

Private Space Flight

House Committee on Science, Space, and Technology

Background

In the decades immediately following the inception of the National Aeronautics and Space Administration, or NASA, privately funded human space flight, or even privately funded satellite launches, was strictly prohibited by the National Aeronautics and Space Act of 1958. All rights to carry out extra-terrestrial endeavors, in the form of both human and robotic missions and experiments, fell entirely to the government-funded space administration. Private companies relied solely on NASA to launch payloads and satellites into space. However, American policy shifted drastically in 1984 when Ronald Reagan signed the Commercial Space Launch Act into law, which recognized the private sector's potential to fund commercial space enterprises and enabled companies to launch satellites and similar technology into space. Following the Challenger explosion in 1986, public opinion and government funding for NASA swayed further towards support for privatization of the space industry, leading to the Launch Services Purchase Act of 1990. The LSPA outright prohibited NASA from launching payloads into space, such as satellites or supplies for the International Space Station, and allowed private companies to manage all forms of their own payload dispatches. From then on, NASA was obligated to purchase launch services from private space companies to send supplies into space.

After the LSPA became the chief regulator of launch service rights, all forms of private space flight quickly began to answer NASA's need for launch services. In the late 1990's, NASA's demand provided a major business incentive for companies to develop the cheapest, most efficient spacecrafts. However, private space industry enterprises did not grow into prominence until 2004 when President George Bush delivered his "Vision for Space Exploration," which encouraged the research and development of a private spaceflight industry, and later in 2011 when President Barak Obama discontinued NASA's shuttle program. With the retirement of the space shuttle, NASA became entirely dependent on private space companies for not only freighting satellites and payloads into orbit but also launching astronauts into space as well. This sparked an even greater race for private spaceflight dominance in the newly born industry, due to NASA's massive monetary incentive as well as the newly viable commercial space taxi enterprise conceived officially in Bush's vision. In turn, major power-players in the commercial space industry rose to the challenge of providing cheap, reusable rockets for government and public services.

Perhaps the most major supporting reason for allowing privatized competition in the commercial spaceflight industry is that the competition for NASA's business, as well as a competitive yet nascent market for commercial citizen spaceflight, will drive down prices and create safer, more efficient spacecraft models. Until most recently, the monolithic investment of capital required to start a private spaceflight business has held back most vying competitors. Depending on various factors, namely the weight of the payload, a single launch could cost up to \$260 million; however, a private company known as SpaceX engineered a feasible module known as the Falcon 9 for just \$55 million. Elon Musk, CEO of SpaceX, ascribes the rocket's shortened price tag to manufacturing efficiency and lack of outsourcing in the construction phase. As well as reducing the costs of construction and development of a rocket module, companies such as SpaceX also labor to design a reusable, refuelable rocket. While the Falcon 9 launch costed \$55 million, the rocket only consumed under a quarter of a million dollars' worth of fuel. If SpaceX were to design a module that would assuredly and steadfastly not burn up in the atmosphere upon re-entry, costs would be cut by over \$54 million. Numerous companies are already racing to design their own Suborbital Reusable Vehicles (SRVs).

Costs of rocket development are not the only expenses that have dropped dramatically. Since 2001, seven individuals purchased tickets for an around-the-world orbital flight, valued at as high as \$35 million dollars a trip. Yet, as of 2012, the cost of the same experience troughed at \$200,000. By the end of this decade, companies such as Virgin Galactic will ferry up to 600 people into space at a time on a grand sight-seeing tour, at prices that continue to decline.

Aside from the profit gleaned from operating a commercial space taxi, private companies also receive revenue from NASA. As of 2011, the only method NASA has at its disposal of sending astronauts and payloads into space is through private space companies like SpaceX and Orbital Science Corp. Although NASA is unable to launch anything into space on their own, they need to constantly resupply the International Space Station, as well as perform routine maintenance on the station and various satellites. NASA has been paying vast sums of money to Russia in turn for American seats on a Russian supply craft; many are more than eager to cut those costs, as well as politically tangled business ties with Russia, in turn for private American spaceflight business. Currently, the government agency has brokered a \$1.6 billion, twelve-mission deal with SpaceX and \$1.9 billion, eight-mission deal with Orbital Science Corp. These vast financial exchanges are funded by NASA's Commercial Crew Program, which also allows finances towards two other private companies. Unfortunately for NASA, Congress regulated that two of the four companies on the CCP budget must be cut, jolting even further competition between these private firms.

Through their business contract with SpaceX, NASA is able to send a supply drop to the space station for about \$166 million per launch, whereas in the 1990's and early 2000's a shuttle did the same job for \$1.6 billion. Massive drops in prices allow NASA to finance larger, more ambitious missions, such as a manned trip to Mars and asteroid mining. President Obama, in favor of this business configuration, claims that by shifting their focus to more daunting tasks, NASA in turn reverts to the classic, familiar "pioneer spirit" exhibited in 1969 when Neil Armstrong and Buzz Aldrin landed on the moon. The president affirms that while private space companies are clearly more adept at lowering prices, only NASA's government resources can manage the research and development required to initiate a manned trip to Mars. However, many against this plan are skeptical of SpaceX's capacity for success, as well as safety.

In 2004, worried about the budding safety issues of new private spaceflight companies expressed by both public and private entities, Congress passed the Commercial Space Launch Amendments Act. Anticipating a need for government regulation in the private space industry, the bill envisioned a commercial space market guided by federal policy and safety regulation. Recognizing the private sector's capacity to construct their own rockets, the bill laid down a preliminary framework for legislative safety requirements, while remaining open and adaptable to future amendments and legislation as SRV technology continues to advance. The law relegated that the Federal Aviation Administration issue a specific set of safety standards on private space flight, concerning both passengers and crew of any commercial SRV. These codes require basic yet stringent rules all companies and SRV pilots should follow, such as informing the FAA of any and all health issues that may be present, educating their passengers on general dangers and proper safety precautions, and taking due precautions against particular risks of their SRV. These regulations also call for a certain allotment of necessary training for a pilot and crew. Medical standards, as well as training qualifications, are also established for all members of an SRV staff. Furthermore, thorough testing of all ship systems, including life support and vehicle hardware, must be performed via flight testing before any passengers are admitted to board and ride. As the fledgling commercial space industry develops, more legislation was to be written to address advancements in technology as they presented themselves.

Moreover, further regulations were added in 2012 as the concept of a private space taxi became reality. In an effort to reduce "doubling up" on safety restrictions and requiring companies to obtain permits from more than one organization, NASA and the FAA collaborated to issue a

Memorandum of Understanding, or jointly-written code, and laid out more definitive safety standards for any private spacecraft on a mission to the ISS. The memorandum consisted of four main goals: to “provide a stable framework for the space launch industry”, “avoid conflicting requirements and multiple sets of standards”, “advance public and crew safety”, and to “advance certified launch operators.” A wide range of tasks was distributed and split up among each agency, and each was expected to provide the necessary funds to carry out their set of duties. Perhaps the most important aspect of the memorandum is the requirement of a special license that must be obtained by a private company from the FAA, provided that the company meets the minimum safety requirement. While the FAA is responsible for licensing, NASA regulates crew and passenger safety, including checks for up-to-date software and equipment, safe re-entry specifications, and operational life support systems. Today, the safety requirements in this memorandum stand as a precedent framework for regulations to come.

Despite upholding these safety regulations, on June 28, 2015, an unmanned SpaceX Falcon-9 rocket detonated and disintegrated shortly after launch. The rocket, bound for the ISS and stocked with weeks’ worth of supplies, equipment, and data, was the third failed launch in the last eight months. Orbital ATK, rival company to SpaceX, experienced a similar failure in October of 2014, just as Russian model exploded after launch in April 2015. Charles Bolden, the current administrator of NASA, assured that “the astronauts are safe aboard the station...and have supplies for the next several months,” and affirmed that NASA was researching possible causes of the explosion to “fix the problem and return to flight.” The accident not only sent shockwaves through public support of a private space industry; government funding for NASA’s CCP also wavered. Plans to send American astronauts up to the station in 2017, so as to avert resorting to Russian crafts to transport American astronauts, also took a hit from SpaceX’s failure. Most experts continue repeating that a certain amount of failure is to be expected from a field of science so complex and calculation-heavy, while others are left questioning how many failures is too many failures. Still others assert that we will learn from the detrimental mistakes, and when SpaceX and Orbital ATK transition from unmanned- to manned-missions, the safety precautions learned from their shortcomings will save more lives in the future.

In 2015, the House passed the Spurring Private Aerospace Competitiveness and Entrepreneurship Act, or the SPACE Act. Intended to supplement the Commercial Space Launch Amendments Act from 2004, the SPACE Act elaborated and expanded on the principles set forth by its predecessor. If the bill passes senate and is signed into law, then further safety standards, as well as SRV crew health and training requirements, would all be more clearly defined to fit the advancements in technology over the last decade. The bill is also intended to foster the continued growth of private spaceflight companies, and sustain honest, fair competition between these companies just as any other big business. Most commercial space companies are in full support of the legislation for the latter reason. Additionally, most Republicans are in favor due to the bill’s capacity to improve fair business competition. However, house Democrats sharply derailed the bill, claiming it is “heavily skewed towards industry desires” and just an “industry wish list.” While the SPACE Act enables NASA and the FAA to enforce a wide range of safety requirements, it prohibits the FAA from even proposing safety regulations on passengers of an SRV until 2025. The bill requires passengers to waive certain rights upon receiving services from a privately-operated SRV; while this protects the business from lawsuits, many believe this negatively affects the consumer. Both political parties yearn for the industry’s success, despite substantial differences between the actions taken by the SPACE act.

Furthermore, the SPACE Act starts to address the issue of property rights concerning asteroid mining. In short, the act grants ownership of anything mined to whoever mined it. To enforce this, the bill would make the FAA the official authority on space-related property rights. However, some assert that this power would make the FAA far too influential on the infant asteroid

mining industry and, by extension, all things space-related. In contrast, the bill does nothing to curtail other rights that most are in favor of, such as the right to enforce safety regulations in both an SRV's crew and participants.

Democratic Point of View

In general, most democrats are in favor of the privatization of the space industry. Democrats like large NASA funding, which in turn allows the space administration to make bigger financial deals with private companies through the Commercial Crew Program. However, democrats are thoroughly in opposition to the SPACE Act on the basis that the act only favors the industry's concerns and does little to protect the needs of the passenger. Furthermore, many find that the proposed regulations on asteroid are controversial at best and are in dire need of more thorough review. The democrats on the Science, Space, and Technology formally stated that the bill "takes an unbalanced approach to the issues facing the commercial space launch industry." They believe that regulations concerning the private space industry should express due involvement with the safety needs of the passenger, as well as the crew. Democrats favor more government involvement, more regulations, and more standards when it comes to safety as well as enforcement of property rights.

Republican Point of View

Just as their adversarial party members, Republicans also favor the growth and development of the commercial space industry. While republicans are against larger NASA funding, shortening the budget allotted for making deals through the CCP, they invest reasonable trust into the strength of a free, equal space market. They are in support of the SPACE Act because it protects the most prominent concerns of private space companies, levels the playing field for competition, and provides the needed safety regulations regarding the pilot and crew of a SRV. Republicans believe that competition is all that companies need to keep their launch vehicles safe; if a company consistently experienced failure, then they would lose business and therefore profits. This forces companies to be safe, without government interference. With just minimal government involvement, just enough to provide the basic framework laid out by the SPACE Act and its 2004 predecessor, republicans assert that the industry will thrive on its own.

NASA Point of View

Due to the Launch Services Purchase Act, NASA needs private companies in order to operate. For this reason, NASA is in full support of the growth and health of private space companies. NASA is also in favor of the success of these private companies because their missions can be done far cheaper than the space shuttle ever could. This reduces costs of missions, and by direct result increases the amount of money the administration has to research more ambitious manned endeavors.

Buzz Aldrin Point of View

In response to the SpaceX rocket failure in June, an interview with Buzz Aldrin revealed that the veteran astronaut believes that the failure "shows we need more commercial space travel, not less... When the interests of the private sector are aligned with NASA's mission, America wins." Aldrin believes that the failure only underscores the importance for more funding towards private

business endeavors. He is eager to remind interviewers that in the field of rocket science, there will be more than a few mishaps, but only good can come out of our failures in the long run.

Conclusion

As the industry of private space travel continues advance into a new age of interstellar travel, the government's role in the regulation of new technologies continues to grow as well. The extent to which our government should restrict, or open up, the commercial spaceflight market remains to be answered. Additionally, as property rights begin to extend out of our atmosphere and into outer space, the method through which property rights are enforced and regulated is also up in the air. Government policy towards the amount of safety regulations for both SRV staff and normal citizens will have to be fleshed out sooner rather than later as technology progresses closer and closer to providing widely accessible spaceflight to the general public. Certainly, above all else, America should desire to remain the most prominent pioneer in space; only through a solid private sector dedicated to commercial space flight can we accomplish this.

Questions to Consider:

- i. Should the government be more involved in the private space industry? Less involved?
- ii. How restrictive should safety regulations on SRV flight be? Should it be left to the market to rule out unsafe business practices, or should the government intervene in certain cases?
- iii. Should the government place restrictions on the number of passengers, weight of payload, length of commercial sightseeing trip, etc.?
- iv. Do you think that the development of the private space industry would only benefit those that are rich enough to pay for a trip?
- v. What is the best way to foster the growth of private spaceflight? Should it grow in the first place?
- vi. How many rocket launch failures is too many failures?
- vii. Should the FAA be given more authority in regulating the operations of private spaceflight companies? Less authority? How much authority is too much authority?
- viii. What consequences should take place if a company injures/kills several people in a tragic accident? Who should be held accountable?
- ix. What other issues may arise involving property rights and asteroid mining?
- x. Should the government further regulate asteroid mining? How would it go about doing this?

Sources for Additional Research

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