

Widespread reusability starts to become a reality

BY ZACHARY FRIEDMAN, AMRUTUR ANILKUMAR AND BOB SEIBOLD

The **Reusable Launch Vehicles Technical Committee** promotes the development and implementation of operationally responsive and economically viable commercial, military and civil reusable launch vehicles and systems for space access and global reach.

This was a year of significant advancements for reusable launch vehicles. While most eyes were on **SpaceX**, which achieved its first **Super Heavy booster catch** in October, other launch providers steadily hit key milestones on the path to both partial and full rocket reusability. In contrast to the focus on small, inexpensive, expendable rockets just a few years ago, providers are now aiming for larger reusable rockets to ensure cost competitiveness.

SpaceX continued to lead the pack for reusable launch. Four **Starship-Super Heavy** rockets were launched as of November, following the two launches in 2023. Perhaps the most notable event of the year occurred during the October launch, when the Super Heavy booster returned to the launch site into the mechanical arms of the launch tower. Meanwhile, SpaceX's workhorse **Falcon 9** rockets set another record for first-stage reuse. The B1062 booster completed its 23rd flight in August, though it fell over and broke apart shortly after landing on the droneship. Looking ahead, planned milestones in 2025 include the first tower catch of a Starship upper stage, plus a transition from test launches into operational capability.

Rocket Lab, the small-lift launch provider with the second-highest launch cadence behind SpaceX, marked progress in developing its reusable **Neutron**

medium-lift vehicle. In May, the company announced that Neutron's debut would be delayed one year to 2025, but developments continued to take place. The first static fire tests with a **Archimedes** engine were completed in August, and the engine was to enter qualification testing and full volume production. Rocket Lab also announced in August that design work for Neutron is complete and that all components have been moved to production or qualification.

Stoke Space, a startup based in Kent, Washington, achieved several milestones in its quest to challenge SpaceX in developing the first fully and rapidly reusable rocket. Stoke completed initial test fires of the first-stage engine in June, just 18 months after design began. While targeting an inaugural launch of its **Nova** rocket in 2025, Stoke is awaiting the completion of an environmental assessment before it can begin to retrofit its Cape Canaveral launch site. In July, Stoke was awarded an **Orbital Services Program-4** contract from the **U.S. Space Force**, making the company eligible to compete for up to \$986 million in national security launch contracts through 2028.

Also inching closer to flight was **Blue Origin's New Glenn**, a heavy-lift design with a reusable first stage. First announced in 2015, New Glenn passed a series of milestones this year, including being raised vertically at its launch pad in February. For the inaugural launch, New Glenn is to send a **Blue Ring** orbital transfer vehicle to orbit. Blue Origin was also awarded several government launch contracts, including securing a late spot in June to compete with incumbents **SpaceX** and **United Launch Alliance** for up to \$5.6 billion in launches under the **National Security Space Launch Phase 3** program. In July, Blue Origin was also awarded a spot on the OSP-4 contract alongside Stoke.

Reusable rocket development continues to increase outside the U.S. as well, most notably in China and India. Chinese rocket startup **Deep Blue Aerospace**

announced four funding rounds between May and August, and conducted a partially successful first-stage flight in September. In total, nine Chinese firms plan to debut rockets in the coming years, with at least half developing partially reusable rockets. In June, India completed the third and final glide test of its **Pushpak** reusable spaceplane. With testing complete, the **Indian Space Research Organisation** now aims for an orbital launch and return. ★

▼ SpaceX in October caught the first Super Heavy booster at the launch tower in Boca Chica, Texas. The booster sent a Starship upper stage to orbit, then fired its engines to return to the launch tower, coming to a stop between the tower's "chopstick" mechanical arms.

SpaceX

