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2023

YEAR-IN-REVIEW



From SpaceX to Chandrayaan-3, operators achieve new heights

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The **Space Transportation Technical Committee** works to foster continuous improvements to civil, commercial and military launch vehicles.

Space transportation this year is set to surpass the record 186 orbital launches conducted in 2022, which broke the previous record of 146 in 2021. Driving the industry was **SpaceX's Falcon 9** fleet, which surpassed 2022's record-breaking launch total with its 62nd launch in September. SpaceX averaged a Falcon launch every four days through that month.

In July, NASA completed a hot fire test of a modified **Aerojet Rocketdyne RS-25** engine at NASA's **Stennis Space Center** in Mississippi in preparation for future **Artemis** missions. The Artemis moon program kicked off in November 2022 when a **Space Launch System** rocket lofted an unoccupied **Orion** spacecraft to orbit for a loop around the moon.

The **Falcon 9** continued to be SpaceX's workhorse launcher. The 200th launch was conducted in February, and a booster was reflown a record 18th time in November. In July, a **Falcon Heavy** launched **Jupiter-3** from NASA's **Kennedy Space Center** in Florida, the heaviest commercial geostationary satellite ever built. In November, **SpaceX** performed the second flight test of a **Starship spacecraft and Super Heavy booster** from its Texas facility. As planned, Super Heavy and Starship separated via an updated **hot-staging technique**. Shortly after separation, Super Heavy exploded while Starship proceeded on for some seconds but was lost. FAA announced that SpaceX would conduct a "mishap" investigation. During the truncated April attempt, control was lost shortly after liftoff and the vehicle was destroyed.

In June, **United Launch Alliance** of Colorado launched the penultimate flight of the **Delta IV Heavy**. The final flight is planned for 2024. As of November, ULA planned to conduct the inaugural launch of its **Vulcan-Centaur** rocket on Christmas Eve, after a structural failure in the second stage during a March pressure test prompted additional testing.

Crew and cargo delivery to the **International Space Station** continued with the final launch of **Northrop Grumman's Antares 230+** rocket in August, two crew rotations aboard SpaceX Falcon 9 rockets and **Crew Dragon** spacecraft in March and August, and the private **Axiom-2** mission in May that sent private citizens to the station.

In January, California-based **Rocket Lab** conducted the first launch of an **Electron** from Virginia. In August, the company reused a previously flown **Rutherford** engine on its 40th mission.

In March, **Relativity Space** of California launched its first 3D-printed, methane-fueled



▲ In April, a SpaceX Starship-Super Heavy became the most powerful rocket to be launched. The test flight from Boca Chica, Texas, ended approximately four minutes after liftoff when thrust vector control of the vehicle was lost, among other problems.

SpaceX

Terran 1 rocket from Cape Canaveral, Florida. After an issue with the second stage, the launcher failed to reach orbit, and the company announced it was canceling future Terran 1 launches to develop the larger **Terran R** rocket.

The **RS1** launcher from **ABL Space Systems** of California failed to reach orbit in its first launch attempt from Alaska in January.

California-based **Virgin Galactic** returned to crewed suborbital flights in May after a nearly two-year absence, and the company began commercial operations in June. As of November, Virgin had conducted five commercial flights in its **VSS Unity** spaceplane with government astronauts and private tourists.

The global space industry also saw several achievements. India became the fourth nation to land a spacecraft on the moon with its **Chandrayaan-3** mission. In July, a **Launch Vehicle Mark-3** launched a lander with its rover, which touched down near the **moon's south pole** in August. In China, **Space Pioneer** for the first time launched its **Tianlong-2** in March, and **LandSpace's Zhuque-2** methane-fueled rocket reached orbit in July. China averaged one launch per week during the first half of the year. In July, **Ariane-space** launched the last **Ariane 5** from French Guiana in July, making way for the **Ariane 6**, which is scheduled to debut in 2024. ★