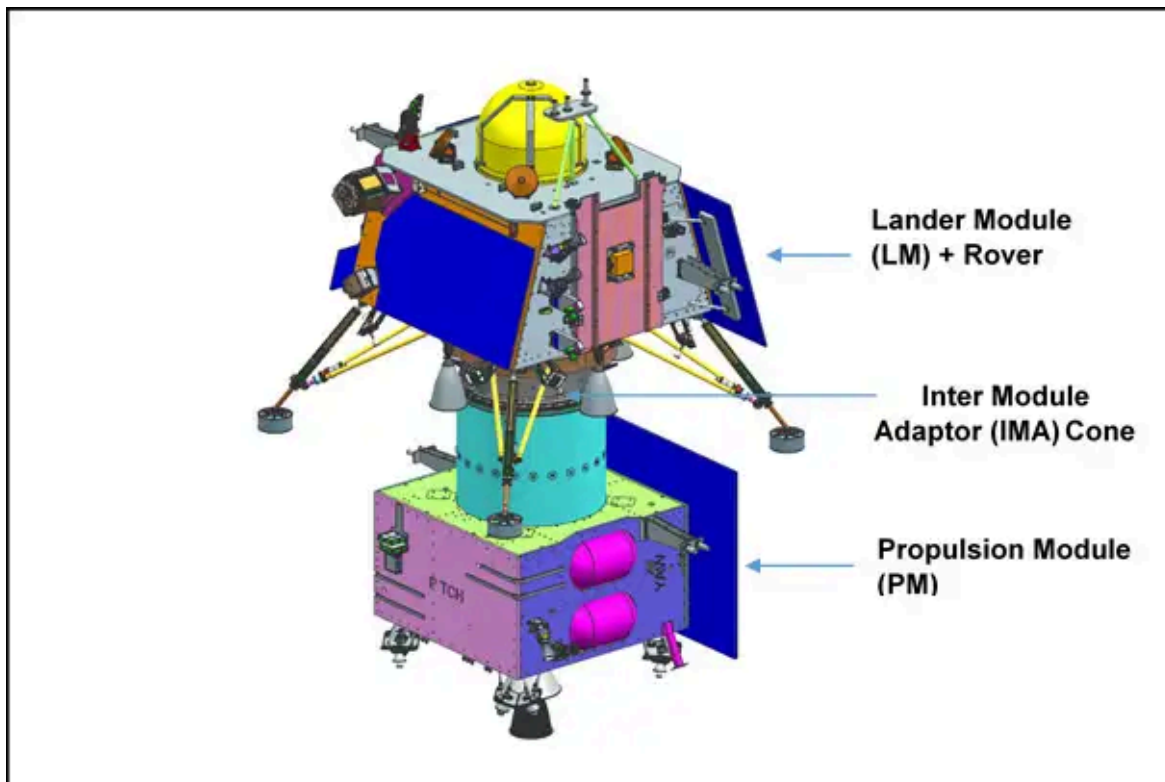


India accomplished a great feat when the Chandrayaan-3 spacecraft made a successful soft landing close to the south pole of the moon. India now joins the United States, the Soviet Union, and China as the fourth nation to successfully land a spacecraft on the moon. At 12:33 GMT (6:03 p.m. Indian Standard Time), the landing took place. The successful landing was announced by Indian Space Research Organisation (ISRO) chairman Sreedhara Somanath after the (ISRO) confirmed it. The achievement was praised by India's Prime Minister Narendra Modi, who emphasised its importance for international space exploration. The spacecraft is made up of the lander Vikram and the rover Pragyan. For roughly 14 Earth days, the solar-powered rover Pragyan will explore the moon's surface and gather scientific data.

India's second attempt at a lunar landing close to the moon's south pole was successful thanks to Chandrayaan-3 after the initial launch, Chandrayaan-2, was unsuccessful in September 2019 due to a software glitch resulting in a communication loss. The Vikram-Pragyan team successfully manoeuvred to lower orbits after separating from the propulsion module and established communication with Chandrayaan-2's orbiter, which serves as a link to Earth. A number of modifications to the landing strategy were made in order to enable the successful touchdown, including better algorithms, bigger landing zones, stronger landing legs, and dynamic engines for better velocity control.

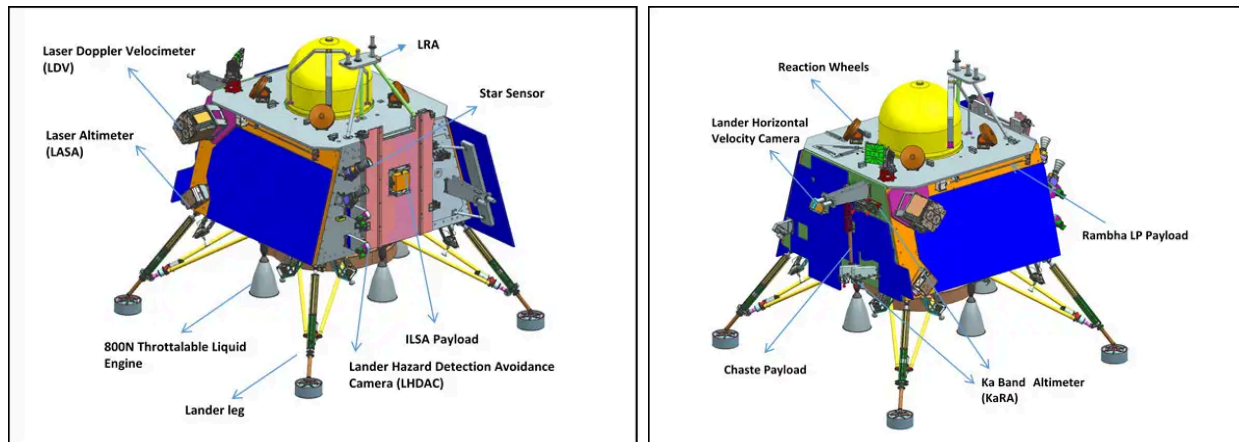
Chandrayaan-3 is the next project after Chandrayaan-2. It will show how safe it is to land and manoeuvre around on the moon's surface from start to finish. It is a combination of Lander and Rover design. The GSLV MkIII will carry it from SDSC SHAR in Sriharikota. The propulsion module will propel the lander and rover until they are 100 km above the moon's surface.



Combined view of the lander and the propulsion module (Image Credits: ISRO)

Lander

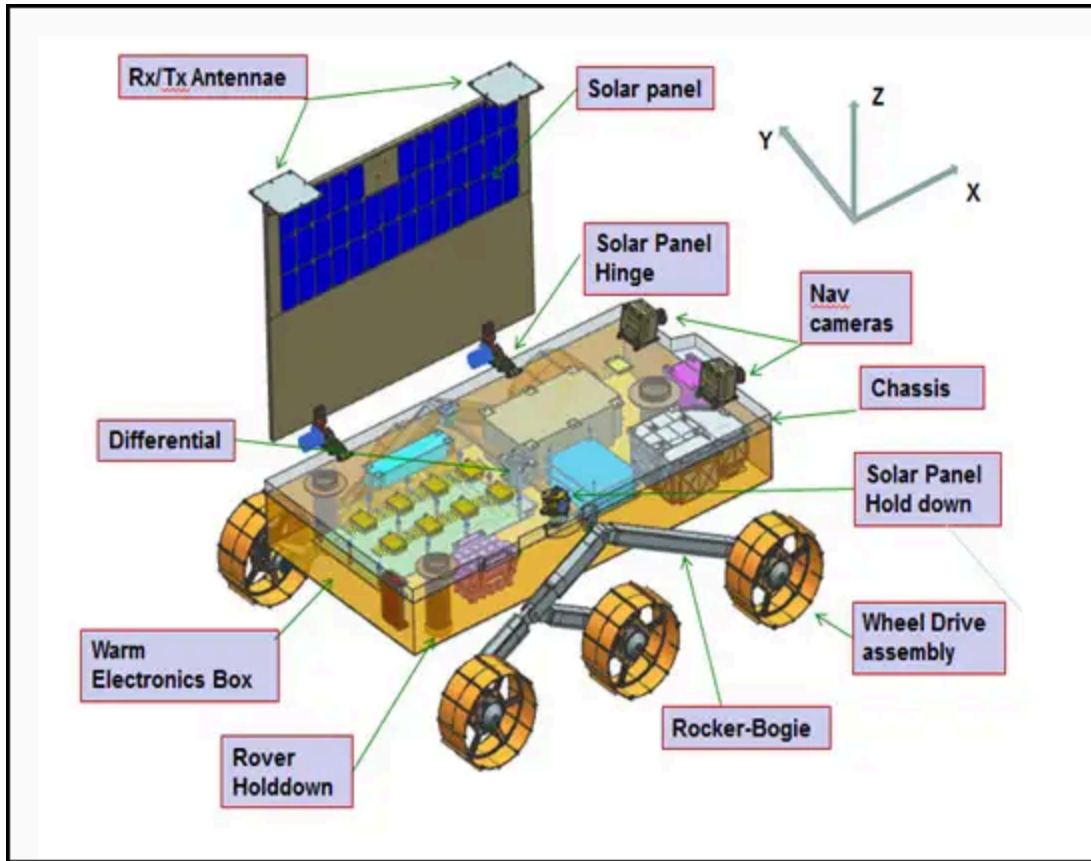
The Vikram lander is responsible for the soft landing on the Moon. It is in the shape of a box and has four landing legs and four landing engines that can each generate a thrust of 800 newtons. It takes the rover and a number of scientific tools that can be used to do research on the spot. The lander is different from Chandrayaan-2's lander in that it has four engines that can change how fast they turn. Chandrayaan-2's lander had five engines, but the fifth one was in the middle and could only do set thrust. One of the main reasons why Chandrayaan-2 couldn't land was that its orientation got worse while the camera was coasting. This problem was fixed by letting the lander control its attitude and thrust at all times during the fall. With Chandrayaan-3, the rate of attitude correction has gone up from $10^\circ/\text{s}$ on Chandrayaan-2 to $25^\circ/\text{s}$. The Chandrayaan-3 rover also has a laser Doppler velocimeter (LDV) that lets altitude be measured in three directions. Compared to Chandrayaan-2, the legs that take the impact have been made stronger, and the redundancy of the instruments has been better. Based on images from the Orbiter High-Resolution Camera (OHRC) on Chandrayaan-2's orbiter, it will aim for a more accurate 16 km^2 (6.2 sq mi) landing area. ISRO made the structure stronger, increased the number of polling points in the instruments, increased the frequency and speed of data transfer, and added more backup systems to make the lander more likely to survive if something went wrong during descent and landing.



Chandrayaan 3 Lander Vikram (Image Credits: ISRO)

Rover

The Pragyan rover is an automotive device with six wheels and a weight of 26 kg (57 lb). It is 917 mm (3.009 ft) long, 750 mm (2.46 ft) wide, and 397 mm (1.302 ft) tall. The rover is scheduled to take a number of measurements that will help scientists learn more about the composition of the Moon's surface, whether there is water ice under the surface, the history of impacts on the Moon, and how its atmosphere has changed over time.



Chandrayaan 3 Rover Pragyaan (Image Credits: ISRO)

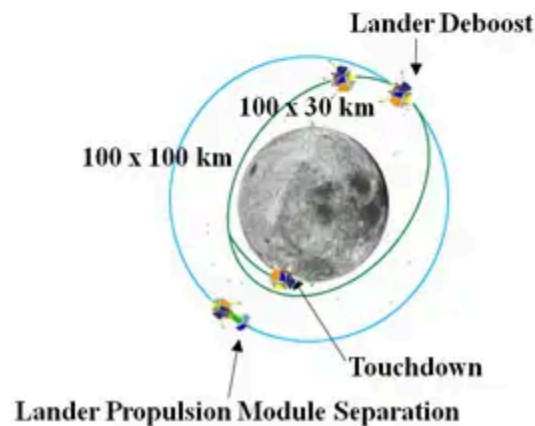
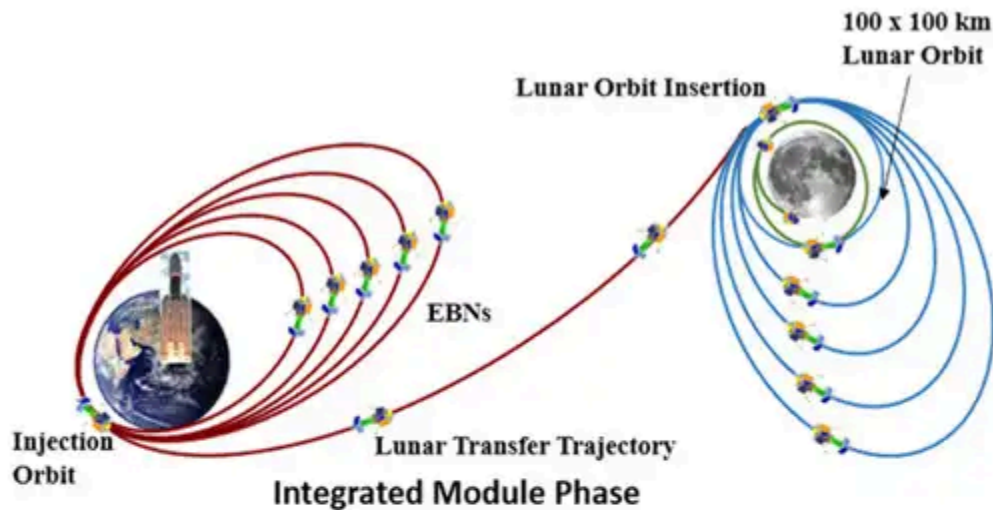
Payloads

On the lander, Chandra's Surface Thermophysical Experiment (ChaSTE) to measure the thermal conductivity and temperature; Instrument for Lunar Seismic Activity (ILSA) to measure the seismicity around the landing site; Langmuir Probe (LP) to predict the plasma density and how it changes. For laser ranging studies on the moon, NASA has set up a passive Laser Retroreflector Array. On the rover, Alpha Particle X-ray Spectrometer (APXS) and Laser Induced Breakdown Spectroscope (LIBS) for deriving the elemental composition in the vicinity of the landing site. The propulsion module has Spectro-polarimetry of Habitable Planet Earth (SHAPE) payload to study the spectral and Polari metric measurements of Earth from the lunar orbit.

Mission Profile

Chandrayaan-3 was sent into space on an LVM3-M4 rocket on July 14, 2023, at 9:05 UTC from the Satish Dhawan Space Centre Second Launch Pad in Sriharikota, Andhra Pradesh, India. It went into an Earth parking orbit with a perigee of 170 km (106 mi) and an apogee of 36,500 km (22,680 mi). ISRO did a lunar-orbit insertion (LOI) on August 5 to put the Chandrayaan-3 spaceship in an orbit around the Moon. This was done after a series of manoeuvres on Earth put Chandrayaan-3 in a trans-lunar injection orbit. ISRO Telemetry, Tracking, and Command Network (ISTRAC) in Bengaluru ran the LOI mission. The Vikram lander pulled away from the propulsion module on August 17 to start the last part of the mission.

When the lander reached the low point of its orbit on August 23, 2023, its four engines fired to slow it down. This was done 30 kilometres (19 miles) above the Moon's surface. After 11.5 minutes, the lander was 7.2 km (4.5 miles) above the surface. It stayed at this height for about 10 seconds, then stabilized itself with eight smaller engines and turned from a horizontal to a vertical position while continuing to fall. Then, it used two of its four engines to slow its fall until it was about 150 meters (490 feet) above the ground. It hovered there for about 30 seconds while it looked for the best place to land, then kept going down and landed at 12:32 UTC.



Mission Profile of Chandrayaan (Image Credits: ISRO)

