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IN FOCUS

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Commercial Human Spaceflight Safety Regulations

The Department of Transportation (DOT), acting through the Federal Aviation Administration (FAA), has regulatory authority over commercial space launch and reentry, including for spacecraft with human occupants. The FAA's authority allows the agency to regulate the safety of human occupants, but a statutory moratorium—or learning period—limits the agency's ability to do so until January 1, 2024. This In Focus identifies considerations for Congress as the end of the statutory learning period approaches.

Currently, private companies hope to create a market for commercial human spaceflight. In addition to contracts with NASA to support federal missions, companies such as SpaceX and Virgin Galactic plan to transport private citizens into space. Other companies such as Axiom Space and Blue Origin are developing orbital platforms with the intent to host both government astronauts and tourists in space. Virgin Galactic and Blue Origin have carried tourists on suborbital commercial launches, and SpaceX has launched both government astronauts and space tourists to the International Space Station.

No commercial spaceflight mission has yet resulted in a fatality of a tourist or government astronaut. However, an atmospheric test flight of a crewed commercial spacecraft in 2014 resulted in the death of one pilot and injuries to another. Several uncrewed commercial launches have failed in the past decade. Given the potential risks, oversight for these missions may be an area of congressional concern.

Legislative Background

The Commercial Space Launch Amendments Act of 2004 (P.L. 108-492) gave DOT the authority to regulate the launch and re-entry of commercial spacecraft, including those carrying humans. The FAA has authority to impose licensing requirements on commercial launches carrying human in order to protects those occupants. The authority is implemented by the FAA Office of Commercial Space Transportation (AST). Operations on orbit, following launch and prior to reentry, are not under FAA jurisdiction. The Commercial Space Launch Amendments Act of 2004 set a statutory moratorium of eight years before the FAA could promulgate commercial human spaceflight regulations, beyond its statuary authorities under 51 U.S.C. §50905(c) and 14 C.F.R. §460. The moratorium was intended to allow the nascent commercial spaceflight industry to develop without potential regulatory burdens.

51 U.S.C. §50905(c) allows FAA regulation of commercial operators when restricting or prohibiting design features or operating practices that have resulted in serious or fatal injury or contributed to an event posing a high risk of serious or fatal injury. The FAA is also able to impose requirements on spacecraft crew in support of the agency's mission to protect public safety under 14 C.F.R. §460, as crew is considered by the agency to be part of the flight safety system. As such, the FAA has created requirements that focus on crew qualifications, medical screening, life support, and similar basic safety elements. Additionally, under 14 C.F.R §460.41-460.53 the FAA requires licensees to inform all human occupants of commercial spacecraft, in writing, of potential risks.

The FAA Modernization and Reform of 2012 (P.L. 112-95) extended the learning period to October 1, 2015; the Commercial Space Launch Competitiveness Act (CSLCA) of 2015 (P.L. 114-90) extended it to October 1, 2023; and the Continuing Appropriations Act, 2024 and Other Extensions Act (P.L. 118-15) extended it most recently to January 1, 2024. On September 21, 2023, Representative Kevin McCarthy (R-CA-20) introduced the Space Transformation And Reliability (STAR) Act (H.R. 5617) that would extend the learning period to October 1, 2031.

The 2015 CSLCA directed the FAA and its Commercial Space Transportation Advisory Committee (COMSTAC) to facilitate the development of voluntary industry consensus safety standards and a safety framework that may include regulation. It also directed FAA, in consultation with COMSTAC, to report on (1) the commercial space industry's progress toward developing the aforementioned standards and framework, (2) metrics that could indicate the readiness of industry and the FAA to transition to the new framework, and (3) a transition plan.

The FAA was also directed to provide updates on progress every thirty months and to provide two separate reports on a new safety framework and transition plan in both 2018 and 2022. The FAA was instructed by the 2015 CSLCA to take into consideration industry standards identified within these reports when developing regulations after the expiration of the learning period. The CSLCA also required the FAA to provide Congress with an independent assessment of industry progress towards developing and adopting voluntary consensus standards, industry and FAA readiness to transition to a new safety framework, and whether further standards development or regulation would be appropriate.

In 2017, the FAA delivered a report to Congress that identified possible safety framework features, including standards, a voluntary reporting system, and compliance mechanisms; detailed industry progress towards voluntary consensus standards development and adoption; and identified several "readiness indicators" that could be used to assess whether industry and FAA readiness to transition to a new safety framework.

The FAA contracted with the RAND Corporation to conduct the independent assessment required by P.L. 114-90. In its 2023 report, RAND noted that the commercial spaceflight industry, working with standards development organizations, had made some progress toward standards development, although "the consensus is that significant work remains to be done." RAND concluded that the learning period should be allowed to expire; the development of voluntary consensus standards should continue; and the FAA should establish an Aerospace Rulemaking Committee to solicit industry input. In April 2023, the FAA created the Human Space Flight Occupant Safety Aerospace Rulemaking Committee.

The FAA submitted its most recent report to Congress in September 2023, which stated that it "believes both the industry and the agency are ready to develop and transition to a new safety framework." It also reported that the FAA had tasked the Human Space Flight Occupant Safety Aerospace Rulemaking Committee with creating recommendations to guide agency development of an initial set of rules after expiration of the learning period.

Considerations for Congress

As the expiration of the learning period approaches, Congress may decide whether to extend the learning period again or allow it to lapse. There are several considerations that may inform this decision.

Is the commercial human spaceflight industry ready for regulation? Some stakeholders question whether the FAA is adequately informed to develop regulations and whether industry has the expertise to develop voluntary standards or ability to respond to draft regulations. In its comments on the FAA's 2023 draft report to Congress, COMSTAC asserted that the commercial human spaceflight operators within its membership "unanimously agree that the learning period is crucial." Although the FAA has described several potential readiness indicators for industry in its reports to Congress—such as size of the industry and purpose of people visiting space—it has acknowledged that these indicators do not have "specific and measurable metrics associated." As such, it may be challenging to concretely assess industry readiness.

Should the moratorium end, how quickly might regulations take effect? The FAA indicated in its 2023 report to Congress that it will begin the process of developing performance-based rules upon expiration of the learning period. The FAA tasked the Human Space Flight Occupant Safety Aerospace Rulemaking Committee with developing recommendations by October 2024. The FAA anticipates final rules to come into effect around April 2028. This rulemaking would be subject to the Administrative Procedure Act (APA) (P.L. 79-404). The APA sets forth a structured process by which regulations can be promulgated, with opportunities for stakeholder input. In addition, regulations may be subject to congressional review before they can take effect.

How would industry input and voluntary consensus standards be used in potential regulation? The FAA has a statutory mandate to "take into consideration the evolving standards of the commercial space flight industry" (51 U.S.C. §50905(c)(9)). The FAA's Human Space Flight Occupant Safety Aerospace Rulemaking Committee would allow industry an opportunity to "provide information, concerns, opinions, and recommendations" to the FAA, per the committee's charter. FAA has a dual mandate to both regulate and promote the commercial spaceflight industry (51 U.S.C. §50903(b)). This mandate would likely serve as an incentive for the agency to carefully consider any regulation's potential impact on industry, but could create challenges in striking an appropriate balance between safety and progress.

What impact would benefit-cost analysis have? The FAA would be required to conduct a benefit-cost analysis of and proposed regulation of human spaceflight, per OMB Circular A-4 and Executive Order 12866. Some stakeholders have argued that such analyses could enable them to understand the appropriateness of particular proposed regulations and might be preferable to an assessment of industry readiness in the absence of measurable metrics to do so.

What is the status of the commercial spaceflight industry's efforts to develop voluntary consensus industry standards, with FAA participation? Proponents of extending the learning period argue that regulation should follow the creation of voluntary consensus industry standards, as they will inform future regulations. In its 2023 report to Congress, the FAA describes industry progress towards voluntary consensus standards as "not as advanced as expected." In 2023, the RAND Corporation found in a congressionally mandated report (P.L. 114-90) that industry has not yet adopted voluntary consensus standards. Critics point to a perceived lack of progress despite the moratorium's extensions in 2012 and 2015, arguing that expiration of the learning period would encourage the FAA and industry to prioritize and devote resources to developing voluntary consensus standards.

Is the FAA adequately resourced to begin preparing for regulations? In comments on the FAA's 2023 draft report to Congress, COMSTAC noted that the agency may be unable to sufficiently regulate commercial human spaceflight with its existing resources, both in terms of funding and personnel. COMSTAC pointed to the agency's backlog of launch and reentry licensing applications, stating that additional mandates or rulemaking activities could negatively impact the FAA's ability to manage their other statutory duties.

Could a high-profile accident spur regulation, regardless of an extension to the moratorium? Even during the learning period, FAA is permitted to issue regulations in response to a serious or fatal accident specific to the health and safety of occupants. Such an accident could generate external pressure, on both Congress and the FAA, to quickly create a regulatory regime, regardless of the readiness of the FAA or industry. Some stakeholders argue that regulations that are methodically implemented with stakeholder buy-in would be preferable to ones quickly implemented as a reaction to an accident.

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