SpaceX thinks it knows why Starship exploded on its last test flight



The goal of the seventh test flight was to test several upgrades SpaceX made to its heavy-lift rocket system. After a successful launch and completing a full duration burn, the Super Heavy booster separated from Starship and triggered a boostback burn designed to return it to the launch site. Following a landing burn, the Super Heavy booster was successfully caught mid-air by the launch tower at Starbase for the second time.

The mission didn’t go quite as well for Starship. Approximately two minutes after the spacecraft ignited its second stage Raptor engines following separation, a flash was observed in the aft section of Starship known as the attic, followed by sensors detecting a pressure rise from a leak. Two

minutes after that, a second flash was observed, followed by sustained fires in the attic section that eventually “caused all but one of Starship’s engines to execute controlled shut down sequences and ultimately led to a loss of communication with the ship.”

Post-flight analysis indicated that Starship’s Autonomous Flight Safety System triggered a self-destruct approximately three minutes after the ground crew lost contact with the spacecraft. According to SpaceX, the most probable cause of the incident was vibrations that were much stronger during the flight than had been experienced during testing. That resulted in increased stress on the propulsion system’s hardware and, eventually, a propellant leak that “exceeded the venting capability of the ship’s attic area and resulted in sustained fires.”

The explosion created falling debris that looked more like a meteor shower over the islands of Turks and Caicos to several tourists who shared videos of the aftermath on social media. Although SpaceX says all the “debris came down within the pre-planned Debris Response Area,” the Federal Aviation Administration briefly slowed and diverted several flights in the area on January 16th as a result of the incident.

As part of the investigation into the explosion involving SpaceX, the FAA, NASA, the National Transportation Safety Board, and the U.S. Space Force, the company conducted a 60-second static test fire with the Starship that will be used on an upcoming eighth flight. Following the results of that test, SpaceX has made hardware changes to fuel feedlines as well as adjustments to propellant temperatures and operating thrust targets.

The company has also added additional vents and a “new purge system utilizing gaseous nitrogen” to the attic section of Starship designed to make that area more robust to propellant leakage.

SpaceX currently plans to launch an eighth test flight of Starship on February 28th, 2025, but is still “working with the FAA to either close the mishap investigation or receive a flight safety determination, along with working on a license authorization to enable its next flight of Starship.”

https://www.theverge.com/news/618529/spacex-faa-nasa-starship-super-heavy-booster-explosion-upgrades