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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 it to regulate the safety of human occupants, but a statutory moratorium—or learning period—limits its ability to do so until January 1, 2025. 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 the National Aeronautics and Space Administration (NASA) to support federal missions, companies such as SpaceX plan to transport private citizens into space. Other companies such as Axiom Space 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 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 continued 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 reentry of commercial spacecraft, including those carrying humans, after the learning period noted above. The FAA has authority to impose licensing requirements after the learning period on commercial launches expires in order to protect human occupants of spacecraft. The authority is implemented by the FAA Office of Commercial Space Transportation (AST). Operations in orbit, following launch and prior to reentry, are not under FAA jurisdiction. For launch and reentry regulations, the Commercial Space Launch Amendments Act of 2004 set a statutory moratorium of eight years (the learning period) before the FAA could promulgate commercial human spaceflight regulations, beyond its statutory authorities described below under 51 U.S.C. §50905(c) and 14 C.F.R. §460. The learning period moratorium was intended to allow the nascent commercial spaceflight industry to develop without potential regulatory burdens.

FAA regulatory authority under 51 U.S.C. §50905(c) is not subject to the learning period moratorium. This authority 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 can also impose requirements on spacecraft crew in support of the agency's mission to protect public safety under 14 C.F.R. §460, as the FAA considers crew to be part of the flight safety system. To that end, 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 learning period has been extended several times, most recently until January 1, 2025, by the FAA Reauthorization Act of 2024 (P.L. 118-63). Two bills in the 118th Congress—H.R. 5617 and H.R. 6131—would extend the learning period to October 1, 2031.

The 2015 U.S. Commercial Space Launch Competitiveness Act (CSLCA; P.L. 114-90) 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 the FAA to provide updates on progress every 30 months and to deliver two separate reports on a new safety framework and transition plan in 2018 and 2022, respectively. The FAA was instructed to consider industry standards identified within these reports when developing regulations after the expiration of the learning period. The FAA, in consultation with COMSTAC, was also required to provide a report (1) addressing the commercial space industry's progress toward developing and adopting the aforementioned standards and framework, (2) identifying metrics that could indicate the readiness of industry and the FAA to transition to the new framework, (3) discussing whether further standards development or regulation would be appropriate, and (4) outlining a transition plan.

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 toward the development and adoption of voluntary consensus standards; and identified several indicators that could be used to assess 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 developing industry standards, 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. Several considerations 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, it has acknowledged that “these indicators [do] not have specific and measurable metrics associated.”

If the moratorium ends, how quickly might regulations take effect? The FAA indicated in its 2023 report to Congress that it will begin 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 will allow industry an opportunity to “provide information,

concerns, opinions, and recommendations” to the FAA, per the committee’s charter. The FAA has a dual mandate to both regulate and promote the commercial spaceflight industry (51 U.S.C. §50903(b)). This mandate would encourage the agency to carefully consider any regulation’s potential impact on industry but could create challenges to 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 any proposed regulation of human spaceflight, per Office of Management and Budget 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.

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 toward voluntary consensus standards as “not as advanced as expected.” In 2023, the RAND Corporation noted 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.

Does the FAA have adequate resources to begin preparing for regulations? In comments on the FAA’s 2023 draft report to Congress, COMSTAC said 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 its other statutory duties.

Could a high-profile accident spur regulation, regardless of an extension to the moratorium? Even during the learning period, the 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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