

John J. McCarthy Observatory

September 2026 Newsburst

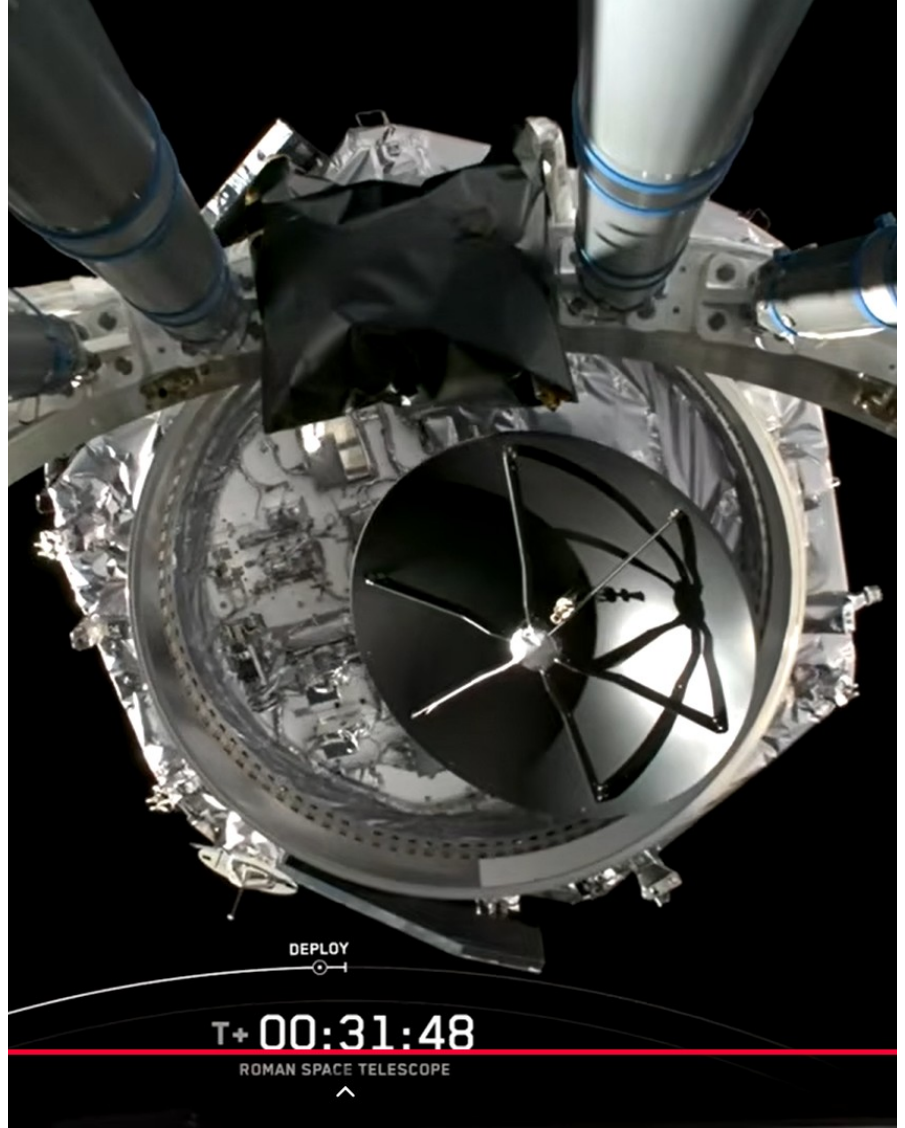


Tiangong Space Station

China's space station passed in front of the Sun on July 23rd, as seen from New Milford. The image is a composite of several frames from a video captured with the McCarthy Observatory's antique refractor (4.25 inch) and with a white light filter.

At the time of the pass, which lasted only 1.15 seconds, the station was approximately 421 miles away. The image of the station in orbit (insert) was taken by the departing crew of Shenzhou 16 (image credit: CMSE).

Go for L2



Left: Telescope sealed inside a Falcon Heavy fairing ahead of August 30th launch (Image credit: SpaceX)

Right: Telescope deployed from the Falcon Heavy's second stage shortly after a successful liftoff. The telescope's main antenna is seen in its stowed position, a 5.6-foot (1.7-meter) high-gain dish, designed to transmit science data back to Earth at speeds up to 500 megabits per second (Credit: NASA TV)

Early Sunday morning, August 30th, NASA's Nancy Grace Roman Space Telescope rode a SpaceX Falcon Heavy booster into orbit from the Kennedy Space Center. Once released from the booster's second stage, the telescope was sent on its way to the Lagrange Point 2 (L2), a gravitational stable location about 1 million miles or 1.5 million kilometers away from the Earth in the opposite direction of the Sun (joining the James Webb, Euclid and Gaia telescopes). The journey to L2 will take about 30 days - to be followed by a three-month checkout period before science operations commence.

Named for NASA's first chief astronomer, the Roman telescope's primary mirror is the same size as Hubble's but its three-mirror anastigmat optical design delivers a field of view 100 times larger. The mirror was donated to NASA in 2012 by the National Reconnaissance Office - being originally built for a canceled spy satellite program.

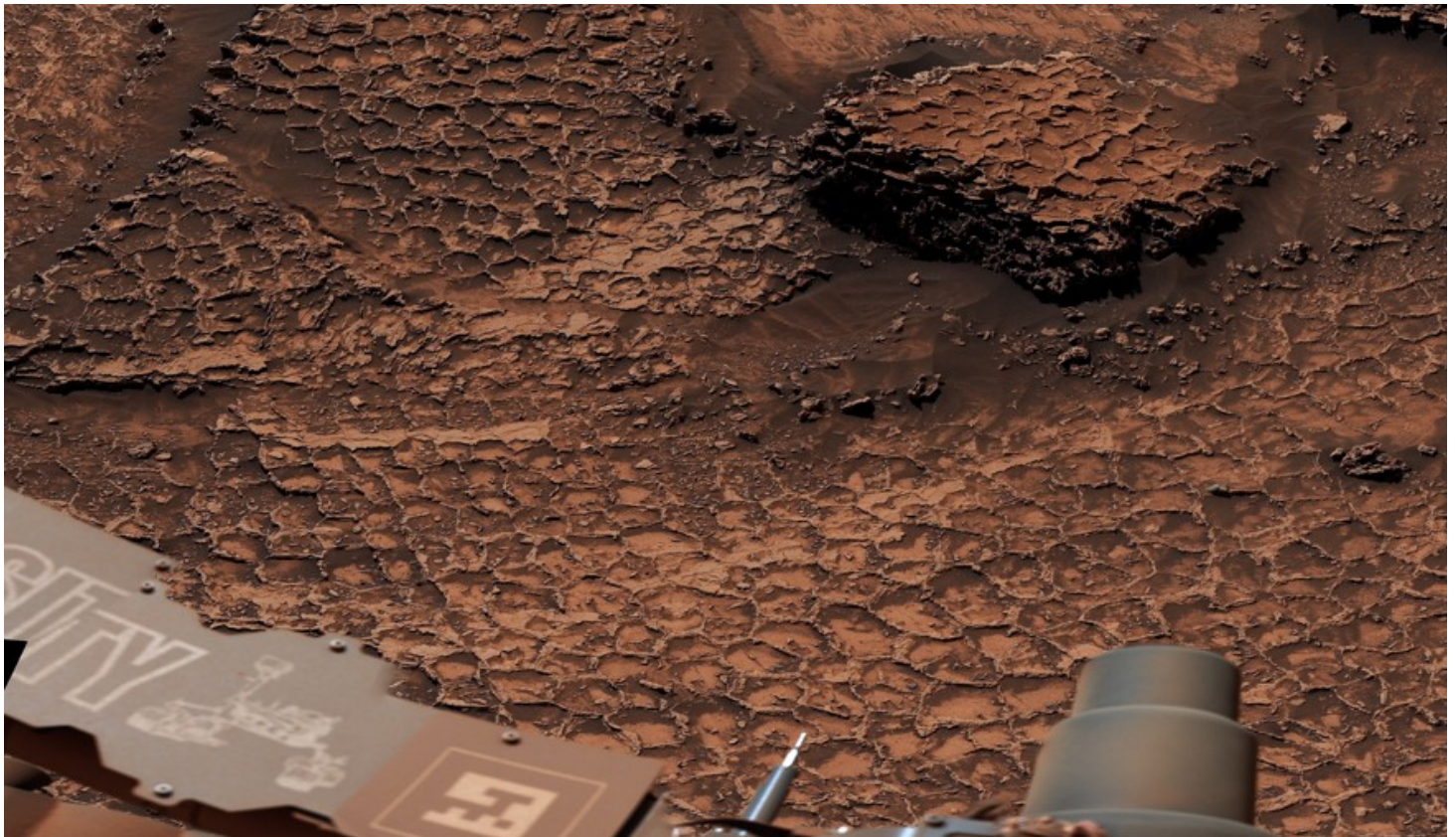
Over its five year prime mission, the telescope's 7.9-foot (2.4 meter) mirror will allow astronomers to survey the universe in near-infrared wavelengths, with targets including stars, galaxies, black holes and exoplanets. Roman's observations are expected to contribute to, and increase our understanding of, both dark matter and dark energy.

Signs of Ancient Water in “Valle Grande”



A field of dried mud polygons and dunes wrap around a 20 foot tall (6 meter) butte on Mount Sharp in Gale Crater on Mars

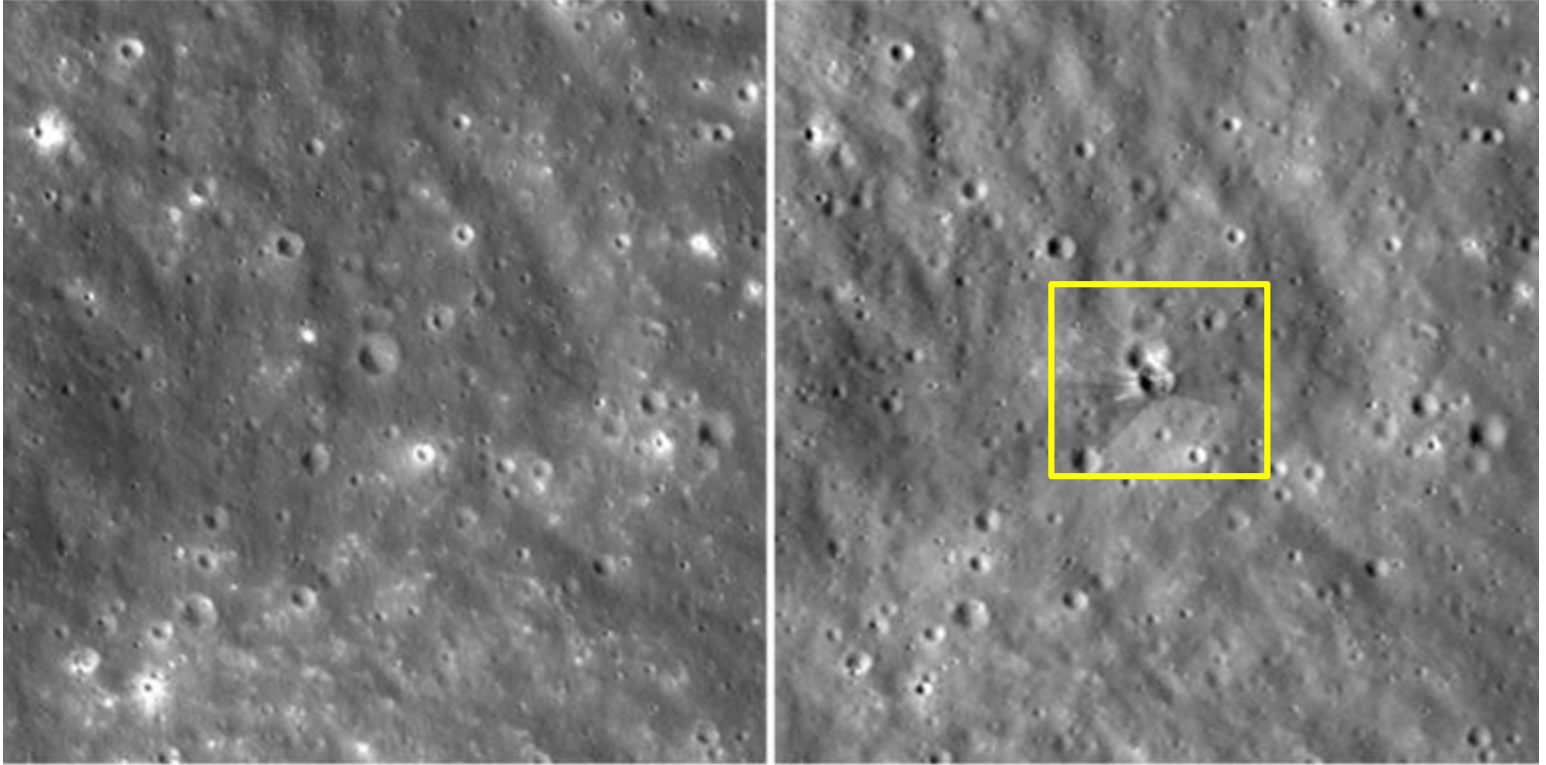
Credit: NASA/JPL-Caltech/MSSS



While NASA's Curiosity rover has come across these formations before, the sheer number of polygons, each one about 1.5 to 3 inches (4 to 8 centimeters) across, gave the landscape the appearance of a large honeycomb. These frozen artifacts can be created as wet mud dries out, shrinks and fractures, from the seasonal cycling of temperatures, and from the weight of overbearing layers squeezing out the moisture – all indications that Mars was once warm enough to support liquid water on its surface.

Credit: NASA/JPL-Caltech/MSSS

SpaceX Creates New Crater



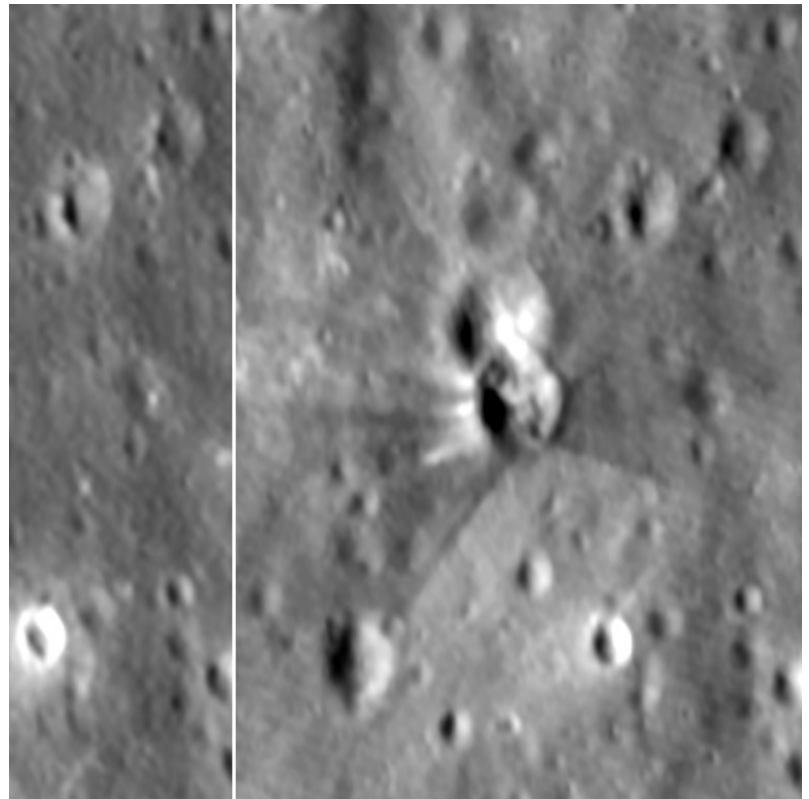
The impact site captured by NASA's Lunar Reconnaissance Orbiter from an altitude of 60 miles (90 km)

Credit: NASA/GSFC/Intuitive Machines

An upper stage of a Falcon 9 rocket, which launched Firefly's Blue Ghost 1 mission in January 2025, crashed into the Moon on August 5th. The impact created a shallow crater approximately 60 feet wide (18 meters) and less than 10 feet deep (3 meters) on the Moon's western rim near the craters Einstein and Bell (19.4759°N, 266.7138°E, 511 meters elevation).

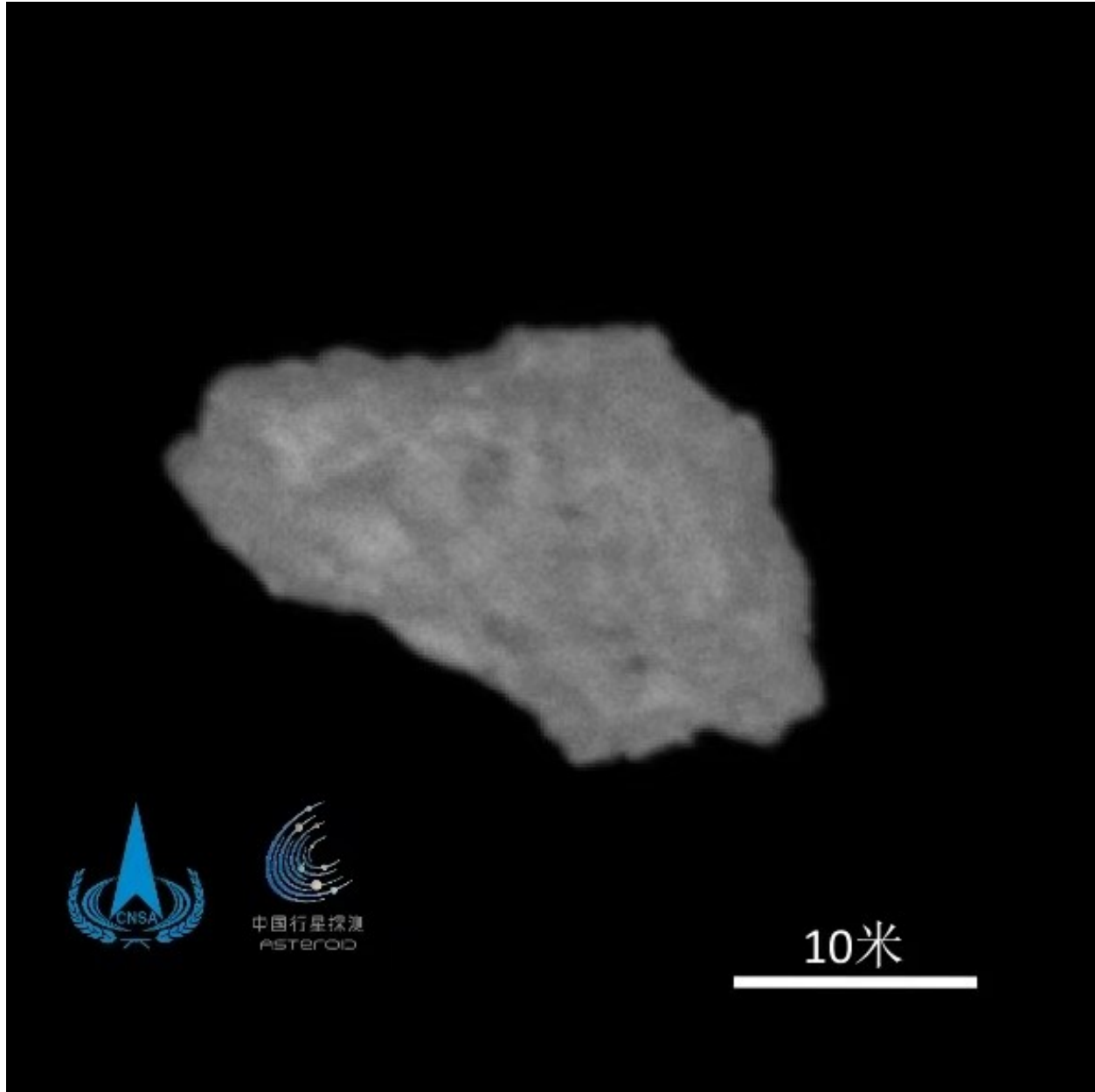
The new crater was initially spotted by the Korean Danuri orbiter. It would be several days before NASA's Lunar Reconnaissance Orbiter, in its polar orbit, passed over the site and captured detail images of the aftermath with its Narrow-Angle Camera.

The upper stage had been left in a high-Earth orbit after delivering the Firefly spacecraft. Over time, gravitational forces and solar activity put the booster on a collision course with the Moon. It struck the lunar surface at approximately 5,400 mph (8,690 km/h) at about 31° from horizontal. The form and structure of the crater are consistent with an oblique impact. Since the booster was not a homogeneous mass, the ejecta pattern would have been determined by the orientation of the 8,800 pound (4,000 kg) empty booster when it hit, e.g., engine first, fuel tank first or something in-between).



The new crater has bright rays from deeper, excavated material, characteristic of a projectile arriving at a relatively low angle. Darker streaks are from older, weathered surface rocks and dust kicked up by the impact.

“Quasi-moon” Kamo'oalewa



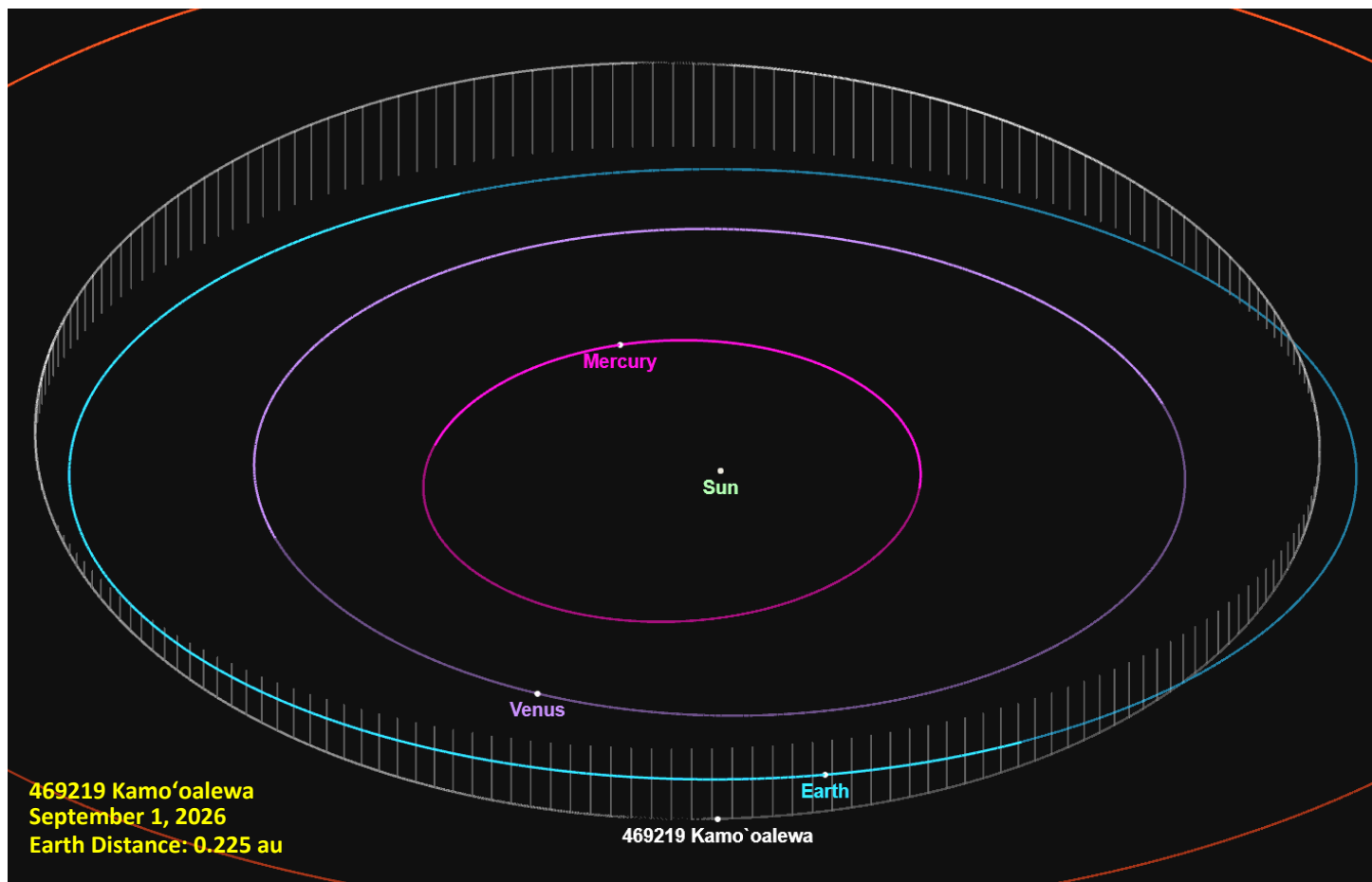
The 131- to 328-foot-wide (40 to 100 meter) asteroid Kamo'oalewa - the target of a sample return mission by the Chinese Tianwen-2 spacecraft.

Image via China National Space Administration.

In early July, the Chinese National Space Administration announced that their Tianwen-2 spacecraft had successfully rendezvoused with the near-Earth asteroid Kamo'oalewa. The announcement was accompanied by a photo of the asteroid captured from distance of about 12 miles (20 km). After studying the asteroid from afar, the spacecraft will attempt to gather a sample from its surface.

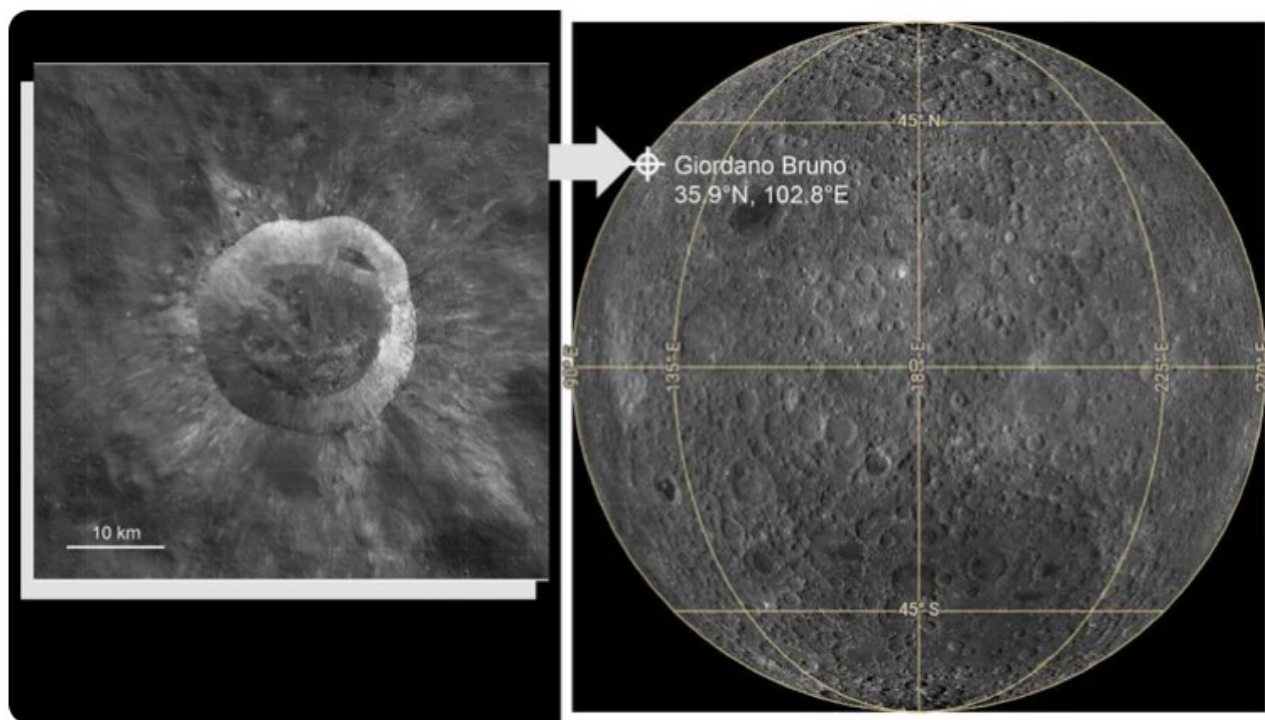
Kamo'oalewa is not your typical minor planet. It orbits the Sun along with the Earth and is sometimes referred to as Earth's "quasi-moon." Discovered in 2016 by the Pan-STARRS 1 asteroid survey telescope on Haleakalā, Hawaii, its rapid rate of rotation and silicate-rich composition suggest an origin outside the main asteroid belt.

It has been proposed that Kamo'oalewa was once part of our moon, having been liberated by an asteroid impact between 1 million and 10 million years ago. Researchers have even identified a potential impact site – the 13.7-mile-wide (22 km) Giordano Bruno crater. However, confirmation of the origin hypothesis will have to wait for sample acquisition in late 2026 and its return to Earth in 2027.



469219 Kamo'oalewa orbits the Sun every 366 days on a trajectory closely matched with that of Earth and getting as close as 12.4 million miles (about 20 million km) from Earth.

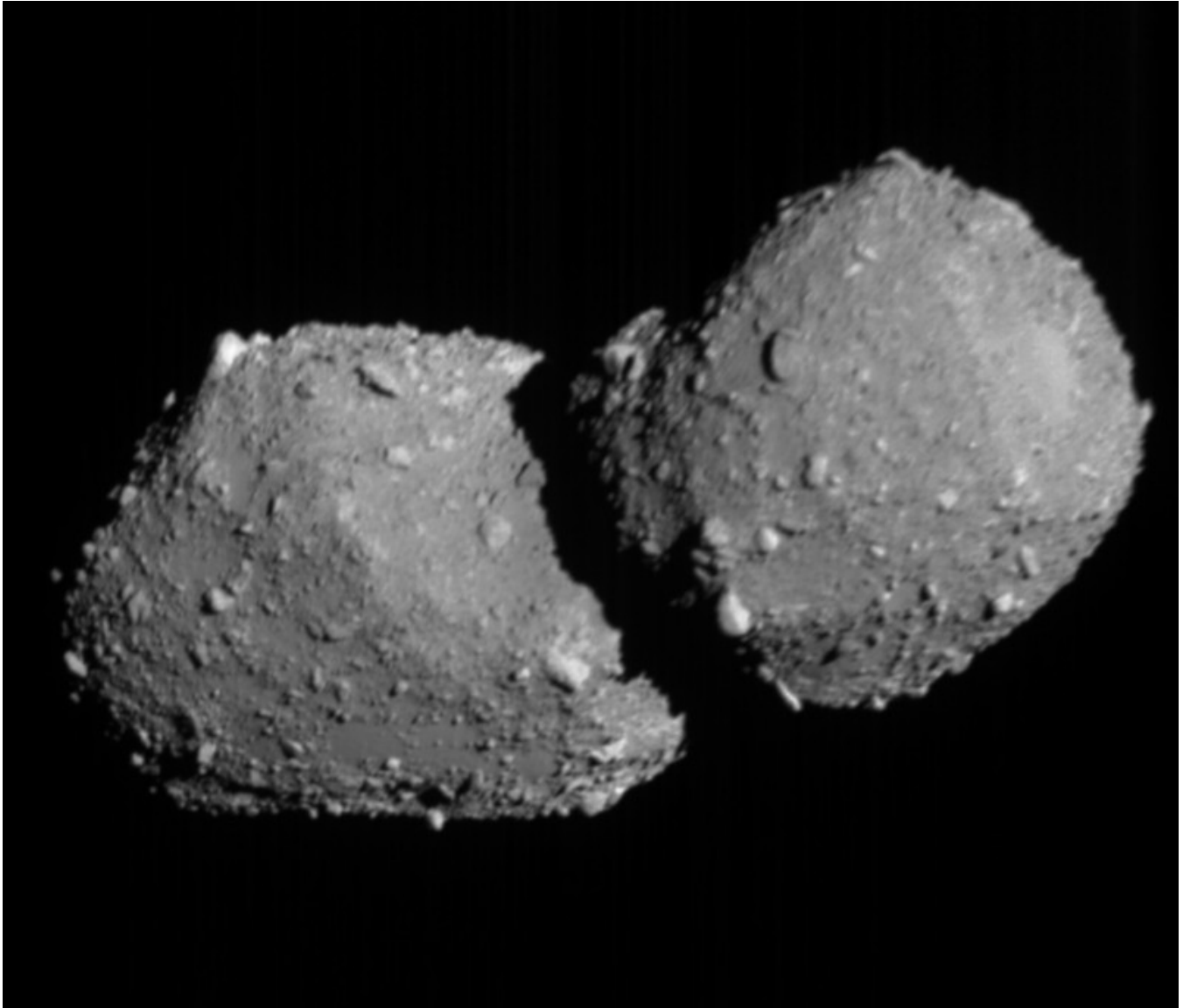
Orbital diagram: JPL Small Body Database



Giordano Bruno crater and suspected origin of the Kamo'oalewa asteroid.

Image credit: Nature Astronomy

Flyby of asteroid Torifune



Asteroid Torifune as seen by the Hayabusa2 probe's optical navigation camera on July 5, 2026.

Image credit: Japan Aerospace Exploration Agency

The Japan Aerospace Exploration Agency's (JAXA) Hayabusa2 probe, after delivering a sample from the asteroid Ryugu to Earth in December 2020, flew by another asteroid in early July. Now almost twelve years after it was launched, Hayabusa2 continues to deliver meaningful science on an extended mission.

The target of the flyby was the asteroid Torifune. Photos returned by the spacecraft reveal what appears as two asteroids fused together, or what is commonly known as a "contact binary." Hayabusa2 flew as close as 6 miles (10 kms) to the 1,475-foot long (450-meter) asteroid.

Torifune is classified as a member of the Apollo group of asteroids – near-Earth asteroids that spend most of their time outside Earth's orbit but at closest approach to the Sun cross our orbit. As such, they are considered to be potential impact hazards. This contact binary orbits the Sun once every 383 days and has a 5-hour rotation rate.

JAXA mission planners are now setting up Hayabusa2 for another deep space challenge – a visit to a tiny asteroid, the smallest yet to be visited by a spacecraft. The spacecraft is heading (after a couple of flybys of Earth) to asteroid 1998 KY26. The asteroid is only 36 feet (11 meters) in diameter and orbits the Sun once every 500 days. Hayabusa2 is scheduled to encounter 1998 KY26 in July 2031.

Storied History of “Slick 6”



Explosive demolition of launch pad SLC-6
U.S. Space Force photo by Staff Sgt. Daekwon Stith

A launch complex built at the Vandenberg Space Force Station in the 1960s to support Gemini, and later space shuttle launches from the west coast, has been dismantled to make way for more modern facilities from which to launch SpaceX's Falcon 9 and Falcon Heavy rockets. Humans never flew into space from Space Launch Complex-6 (SLC-6), with the Air Force's Manned Orbiting Laboratory canceled in 1969 as advances in orbiting reconnaissance satellites became more cost effective and safer than putting observers in space, and the failed promises of the space shuttle to provide ready access to low-Earth orbit following the Challenger accident in 1986.

The intent to fly dedicated shuttle missions from SLC-6 would have had the shuttle Discovery moved permanently to California. In the end, the only shuttle to reach the pad was the atmospheric trial vehicle Enterprise, for fit tests. Shuttles at Vandenberg would have been assembled on the pad in contrast to NASA's Kennedy Space Center where the external tank and solid rocket boosters were joined in the Vehicle Assembly Building and then rolled out to the pad.

Space Shuttle Enterprise at Vandenberg
Credit: Air Force



Test Flight 13



Ship captured in flight from the Booster after separation, bobbing in the Indian Ocean after landing, and under tow to Christmas Island

Image: SpaceX



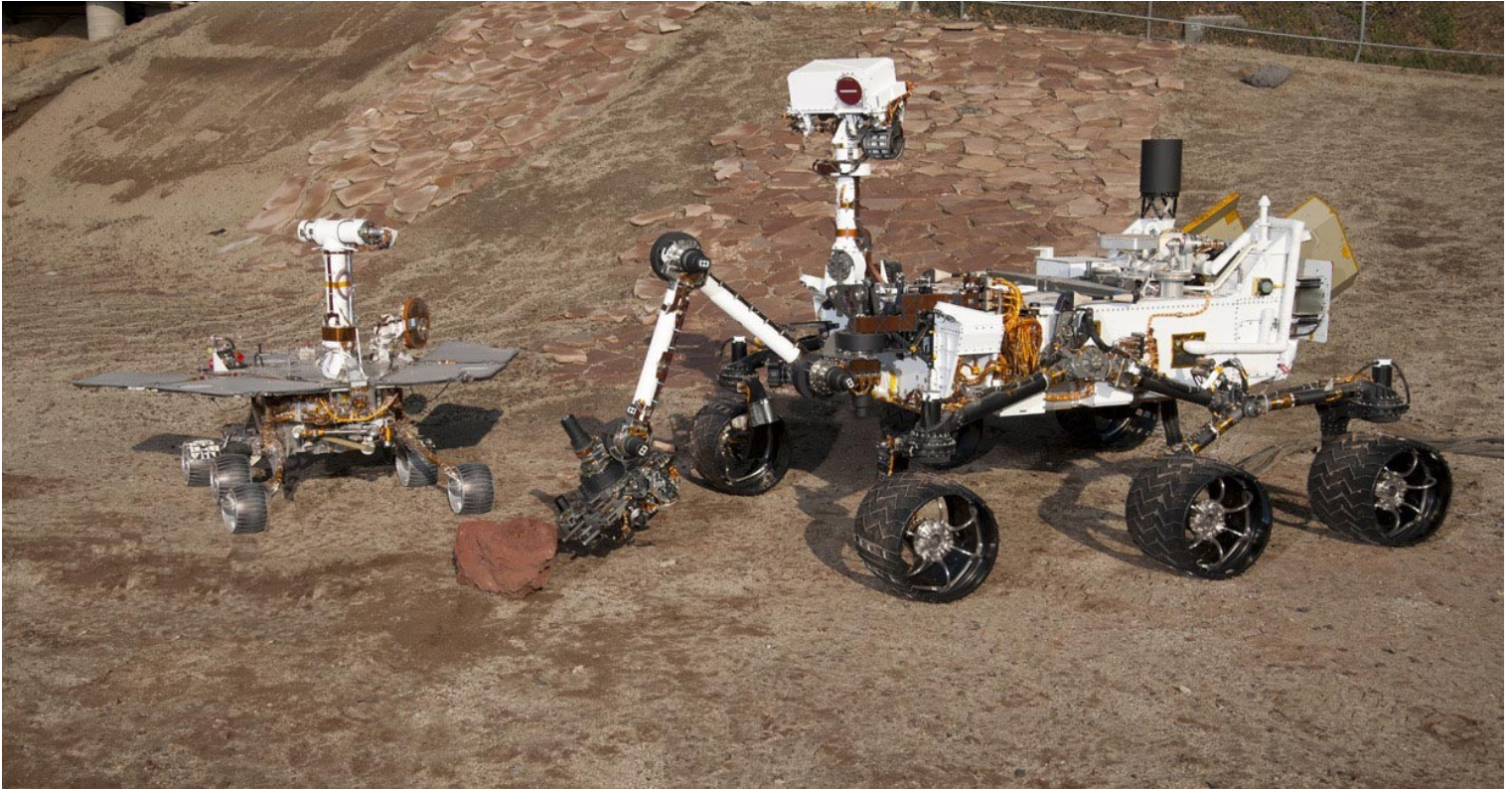
SpaceX's Starship ("Ship") Flight 13 was an unqualified success, with Ship completing a suborbital flight, during which it deployed 20 operational Starlink V3 satellites, performed a 14-second relit of a Raptor engine in space, and executed a picture-perfect reentry and splashdown in the Indian Ocean approximately 65 minutes after lifting off from the company's Starbase facility in southern Texas. Unlike previous ocean landings, where Starship would topple and explode upon impact before sinking, the Flight 13 vehicle remained intact and drifting on the surface.

With the opportunity to inspect a flown vehicle, SpaceX commenced recovery operations – slowly towing Ship to a safe harbor. After several weeks, Ship arrived at Christmas Island in the eastern Indian Ocean. The Ship has now been loaded onto a semi-submersible heavy-lift vessel for the journey back to Texas.

The flight was not without issues. The first stage booster executed a nominal liftoff, separation and boost-back burn. However, several engines failed to light during its landing burn resulting in a hard landing in the Gulf of Mexico. Also, while Ship's heat shield functioned as designed, it may not be as robust as SpaceX needs it to be for rapid reuse, with indications of super-heated air intrusion during reentry and multiple tiles that appear to be missing and/or broken that would need to be replaced (subject to a more detailed examination when it arrives home).

NASA awarded SpaceX a multi-billion dollar contract to develop a Human Landing System (HLS) for the Artemis program. However, the agency has raised concerns that SpaceX's HLS won't be ready in time to support the Artemis III flight in 2027. Delays in vehicle development prompted NASA to award a second contract for a HLS to Blue Origin. While Blue Origin has made progress qualifying its Blue Moon lunar lander, its New Glenn launch vehicle suffered a catastrophic failure during a ground test earlier this year.

Setting a New Off-World Driving Record



Size comparison of the Mars Exploration Rovers (e.g., Opportunity and Spirit) with the latest generation (e.g., Curiosity and Perseverance)

Image courtesy of NASA/JPL-Caltech

NASA's Perseverance rover is closing in on a new total distance record for a wheeled vehicle operating on another world. In the next few days, the Mars 2020 rover will surpass the distance traveled by NASA's Opportunity rover. "Oppy" held the record, set in 2018 (28.06 miles or 45.16 kilometers) before becoming trapped in a global dust storm – more than 14 years after landing on the Red Planet for a 90-day mission.

Opportunity was a roving geologist, visiting over 100 impact craters in its travels - from those whose dimensions were measured in inches (cm) to the 14 mile (22 km) Endeavour crater. By comparison, Perseverance has confined its travels to the delta and rim areas of Jezero crater.

That Perseverance will become the new distance record holder doesn't diminish Opportunity's accomplishments. Unlike its nuclear powered successor, the diminutive Opportunity had a mass of about 150 pounds or 70 kgs on Mars as compared to Perseverance's 866 pound (393 kg) mass and with wheels half the size. Driving across the plains and dunes of Meridiani Planum was both cautious and deliberate. Each drive was planned on Earth before relayed to the rover to execute, with the results downloaded and analyzed before moving on.



Wheel comparison of the two generations of Mars rovers

Image courtesy of NASA/JPL-Caltech

By comparison, Perseverance is equipped with an autonomous navigation system that identifies obstacles while in motion and adjusts its path accordingly. "AutoNav" has enabled the rover to travel longer distances over rugged terrain without intervention from its handlers on Earth.

Project MoonFall



Artist's rendering of a MoonFall drone operating near the Moon's south pole.

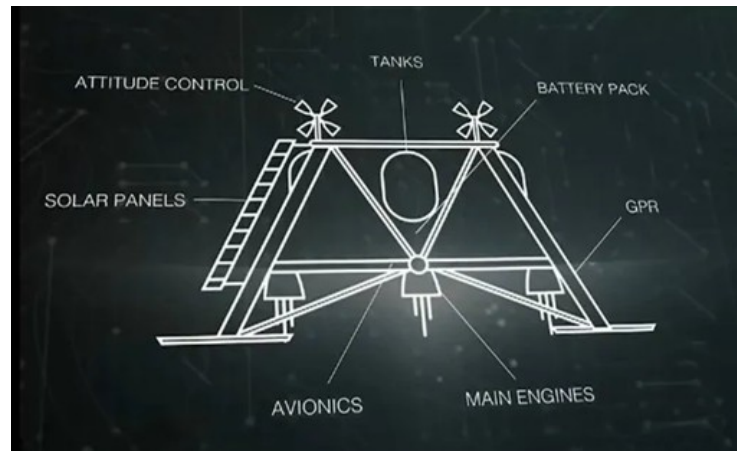
Image source: NASA

Sometime next year, a Firefly Aerospace Elytra Dark spacecraft will transport four drones to the Moon as part of a project NASA has dubbed "MoonFall." While the Firefly spacecraft will remain in lunar orbit, the four drones will be dispersed to sites near the Moon's south pole.

The drones, built by the Jet Propulsion Laboratory (JPL) in Pasadena, California, will spend a lunar day (approximately 14 Earth days) using their small rocket engines to "hop" around the cratered landscape. Their high-definition cameras will build detailed maps of the terrain at a significantly higher resolution than current satellite imagery. Each drone is expected to cover about 30 miles (50 kms) during its operational life.

Drone neutron spectrometers will measure subsurface water ice in permanently shadowed regions and radiation spectrometers will characterize the radiation environment around the south pole.

While the propellant systems are not expected to survive the intense cold of the lunar night, the drone's operating systems are designed for reactivation once the Sun reappears.



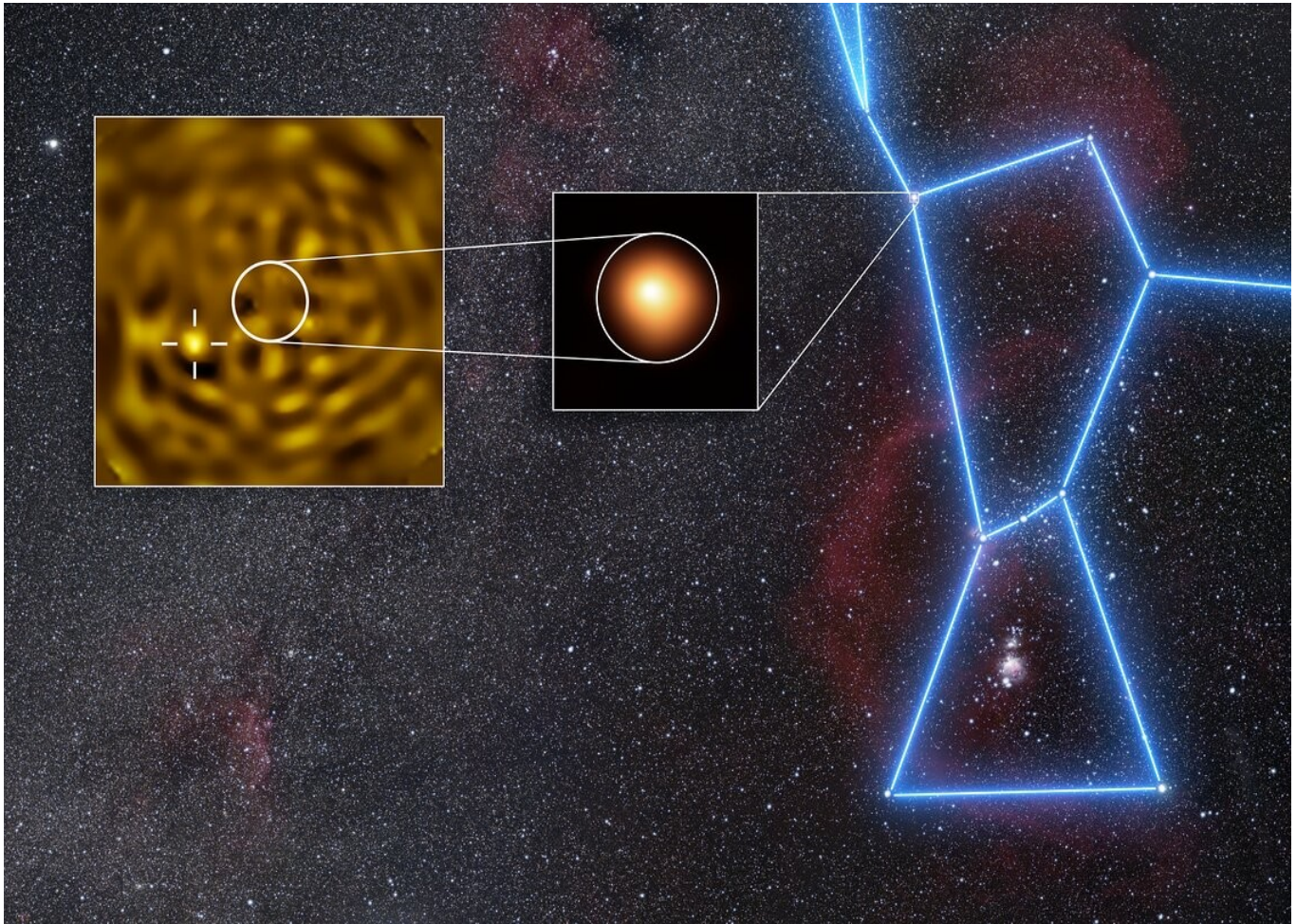
MoonFall drone configuration

Image source: NASA

Each drone will be able to operate independently (putting to use JPL's experience with the Martian helicopter Ingenuity) and will be equipped with a laser retroreflector array for tracking their location.

MoonFall will aid in landing site selection for Artemis IV, and future missions, as well as identifying in-situ resources to sustain a permanent human presence on the Moon.

Companion of Betelgeuse Imaged



VLT images of Betelgeuse and its companion

Credit: ESO/M. Montargès et al. Background: N. Rissinger (skysurvey.org)

The European Southern Observatory's Very Large Telescope (VLT), situated in Chile's Atacama Desert, has captured the clearest image of, what is likely, the stellar companion to the red supergiant Betelgeuse. Long suspected, but hidden in the glare of Betelgeuse, astronomers waited until the star, dubbed Betelgeuse B, was predicted to be furthest away from the red giant in its orbit before attempting to image it with their adaptive optics SPHERE instrument (designed to detect faint planets by blocking the light of the host star).

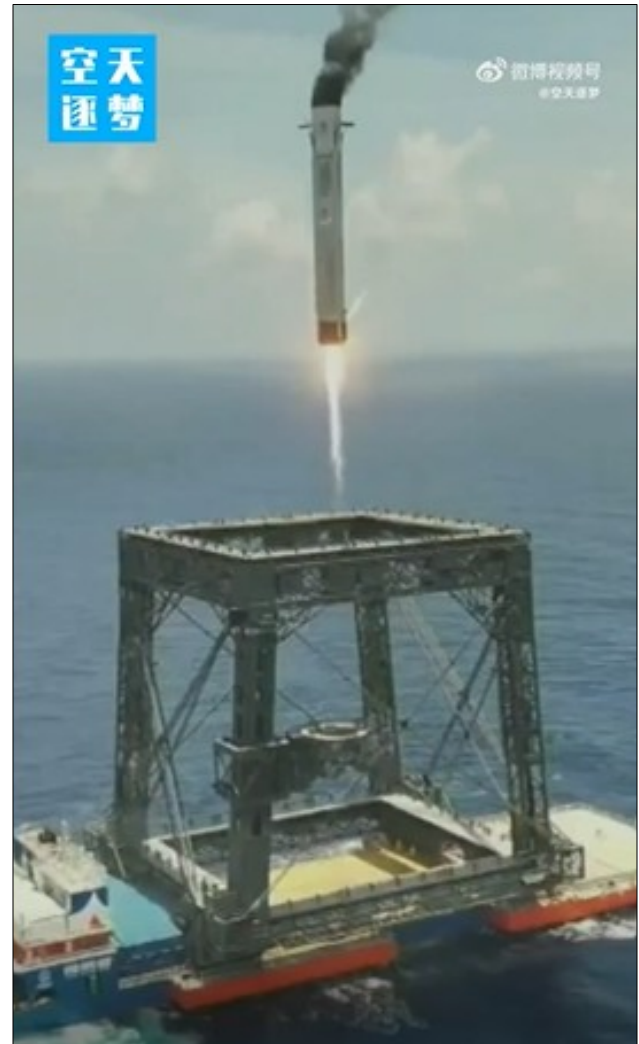
Betelgeuse B was larger and brighter than had been expected, estimated at two to three times the mass of our Sun, which aided in its detection. The presence of a companion had long been proposed to explain Betelgeuse's periodic changes in brightness.

ESO plans follow-up observations when Betelgeuse B is on the other side of the primary, but are very confident that they have found the elusive companion. Still unanswered is how the companion will affect the evolution of the supergiant when it undergoes a core-collapse supernova sometime within the next 100,000 years or so.

Race to Reusability



First hop of Japan's RV-X reusable rocket
Image credit: JAXA



Catch of the Long March 10B rocket after a successful flight
Image credit: CCTV

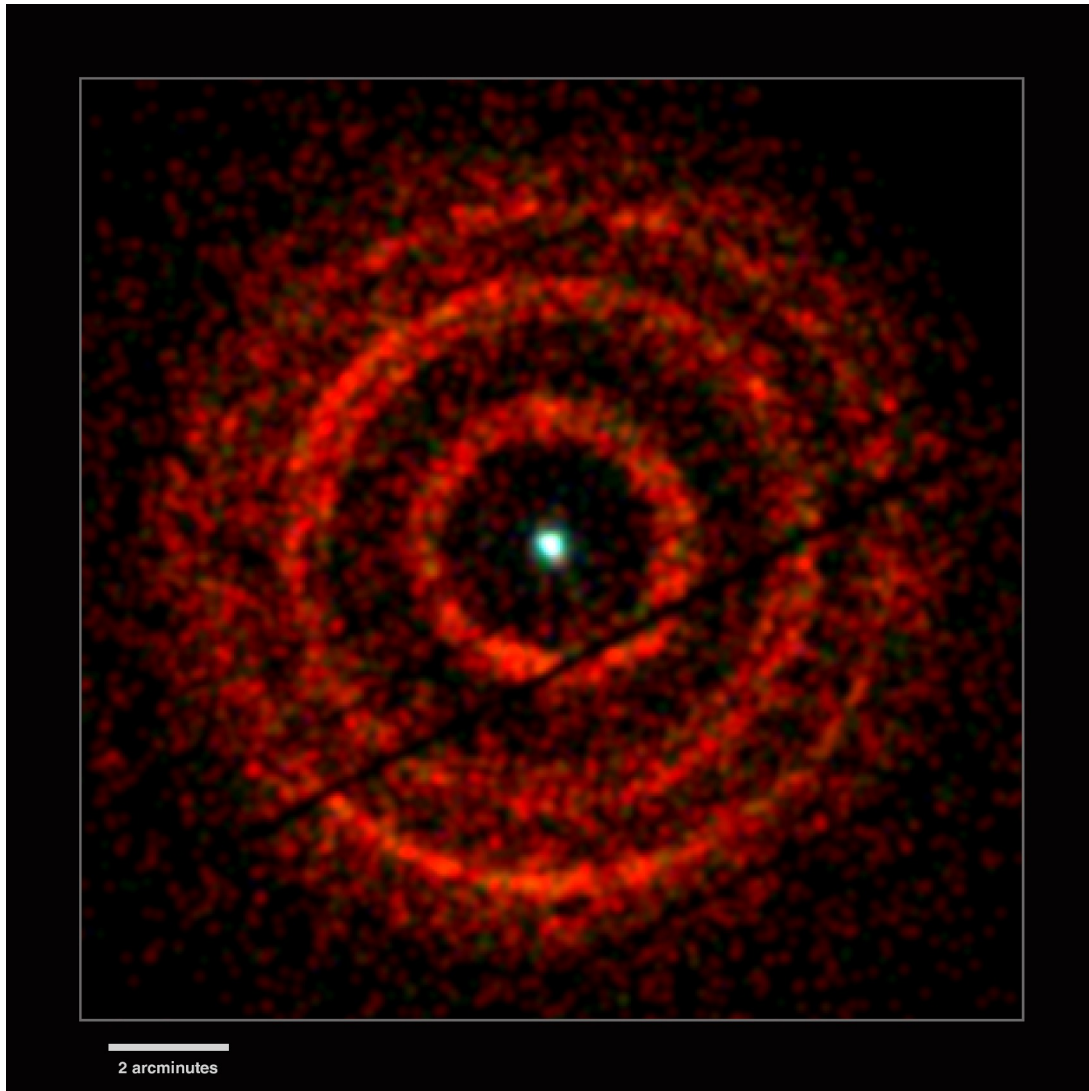
SpaceX has demonstrated the value of reusability with their Falcon 9 rocket boosters (Booster No. 1067 has flown a record 35 times, with six other boosters flying more than 25 times). The company's success has not gone unnoticed with several of their competitors aiming to duplicate SpaceX's business model.

Japan made one small step towards that goal with the successful flight of the Japan Aerospace Exploration Agency's (JAXA) RV-X experimental reusable rocket prototype on July 11th at their Noshiro test facility. The 24-foot-tall (7.3 meters) vehicle rose just over 33 feet (10 meters) into the air before traveling a horizontal distance of approximately 50 feet (15 meters) and landing on the opposite side of the pad.

JAXA's work with RV-X is part of a larger initiative and joint venture with France's space agency CNES and the German Aerospace Center (DLR) to design and build a single-stage rocket for reuse. Called the "Cooperative Action Leading to Launcher Innovation in Stage Toss-back Operations," or CALLISTO, the goal is to develop and evaluate the technologies needed for reusable launch services.

Not to be outdone, several companies in China have been developing and started flying their own reusable launch vehicles. On July 10th, a Chinese Long March 10B booster was recovered approximately six minutes after stage separation (and after a satellite was successfully placed into low-Earth orbit by the second stage). It was the first time that a Chinese rocket has been recovered. The recovery took place at sea, with the kerosene and liquid oxygen powered booster captured by a net-like structure. According to the China Aerospace Science and Technology Corporation, the main contractor for China's space program, the intent is to re-fly the rocket by the end of the year. Chinese CAS Space, Galactic Energy and Deep Blue Aerospace are also developing reusable vehicles.

Space Rescue Fails



Rings of X-ray light centered on a binary system containing an erupting black hole (dot at center) imaged by the Swift Observatory's X-ray telescope

Credit: Andrew Beardmore (Univ. of Leicester) and NASA/Swift

The last ditch effort to save NASA's Neil Gehrels Swift Observatory has been abandoned. Katalyst Space's robotic servicing spacecraft LINK, launched into orbit on a Northrop Grumman Pegasus XL rocket and designed to raise Swift's orbit, developed control issues less than a month into the mission when two of the spacecraft's three reaction wheels stopped working properly and the cold gas thruster system experienced a partial loss of functionality. The failures placed LINK into an uncontrolled spin that impeded ground communications.

The Katalyst team was able to reduce the spin using one of LINK's electric propulsion thrusters and upload new flight software for the spacecraft's new configuration. However, considering the ongoing attitude control issues, Katalyst Space and NASA decided not to proceed with the mission (capture and boost of the observatory). Katalyst will attempt to move LINK into a position closer to Swift to gather data for future servicing missions.

The telescope is expected to enter the Earth's atmosphere by year end. Launched in 2004, Swift was unique in its ability to respond quickly to energetic outbursts from cataclysmic events in our universe. Its Burst Alert wide-field telescope scanned the sky for gamma-ray bursts. Within a minute of detection, the spacecraft would automatically swivel to point its narrow-field instruments (X-ray and Ultraviolet/Optical telescopes) at the target to gather detailed data on the transient event and alert ground telescopes.



FREE EVENT

John J. McCarthy Observatory
Behind the New Milford High School
860.946.0312

www.mccarthyobservatory.org

September 12th

8:00 - 10:00 pm

Free Star Party

Featuring:

**AstroFun 104: The Ice Giants,
Uranus and Neptune**



All are welcome to enjoy
a brief presentation along with
observing* the sights of the late
spring night sky through
a variety of telescopes!

*Observing if weather permits



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