

Should Congress Extend the Moratorium on Regulating Human Spaceflight?

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Research in Focus

Since 2004, a congressional moratorium has prevented the Federal Aviation Administration (FAA) from regulating to protect people on board commercial launch and reentry vehicles. Now that the moratorium is on the verge of expiration, there are several considerations federal policymakers should take into account. First, it is necessary to know the difference between public safety and human spaceflight safety. Next, with one possible exception, the FAA's regulatory requirements already protect people on board launch and reentry vehicles. Typically, commenters tee up the discussion as if such regulations did not exist now. They do. Third, Congress has not given the FAA the job of protecting people on orbit, only on launch and reentry. The moratorium's expiration would not grant the FAA any new authority. Lastly, and most importantly, the industry does not meet the FAA's own criteria for reaching the point where the industry requires regulation. Accordingly, a significant overhaul of the regulatory framework is not necessary, and the moratorium should be extended.

Background

Over the past few years, the commercial human spaceflight industry has launched crew members, government astronauts, and spaceflight participants to the edge of space and into orbit. (Congress dubbed passengers "spaceflight participants" to underscore the reality that they were participating in the risk.¹) Under FAA license,² Blue Origin and Virgin Galactic have taken people on suborbital trajectories. SpaceX has flown government astronauts, its own crew, and spaceflight participants to the orbiting International Space Station. We will likely see the launch cadence of these two companies pick up, and new entrants may also enter the market.

Congress passed the Commercial Space Launch Act in 1984, assigning to the Secretary of Transportation the job of addressing the safety of commercial launches.³ Since then, Congress has given the Secretary, and now, through delegations, the FAA, authority over reentry as well.⁴ The FAA historically regulated cargo-carrying expendable launch vehicles (ELVs), which do not carry crew or passengers. As the name suggests, expendable launch vehicles expend or jettison the stages necessary to get there

along the way, often in an ocean. (SpaceX's fly-back boosters are moving away from this approach and leading to more reusability.)

The FAA's safety role was initially confined to protecting the public—namely, people who are not involved in a given launch or reentry—from the hazards posed by these ELVs. Because the vehicle's stages are full of propellant with a high explosive yield, the FAA's regulations require that a launch operator or a federal range have the capability to destroy the vehicle in the event of an anomaly so the launch vehicle does not reach a populated area like a city. The operator drops the rocket's empty stages in the ocean. The FAA's regulations require that the areas below be clear of aircraft and shipping, just as it requires such clearances at launch and reentry. The FAA's regulations for protecting the public address the design, operation, and testing of a vehicle's flight-termination system, acceptable levels of risk, and vehicle hazards, including debris, toxic releases, and overpressure.

In 2004, Congress made it clear that the FAA does indeed have authority to protect people on board the launches and reentries the agency licenses.⁵ Congress, however, issued as a caveat what the FAA calls a "moratorium" on issuing regulations to protect persons on board,⁶ initially for eight years and now until October 1, 2023. The law and the commercial human spaceflight industry call it a "learning period," much like the one the aviation industry had at the turn of the last century before the creation of the FAA in the 1950s.

With the advent of people on board space vehicles, destroying a commercial rocket becomes a less attractive means of ensuring safety. The FAA must still protect the uninvolved public, but the industry now looks to new safety approaches centering on the protection of those on board.

Finally, in 2015, Congress told the FAA to prepare a report "specifying key industry metrics that might indicate readiness of the commercial space sector and the Department of Transportation to transition to a safety framework that may include regulations . . . that considers spaceflight participant, govern-

ment astronaut, and crew safety.”⁷ As I discuss later, the FAA found that the industry is not yet ready for regulation.

Current Regulations

The moratorium does not affect public safety

Under current law, Congress has directed the FAA to authorize and regulate the launch and reentry of launch and reentry vehicles to protect, among other things, the safety of the public. In other words, the moratorium Congress placed on the FAA does not apply to the FAA’s role in protecting uninvolved people, whether on the ground, in flight, or at sea.

The FAA’s authority on orbit and elsewhere in outer space

Even as it granted the FAA regulatory authority over the reentry of reentry vehicles in the late 1990s, Congress made it clear that the FAA does not have authority over in-space activities. This means, for example, that when the FAA licenses SpaceX’s launches to orbit and its reentries from orbit, the FAA does not license SpaceX’s activities on orbit. The moratorium’s expiration in 2023 would not grant the FAA authority over orbital activities.

The moratorium does apply to human spaceflight safety

When Congress passed the 2004 amendments to the Commercial Space Launch Act and clarified that the FAA has authority to protect a vehicle’s occupants, Congress told the FAA to wait before issuing regulations to that effect. Initially, Congress set the moratorium to expire after eight years, but it has extended the deadline twice since. It is currently set to expire on October 1, 2023, less than a year from now.

The congressional decision to impose a moratorium on human spaceflight regulation arose out of the industry’s concerns that it needed to have a learning period akin to that in the early days of aviation. Aviation saw several decades of experimentation and flight before the FAA began regulating it. The commercial space sector wanted the same before it would be required to contend with regulatory drag. As noted in the FAA’s cost-benefit analysis of its rules, industry foresaw over 10,000 launches in the eight years following passage of the 2004 amendments. Such a launch cadence would have allowed sufficient activity to determine which designs worked well and which did not. Those 10,000 launches did not take place, leading to the moratorium’s extensions. To date, there have been fewer than a dozen FAA-licensed launches with people on board.⁸

How the Moratorium Works

During the moratorium, the FAA may issue regulations governing the design or operation of a vehicle to protect the health and safety of crew, government astronauts, and spaceflight participants under certain conditions: until 2023, the FAA may issue regulations only to address design features or operating practices that resulted in death, a serious injury, or an event that posed a high risk of causing death or serious injury.⁹

Even so, and contrary to what we are seeing in the press, current FAA regulations do protect people on board. Specifically, the FAA’s regulations protect crew members.¹⁰ Despite the moratorium, it is legal for the FAA to do this because the crew are part of a vehicle’s flight-safety system, which is what protects the uninvolved public from the numerous hazards posed by rockets.

Flight crew are positioned to respond to risk to the public on the ground—for example, by aborting the flight or maneuvering the vehicle away from populated areas in the event of an anomaly. Thus, in order to carry out its mandate to protect the public—a role the moratorium does not affect—the FAA imposed regulations to protect the flight crew.

The regulations address a number of areas that ensure the flight crew is able to do its job. The FAA has training and qualification requirements for the pilot and any remote operator as well as medical requirements for crew with a critical safety role.¹¹ The FAA’s environmental-control and life-support regulations require an operator of a launch or reentry vehicle with crew on board to “provide atmospheric conditions adequate to sustain life and consciousness for all inhabited areas within a vehicle.”¹² The regulations require both monitoring and control of atmospheric conditions such as atmospheric composition—including oxygen and carbon dioxide, pressure, temperature, contaminants, ventilation, and circulation.¹³ The FAA’s regulations address smoke detection and fire suppression.¹⁴ They apply to human factors.¹⁵ The FAA’s verification program requires an operator to “successfully verify the integrated performance of a vehicle’s hardware and any software in an operational flight environment before allowing any spaceflight participant on board during a flight.”¹⁶ Verification must include flight testing.¹⁷

Despite the moratorium’s prohibition on protecting vehicle occupants for their own safety, the fact of the matter is that the FAA’s legitimate protection of the flight crew also protects other persons on board, such as any spaceflight participants. The requirement for life-sustaining atmospheric conditions for all of a vehicle’s inhabited areas, for example, may be allowed under the moratorium for the protection of the flight crew, but an operator must account for the presence of any spaceflight participants in order to ensure the crew has a life-sustaining atmosphere. In other words, not only is the commercial space industry not taking people to space in a vacuum, but the FAA currently has in place a number of measures that effectively protect all vehicle occupants.

Arguably, one exception to this safety regime exists. If a fully autonomous vehicle with no crew on board takes spaceflight participants to space, certain of the FAA’s regulations may not apply under the statute. Ignoring the issues those regulations address, however, would likely serve as a poor business model.

FAA Metrics for Determining Whether Regulation of the Human Spaceflight Industry Is Necessary

In 2017, in response to congressional direction, the FAA prepared a report on “key industry metrics that might indicate the readiness of the commercial space sector and the agency to transition to a safety framework that includes regulations.”¹⁸ Although couched in opaque terms of “regulatory readiness,” a clearer characterization could be that Congress directed the FAA to come up with criteria for determining when it and the industry needed regulation.

The FAA recommended three areas for assessing industry “readiness”: the purpose of space travel, the size and complexity of the industry, and the industry’s safety record. The first and third metrics are of interest here. The FAA expects “the public’s expecta-

tion of safety to increase as the purpose of flying to space evolves from adventure, to occupation, to transportation.”¹⁹ Safety may require regulation if, for example, there is evidence of unsafe operations, if industry has trouble attracting new customers, and if insurance companies are unwilling to insure spaceflight participants. The report noted that the FAA’s own readiness to regulate depends on whether it has authority from Congress and whether it has the necessary expertise in human spaceflight safety.

In 2019, in response to congressional direction²⁰ and noting the paucity of commercial activity, the FAA assessed its readiness indicators and concluded that “there are no commercial human spaceflight activities that are ready for a new safety framework that may include regulatory action.”²¹ Since then, fewer than a dozen tourist launches have taken place under FAA license.²²

The Path Forward

In the coming year, Congress will again have to revisit the question whether to renew the moratorium, thus allowing industry’s learning period to continue, or let it expire and subject the industry to additional regulation.

This raises a question. Is additional regulation necessary? The FAA already has human spaceflight regulations in place. Although they are designed only for the crew to ensure public safety, as a practical matter they apply to the safety of all occupants. There thus appears to be no crisis or emergency calling for wholesale regulation. Even when a Blue Origin rocket carrying cargo aborted after launch, the emergency systems performed as designed,²³ boding well if such an emergency were to occur with people on board.

The next item to consider is whether the FAA’s key metrics have been met. The FAA tied industry readiness in part to the purpose of space travel. Space travel is still an adventure for most participants. Even counting flight crew and government astronauts, the industry is not seeing thousands of persons heading to space for work yet, and we have not come close to the 10,000 launches predicted back in 2004. As of 2019, the FAA considered the industry decades away from using suborbital flight for transportation. Tellingly, the agency found no commercial space activities that required regulation in 2019, and circumstances have not changed noticeably since then. These factors suggest that the moratorium should be extended until significantly more human spaceflight activity takes place and its purposes evolve substantially beyond adventure travel.

The original projections for commercial human spaceflight were ambitious. They have yet to be met. Until they are, Congress should extend the moratorium.

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Endnotes

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