



U.S. Department
of Transportation
**Federal Aviation
Administration**

Commercial Space Transportation

800 Independence Ave., S.W., Rm 331
Washington, DC 20591

February 26, 2024

Shana Diez
Director of Starship Reliability
Space Exploration Technologies
1 Rocket Road
Hawthorne, California 90250

Dear Ms. Diez,

On November 18, 2023, at 13:02:50 UTC, Space Exploration Technologies, Inc. (SpaceX) conducted Starship Super-Heavy Orbital Test Flight 2 (OTF-2) launch operations from its Boca Chica, Texas site under Federal Aviation Administration (FAA) launch license VOL 23-129 Rev. 1. After a successful ascent and stage separation, the Super-Heavy Booster 9 (B9) suffered a mishap during its boostback burn resulting in a mid-air explosion and vehicle loss.

Following a successful start-up of all engines and separation from B9, Starship Ship 25 (S25) had a nominal ascent until 13:09:55 UTC, when the planned pre-second engine cutoff Liquid Oxygen dump started. Over the next minute, several explosions and sustained fires were observed in onboard camera aft video streams, ultimately resulting in a loss of communication between the forward and aft flight computers. This resulted in a commanded shutdown of all six engines, and an Autonomous Flight Safety System flight termination triggering at 13:10:55 UTC per flight safety rules.

The FAA classified the Starship Super-Heavy OTF-2 launch as a mishap, as defined in Title 14 Code of Federal Regulations (14 CFR) § 401.7 paragraphs (7) and (9).¹

Following the launch, the FAA, consistent with its statutory authority under Title 51 of the U.S. Code and 14 CFR § 450.173(e), required SpaceX to conduct a mishap investigation following its approved mishap plan under FAA oversight.² The FAA conducted a final review of the B9 and S25 mishap reports.³ The primary focus of these reviews was to ensure operator compliance with 14 CFR § 450.173. The FAA has been provided with sufficient information and accepts the root causes and corrective actions described in the mishap reports. Consequently, the FAA considers the mishap investigation that SpaceX was required to complete to be concluded.

¹ Additionally, the FAA granted official observer status to National Aeronautics and Space Administration and National Transportation Safety Board representatives.

² In accordance with the mishap plan, SpaceX convened an investigation team that utilized a well-established fault tree tool to ascertain the most likely root cause(s) of the mishap.

³ SpaceX Booster 9 Super Heavy Final Flight Mishap Report, February 5, 2024, and Starship 25 Final Flight Mishap Report, February 16, 2024.

The final B9 and S25 mishap investigation reports cited seventeen (17) corrective actions for SpaceX to implement. Seven (7) booster corrective actions were identified, including redesigns of vehicle hardware to increase tank filtration and reduce slosh, updated thrust vector control system modelling, reevaluation of engine analyses based on OFT-2 data, and updated engine control algorithms. Ten (10) starship corrective actions were identified, including hardware redesigns to increase robustness and reduce complexity, hardware changes to reduce leaks, operational changes eliminating pre-second engine cutoff propellant dumps, flammability analysis updates, installation of additional fire protection, creation of analytical guidance, performance of transient load analysis, and modeling updates.

Launch license VOL 23-129 Rev. 1 for Starship authorized SpaceX to conduct the OTF-2 mission only. SpaceX applied for a modification to the VOL 23-129 license to allow for subsequent launches. As part of its application for this modification, SpaceX needs to demonstrate compliance with 14 CFR § 450.173(f) by evidencing the implementation of corrective actions adopted in response to its November 18, 2023 mishap. If FAA approves the modification, SpaceX will be required to conduct licensed activities under the representations made in its application (14 CFR § 450.211). Failure to do so is grounds for enforcement. Once the FAA determines SpaceX has implemented the corrective actions directly tied to public safety, the agency will consider SpaceX to be in compliance with 14 CFR § 450.173(f).

Further, the FAA's closure of the mishap investigation does not predetermine the results of any ongoing or future environmental reviews associated with Starship operations at Boca Chica.

Please contact me with any questions or concerns at (202) 267-8308 or by email at Marcus.ward@faa.gov.

Sincerely,

Marcus Ward
Manager
Safety Assurance Division

cc: Rachel Sage
Jillian Yuricich
Kara Fambrough
Christopher Cardaci