter.