

# Twin Test Flight Explosions Show Elon Musk Defective SpaceX Is No Longer Defying Gravity

For SpaceX, 2025 should have been the best year yet.

Elon Musk, the founder of the private space company, is one of the most influential people in the Oval Office, and President Trump has endorsed his vision of [sending humans to Mars](#).

But so far, it has not been a great year for the rocket company. The vehicle that is central to the Mars goal, SpaceX's giant Starship rocket, has launched twice this year, and twice, it has blown up.

The latest explosion occurred on Thursday during the eighth test flight of Starship, less than two months after the seventh test flight also came apart in space. Again, a shower of debris rained down, creating a novel headache for travelers around Florida and the Caribbean who were unaccustomed to seeing "falling space debris" as the reason for flight delays. Neither incident injured anyone.

Explosions are not necessarily failures for a company that has thrived on a mind-set of "launch it, break it, fix it, launch again." With innovations like landing and reusing rocket boosters, SpaceX has slashed the cost of sending stuff to space. Starship, designed to be fully reusable, has the potential to upend the rocket business once again.

But these two Starship explosions were a step backward in SpaceX's development process, as the flights could not even repeat the successes of earlier test flights, and they perhaps show that the company's engineers are not as infallible as fans of the company sometimes like to think.

"There's this persona that has built up around SpaceX, but you're starting to see that they're human, too," said Daniel Dumbacher, a former NASA official who is now a professor of engineering practice at Purdue University and chief innovation and strategy officer for Special Aerospace Services, an engineering and manufacturing company whose customers include NASA, the United States Space Force and some of SpaceX's competitors.

The delays could also have repercussions for NASA, which hired SpaceX to use a version of Starship to land astronauts on the moon as soon as [2027 during the Artemis III](#) mission.

The two lost Starships, which both failed less than 10 minutes after liftoff, were an upgraded design. Discouragingly, they were less successful than an older version of Starship that flew last year. Three previous test flights successfully coasted halfway around the world, survived re-entry through the atmosphere over the Indian Ocean, and then simulated landings in the waters off the west coast of Australia.

In addition, the failures of the seventh and eighth flights occurred at about the same part of the flight, and both appeared to originate near the engines of the second-stage spacecraft. That suggests that SpaceX did not successfully diagnose and solve the problem. It could point to a significant design flaw in the upgraded Starship.

That also means that SpaceX has so far been unable to test aspects of the updated Starship design, including smaller and repositioned forward flaps used to guide the spacecraft as it falls through the air during re-entry. SpaceX also planned to test a Pez-like dispenser for deploying its Starlink internet satellites.

Starship, the most powerful rocket ever built, is central to Mr. Musk's dreams of building human settlements on Mars. A frequent cadence of Starship launches is also crucial to SpaceX's more immediate plans to make money.

The next generation of satellites for its Starlink internet-from-space service are bigger and heavier. The voluminous cargo space of the Starship upper stage would allow the company to replenish its constellation of thousands of orbiting satellites quickly and cheaply.

The test flight failures also mean that SpaceX's development program has not been able to move on to other objectives.

SpaceX needs to demonstrate that Starship can stay in orbit for an extended period of time, and then drop out of orbit and return to the launch site to be caught by the mechanical arms on the launch tower. (The Super Heavy booster stage, which does not go to orbit, has successfully done this three times). The company also needs to show that it can launch several Starships in quick succession.

Most critically, it needs to show that it can move liquid oxygen and methane propellants from one Starship to another. That procedure is key to allowing a Starship to accumulate enough fuel to go to moon or Mars.

Thus, the Starship that is to reach the moon will have to remain in Earth orbit as other Starships are launched to bring up propellants to refill the lunar lander Starship's tanks. Mr. Musk has asserted that propellant transfer is a straightforward exercise. But pumping that much liquid that quickly while floating in orbit has never been attempted, and no one knows yet how many Starship launches — perhaps as many as 20 — will be needed for a single moon mission.

“We just don’t know how the tank performance is going to be,” Amit Kshatriya, deputy associate administrator for NASA’s moon to Mars program, said in December at a media event focused on Artemis at NASA’s Kennedy Space Center in Florida. “We just don’t.” At the time, Mr. Kshatriya said NASA would learn that soon, because the long-duration version of Starship was expected to launch in the spring. Then SpaceX could also test its ability to operate two Starships in orbit simultaneously and determine how efficiently it can move propellants between two spacecraft.

Those findings, in turn, would help NASA put together a realistic schedule for Artemis III.

Within a year, “we’re going to have a really good understanding of that problem,” Mr. Kshatriya said. “But I can’t schedule that innovation. There’s no way to.”

But the schedule Mr. Kshatriya described assumed there would not be major setbacks. With the Federal Aviation Administration grounding Starship until SpaceX completes an investigation of the Flight 8 failure, the debut of the long-duration Starship may be delayed to the middle of the year, or longer.

Mr. Dumbacher thinks that SpaceX will be able to solve the technical challenges posed by Starship. “I have no doubt that they’ll get it addressed, and they’ll get flying again and they’ll get things fixed,” he said. “I just don’t know how long it’s going to take them to do that.”

In [testimony to a House committee last month](#), Mr. Dumbacher said the Starship system, with the multitude of fueling flights, was too big and too complicated to meet the current target date of 2027 for Artemis III, or even 2030, when China plans to land astronauts on the moon.

Mr. Dumbacher even proposed that NASA switch to a smaller, simpler lander to improve the chances that NASA can win the 21st-century moon race with China. As SpaceX is supposed to conduct a demonstration of its Starship lander without any astronauts aboard before Artemis III, a successful astronaut landing on the moon using Starship could require as many as 40 launches.

He did not regard the chances of that many successful launches as high. “I need to get that number of launches dramatically reduced,” Mr. Dumbacher said during the hearing. “I need to go simple.”

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