U.S. Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

June 29, 2017

The Honorable John Thune
Chairman, Committee on Commerce,
Science, and Transportation
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

As requested by Public Law 114-90, U.S. Commercial Space Launch Competitiveness Act (CSLCA), Section 105, the U.S. Department of Transportation (DOT) is pleased to provide the enclosed report. CSCLA Section 105 requires the DOT to submit a report on approaches for streamlining the licensing and permitting process of launch vehicles, reentry vehicles, or components of launch or reentry vehicles, to enable non-launch flight operations related to space transportation.

DOT's recommended streamlined approach to enabling non-launch flights of hybrid vehicles related to space transportation is to authorize their flight with a launch license or experimental permit. This approach would not remove any options or eligibilities that are currently available to an operator. Allowing non-launch flight operations to be conducted under a launch license or experimental permit would streamline the process by allowing a vehicle's full flight envelope to be flown under a single license or permit from DOT rather than requiring operations under two different regulatory regimes.

We have sent a similar letter to Chairman Smith, Senator Nelson, and Congresswoman Johnson.

If I could be of further assistance, please contact me or Chris Brown, Assistant Administrator for Government and Industry Affairs, at (202) 267-3277.

Sincerely,

Michael P. Huerta
Administrator

Enclosure

U.S. Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

June 29, 2017

The Honorable Bill Nelson
Ranking Member, Committee on Commerce,
Science, and Transportation
United States Senate
Washington, DC 20510

Dear Senator Nelson:

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We have sent a similar letter to Chairmen Thune and Smith and Congresswoman Johnson.

If I could be of further assistance, please contact me or Chris Brown, Assistant Administrator for Government and Industry Affairs, at (202) 267-3277.

Sincerely,

Michael P. Huerta
Administrator

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800 Independence Ave., S.W.
Washington, D.C. 20591

June 29, 2017

The Honorable Lamar Smith
Chairman, Committee on Science,
Space, and Technology
House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

As requested by Public Law 114-90, U.S. Commercial Space Launch Competitiveness Act (CSLCA), Section 105, the U.S. Department of Transportation (DOT) is pleased to provide the enclosed report. CSCLA Section 105 requires the DOT to submit a report on approaches for streamlining the licensing and permitting process of launch vehicles, reentry vehicles, or components of launch or reentry vehicles, to enable non-launch flight operations related to space transportation.

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We have sent a similar letter to Chairman Thune, Senator Nelson, and Congresswoman Johnson.

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Michael P. Huerta
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800 Independence Ave., S.W.
Washington, D.C. 20591

June 29, 2017

The Honorable Eddie Bernice Johnson
Ranking Member, Committee on Science,
Space, and Technology
House of Representatives
Washington, DC 20515

Dear Representative Johnson:

As requested by Public Law 114-90, U.S. Commercial Space Launch Competitiveness Act (CSLCA), Section 105, the U.S. Department of Transportation (DOT) is pleased to provide the enclosed report. CSCLA Section 105 requires the DOT to submit a report on approaches for streamlining the licensing and permitting process of launch vehicles, reentry vehicles, or components of launch or reentry vehicles, to enable non-launch flight operations related to space transportation.

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We have sent a similar letter to Chairmen Thune and Smith and Senator Nelson.

If I could be of further assistance, please contact me or Chris Brown, Assistant Administrator for Government and Industry Affairs, at (202) 267-3277.

Sincerely,

Michael P. Huerta
Administrator

Enclosure

FEDERAL AVIATION ADMINISTRATION

Report to Congress:

DOT/FAA Approach to Enabling Non-Launch Flight Operations of Space Support Vehicles Related to Commercial Space Transportation

U.S. Commercial Space Launch Competitiveness Act (CSLCA) (Public Law 114-90) Section 105

Contents

1. Executive Summary

On November 25, 2015, the President signed into law the Commercial Space Launch Competitiveness Act (CSLCA). In addition to amending Title 51 of the United States Code ("Title 51"), the Act requires the Secretary of Transportation to prepare reports on emerging commercial space challenges. This report is intended to fulfill the requirement in Section 105 of the CSLCA, which requires the Secretary of Transportation to "prepare a report on approaches for streamlining the licensing and permitting process of launch vehicles, reentry vehicles, or components of launch or reentry vehicles, to enable non-launch flight operations related to space transportation." The report focuses on approaches the Department of Transportation (DOT) Federal Aviation Administration (FAA) considered, pursuant to Congressional direction, "to improve efficiency, reduce unnecessary costs, resolve inconsistencies, remove duplication, and minimize unwarranted constraints."

The DOT/FAA's recommended approach to enabling non-launch non-reentry flights of hybrid vehicles related to space transportation is to consider allowing an operator to obtain a license or permit for non-launch non-reentry flights in the air of a launch vehicle, reentry vehicle, or component of a launch or reentry vehicle. Operations carrying persons or property for compensation or hire under a license could be limited to flights that take off from and land at the same location, except if there is an emergency situation. Prior to an operator holding a launch or reentry license, an operator could be allowed to obtain an experimental permit for developmental space support flights that would not involve compensation or hire. The permit may authorize flight of a vehicle in development to be a launch vehicle, reentry vehicle, or component of a launch or reentry vehicle.

For non-launch non-reentry flights to be authorized under a single regulatory regime, a legislative change may be required. This approach could be crafted in a way that would not remove any options or eligibilities that are currently available to an operator to apply for a special airworthiness certificate under Federal Aviation Regulations promulgated under Title 49, United States Code. A single regulatory approach could provide hybrid vehicle operators with flexibility and streamlining for non-launch non-reentry flight activities and could be structured in a way could allow operators to obtain a flight authorization from a single permitting authority. Allowing non-launch non-reentry flight operations of hybrid vehicles could streamline the process by allowing a licensed or permitted vehicle's full flight envelope, including research and development flights and operational flights, to be flown under a single regulatory regime.

It is important to note that the CSLCA requires two reports involving space support vehicles. Section 116 of the CSLCA requires the Comptroller General to submit a report to Congress on the use of space support vehicle services, where the aircraft may not be launch or reentry

vehicles or components thereof, in the commercial space industry. The Section 116 report will address the extent to which launch providers rely on such services as part of their business models, as well as the statutory, regulatory, and market barriers to the use of such services, and provide recommendations for legislative or regulatory action that may be needed to ensure reduced barriers to the use of such services if such use is a requirement of the industry.

DOT has considered what would be necessary to allow a license or experimental permit to be issued for space support vehicle flight. It would be important to define space support flight and space support vehicle in a way that ensures it includes non-launch flights of launch vehicles, reentry vehicles, or a component of a launch or reentry vehicle as well as vehicles in development to become a launch vehicle, reentry vehicle, or component of a launch or reentry vehicle.

2. Background

On November 25, 2015, the President signed into law the.Commercial Space Launch Competitiveness Act (CSLCA). In addition to amending Title 51 of the United States Code, the Act requires the Secretary of Transportation to prepare reports on emerging commercial space challenges. This report is intended to fulfill the requirement in Section 105 of the CSLCA, which requires the Secretary of Transportation to "prepare a report on approaches for streamlining the licensing and permitting process of launch vehicles, reentry vehicles, or components of launch or reentry vehicles, to enable non-launch flight operations related to space transportation." The report focuses on approaches the DOT/FAA considered, pursuant to Congressional direction, "to improve efficiency, reduce unnecessary costs, resolve inconsistencies, remove duplication, and minimize unwarranted constraints."

3. Description of non-launch non-reentry flight operations of hybrid vehicles

Informally, the FAA uses the term hybrid vehicle to mean a launch or reentry vehicle that may also be used for non-launch non-reentry operations. Congressional Report 108-429 notes that, "Hybrid vehicles are vehicles that have some of the characteristics of aircraft and some of the characteristics of launch vehicles." An example of a hybrid vehicle is the XCOR Aerospace Lynx vehicle. The Lynx will be rocket powered for every flight, but because of the definition of suborbital rocket, some of its missions would not be considered launches. By statutory definition under 51 U.S.C. § 50902, suborbital rocket means a vehicle, rocket-propelled in whole or in part,

intended for flight on a suborbital trajectory, and the thrust of which is greater than its lift for the majority of the rocket-powered portion of its ascent. Accordingly, the operations of a vehicle such as the Lynx will not always meet the definition of launch because when it is operated in a lower thrust configuration, it will not exceed lift for the majority of the rocket-powered portion of its ascent.

The FAA has also been using the term hybrid launch system to mean a launch vehicle, including a suborbital rocket, that may be comprised of two or more components, at least one of which is an aircraft and can operate as an aircraft when not engaged in launch. Examples of carrier aircraft that are part of a launch system include Orbital ATK's Stargazer L-1011 carrying aloft a Pegasus rocket; Virgin Galactic's White Knight Two carrier aircraft carrying SpaceShipTwo; Stratolaunch's Roc carrier aircraft carrying an expendable launch vehicle; and Virgin Galactic's 747 carrier aircraft carrying the LauncherOne expendable launch vehicle. Many operators that use a carrier aircraft plan to conduct non-launch operations with the carrier aircraft when it is not launching a rocket. Non-launch operations of space support vehicles that are components of a hybrid launch system would typically use either purpose built aircraft or aircraft that previously held a type certificate issued under the chapter 447 of title 49, United States Code. Orbital ATK's L-1011 is one such aircraft. Non-launch operations related to commercial space transportation may include return-to-service flights after maintenance, repositioning flights, crew proficiency flights, space flight participant training, payload testing flights, research and development flights, and other related activities. Hybrid launch systems may come in a different variety as well, and consist of launch vehicles that may be operated as aircraft. XCOR's proposed Lynx is an example of such a dual-purpose vehicle. Non-launch operations of both types of hybrids may include limited thrust or unpowered developmental testing of the vehicle, including glide flights and propellant cold flow flight tests.

4. How FAA utilizes the current statutory and regulatory regimes for non-launch operations

Current statutory authority requires an operator to seek, from FAA's Office of Aviation Safety (AVS), certification of the aircraft component of a launch system for non-launch flight operations under Title 49. Aircraft manufacturers must obtain airworthiness certificates, type certificates, and production certificates. Operating rules designed for aircraft, and airmen certification requirements designed for pilots also apply. The FAA's current approach for new operators is for FAA's Office of Commercial Space Transportation (AST) to manage the overall program with the operator if the goal of the new program is a commercial space activity. The FAA holds regular joint AST/AVS telecon meetings and quarterly in person meetings with

hybrid operators. For hybrid vehicles and aircraft that are components of hybrid launch systems supporting commercial space activities, AVS invites AST participation in airworthiness inspections and meetings and the development of appropriate operating limitations.

Currently, during non-launch flights, operators are required to follow aviation laws and regulations when operating a launch vehicle. When the same vehicle or system meets the definition of a suborbital rocket (its thrust is greater than lift for the majority of the rocket powered portion of its ascent), the operation must be conducted under Title 51.

5. Approaches to improve the process to enable non-launch non-reentry operations related to space transportation.

A possible approach to streamlining the process to enable non-launch non-reentry flight operations related to space transportation could be for a launch operator to be eligible for a single authorization for the launch vehicle, reentry vehicle, or component that allows both launch and non-launch non-reentry flights.

Hybrid vehicle operators are currently burdened with the requirement to operate under two different regulatory regimes. Allowing a hybrid vehicle operator the option to obtain a license or permit under a single regulatory regime for its non-launch non-reentry flight operations would reduce regulatory costs for commercial space operators. For example, pilot training and operation rules are quite different between 14 CFR parts 61 and 91 and part 460. Training and currency under parts 61and 91 are very prescriptive while part 460 is more tailored to the specific operation and controlled by company-specific manuals submitted to the FAA. Commercial space companies have indicated that there would be great benefits to having a regime where pilot training and currency is more tailored to the specific company and operation. In addition to the part 460 requirements, hybrid operators currently must also keep up with AVS required training and recent flight experience requirements in order to keep open the option for any future non-launch non-reentry operations. Another example is that for hybrid vehicles that have an unpowered phase of flight, AVS requires a separate commercial glider rating with 3 takeoffs and landings every 90 days to carry passengers. This requirement adds more required ratings and currency than seems practical for a purpose-built commercial space launch system, particularly when many of the concepts will never actually perform a "takeoff" as envisioned by the glider regime.

For responsible safety oversight, AST currently reviews flights conducted under Title 49 before AST authorizes additional launches. Similarly, if a commercial space operator performs a non-launch flight after a launch, AVS needs to understand the impact of the high g-load and heating

from spaceflight before authorizing flight under Title 49. This causes duplicative work within the FAA that could be minimized by allowing both launch and non-launch flight operations to be conducted under a single regulatory regime.

Commercial space vehicles are typically purpose built, and any follow on vehicles will not be identical because they will be modified to evolve the design for continuous improvement. Unlike certified aircraft, these vehicles will not maintain a static design and do not lend themselves to a certification regime. Certification entails meeting mature design and manufacturing standards that have evolved from an experienced industry. The cost and effort to comply with a certification regime is viewed by the commercial space transportation industry as burdensome or prohibitive. If a component of a launch system were required to meet all aircraft certification design requirements and constraints for the entirety of its lifecycle, in many cases it would be too heavy to fulfill mission requirements. Space flight is inherently risky, and launch vehicles typically have much smaller design and safety margins in order to have the performance to make it to space.

Authorizing a single entity to license non-launch non-reentry operations related to space transportation would minimize constraints imposed by the aviation regime by allowing licensed space support flights to carry persons and payloads for compensation. AVS rules do not allow compensation or hire for space flight participant training in experimentally certificated aircraft without an exemption based on, among other things, that the grant of an exemption would not adversely affect safety, or that the grant of exemption provides a level of safety at least equal to that provided by the rule exempted. The effect this has had on hybrid operators is to increase the cost for additional ground training and decrease the effectiveness of training, which may result in higher risk during launch. Enabling a single entity to issue experimental permits for developmental non-launch non-reentry operations would be similar to aviation regulation because experimental permits do not allow flights for compensation or hire and would therefore not allow a company to operate for compensation during the developmental phase.

If a single regulatory regime were adopted, it would be necessary to continue to incorporate by reference applicable sections of aviation requirements for hybrid launch operations and piloted vehicles by including them in license or permit terms and conditions. It would also be necessary to review and seek input from industry on its licensing expected casualty risk requirements because they have proven to be challenging to apply to hybrid and piloted vehicles. In order to avoid over burdening hybrid operators with launch regulation for airplane-like operations of a space support vehicle, a regime would need to be developed for space support vehicles modeled after the experimental aircraft regulations, but which would be much more applicable to space support flight operations.

Currently, hybrid operators face the challenge of needing local AVS inspectors to be familiar with a rather unique set of vehicles in order to properly evaluate their operations. While that arrangement works at the sites where the vehicles are being developed, it is difficult for operators to plan for the business risks of other locations. Relying on a single dedicated oversight entity would remove duplication and ensure consistency for operations at spaceports across the country and around the world.

6. Existing private and government infrastructure

The commercial space sector has the option of taking advantage of private or Federal Government infrastructure during the design and development process, or during licensed or permitted activities. Companies often utilize government infrastructure to perform testing as well as other activities, culminating in the launch. For example, commercial space companies have successfully negotiated the use of government infrastructure such as launch pads, control rooms, runways, and wind tunnels. NASA and DOD use a variety of agreements to allow commercial utilization of facilities, infrastructure, and services. Licensing regulations do not require that these agreements be submitted to the FAA, but additional information may be available from NASA and DOD.

7. Conclusion

The option of having a single statutory regime and regulatory office oversee a demonstrated commercial space program throughout its operational lifecycle would allow consistent application of regulatory philosophy and safety oversight and be more efficient and cost effective for the launch operator as well as the licensing agency. For an evolving industry, a regulatory environment that can adjust to accommodate changes would allow for more flexible and more responsive oversight.

Any proposal to authorize a license or experimental permit to be issued for space support vehicle flight would need to consider all related factors. It would be important to define space support flight and space support vehicle in a way that ensures it includes non-launch flights of launch vehicles, reentry vehicles, or a component of a launch or reentry vehicle as well as vehicles in development to become a launch vehicle, reentry vehicle, or component of a launch or reentry vehicle. We would be pleased to work with Congress on any proposal it may have to streamline the licensing and permitting process for flight operations related to space transportation.