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▲ **A two-minute hot-**fire test was the first solid rocket booster test for NASA's Space Launch System. NASA and Northrop Grumman, the SLS booster lead contractor, will analyze the results to choose potential new materials and processes for missions after Artemis III.
NASA/Northrop Grumman

Full-scale SLS booster test, OSIRIS-REx nail-biter are among exploration successes

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The **Space Exploration Integration Committee** brings together experts on topics relevant to future human and robotic exploration missions.

NASA put its **Space Launch System** through its first full-scale booster test in September at Northrop Grumman's Utah site. Engineers and researchers will use data collected from the **Flight Support Booster-1** test to verify the rocket motor's performance capability, propellant efficiencies, build processes and potential new materials comprising the booster. Since full-scale booster tests are rare, NASA ascribes multiple test objectives to each with the goal that any changes to the boosters will still allow them to meet performance and design needs at launch. The SLS rocket, Orion spacecraft, lunar Gateway and Human Landing System are the backbone of NASA's deep-space exploration program, Artemis, aiming to put humans back on the moon by 2024 and then on to Mars. The SLS boosters are the largest, most powerful boosters built that can deliver the exploration spacecraft, Orion, astronauts and supplies to the moon from Earth in a single launch.

OSIRIS-REx, short for NASA's Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer, briefly touched asteroid Bennu and collected regolith samples from its surface in October. Two days later, the mission team received images of the sample collector head that showed some of the particles collected were leaking from the sample collector. The team worked round-the-clock for two days to stow and seal the the Sample Return Capsule for its return.

NASA's **Parker Solar Probe** performed its **fifth perihelion pass of the sun** in June followed in July by its third flyby of Venus at 830 kilometers. Parker has been using Venus for gravity-assisted flybys to slingshot into lower and lower solar passes. The **Venus flyby** was tracked by Earth observatories that, together with Parker's telemetry, provided information about how Venus interacts with solar winds and insight into its effects felt on Earth. Parker will continue to make progressively closer passes to the sun. Data collected from the probe's four instrument suites through November 2019 were publicly released in April.

The joint European-Japanese large-scale Mercury-mapping mission on the twin **BepiColombo** spacecraft that was launched in October 2018 performed an Earth gravity-assisted pass in April at 12,000 kilometers to check its suite of scientific instruments. It was the first of its nine scheduled planetary-assisted passes, with the next two scheduled around Venus. Among BepiColombo's instrument suite tested in this flyby were cameras, a precision magnetometer and the highly sensitive **Italian Spring Accelerometer**, which measures acceleratons imparted to the spacecraft by solar radiation. BepiColombo's objectives include mapping Mercury's magnetosphere. Apart from Earth, Mercury is the only other terrestrial planet with a magnetic field, and this mission may provide more insight into Earth's magnetosphere.

The **Japan Aerospace Exploration Agency** researchers working on the **Hayabusa-2** reentry capsule spent much of 2020 analyzing the telemetered data collected from the capsule on its six-year mission to the asteroid Ryugu. JAXA also managed logistics that will allow the capsule to land in Australia's Woomera area and researchers to collect the capsule. ★