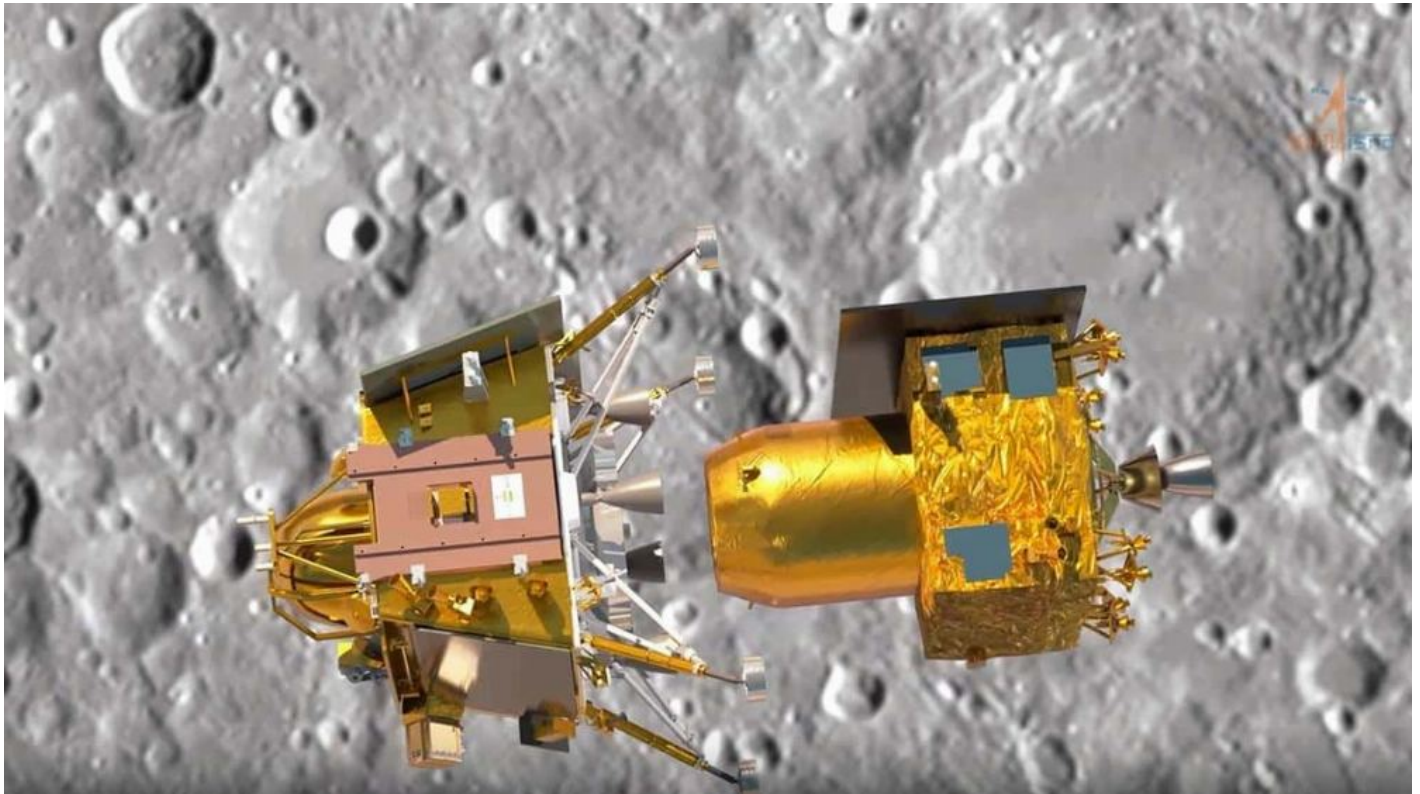


Chandrayaan-3 Propulsion Module retraces steps to Earth Orbit

December 7, 2023 • vajiramandravi.com



What's in Today's Article?

- Why in the News?
- What is Chandrayaan-3 Mission?
- What is a Propulsion Module in Chandrayaan-3?
- Significance of Propulsion Module Coming Back to Earth's Orbit

Why in the News?

- Scientists have brought the Propulsion Module (PM) of the Chandrayaan-3 mission back into Earth orbit.

What is Chandrayaan-3 Mission?



The infographic is set against a dark space background with a faint image of the Moon's surface. It is divided into two main sections: 'Lander Payloads' and 'Rover Payloads'. The 'Lander Payloads' section includes three items: RAMBHA-LP (a small probe), ChaSTE (a bundle of wires), and ILSA (a box-like instrument). The 'Rover Payloads' section includes two items: APXS (a small electronic device) and LIBS (a larger instrument). To the right of these is a separate section for the 'Propulsion Module Payload' which includes SHAPE (a large, complex instrument). The ISRO logo is in the top right corner.

Lander Payloads



RAMBHA-LP
Langmuir Probe
To measure the near surface plasma (ions and electrons) density and its changes with time.



ChaSTE
Chandra's Surface Thermo-physical Experiment
To carry out the measurements of thermal properties of lunar surface near polar region.



ILSA
Instrument for Lunar Seismic Activity
To measure seismicity around the landing site and delineating the structure of the lunar crust and mantle.

Rover Payloads



APXS
Alpha Particle X-Ray Spectrometer
To determine the elemental composition (Mg, Al, Si, K, Ca, Ti, Fe) of lunar soil and rocks around the lunar landing site.



LIBS
Laser Induced Breakdown Spectroscope
To derive the chemical composition and infer mineralogical composition to further enhance our understanding of lunar surface.

Propulsion Module Payload



SHAPE
Spectro-polarimetry of Habitable Planet Earth
An experimental payload to study the spectro-polarimetric signatures of the habitable planet Earth in the near-infrared (NIR) wavelength range (1-1.7 μm).

- Chandrayaan-3 is a follow-on mission to Chandrayaan-2 (2019) to demonstrate ISRO's end-to-end capability in safe landing and roving on the Moon's surface.
- It comprises an indigenous propulsion module, lander module (called Vikram), and a rover (called Pragyaan) with the objective of developing and demonstrating new technologies required for inter-planetary missions.
- The propulsion module, other than carrying the lander and rover configuration till about 100 km lunar orbit, carries the Spectro-polarimetry of Habitable Planet Earth (SHAPE) payload to study spectral and polarimetric measurements of the Earth from lunar orbit.
- On August 23rd, Vikram Lander made its historic touchdown on Moon and subsequently Pragyaan rover was deployed.
- With the success of Chandrayaan-3, India joined United States, Russia, and China as one of the few countries to successfully land on the Moon.

What is a Propulsion Module in Chandrayaan-3?

- The propulsion module is a box-shaped component of the Chandrayaan-3 spacecraft powered by solar panels.
- With regard to Propulsion Module, the main objective was to ferry the Lander module to the final lunar polar circular orbit and separate the Lander.
- Subsequent to separation, SHAPE payload in the PM was also operated.
- The initial plan was to operate this payload for about three months during the mission life of PM.
- On December 4th, the ISRO announced that it had moved Chandrayaan-3's PM out of lunar orbit and placed it high above Earth for a bonus mission, where it now survives on leftover fuel.
- The new experiment will demonstrate technologies that will help Indian scientists bring samples from the moon to Earth someday, ISRO said.
- The ISRO has not revealed what it plans to do with the spacecraft when it runs out of fuel.

Significance of Propulsion Module Coming Back to Earth's Orbit

- ISRO added that the following are the main outcome from the return maneuvers carried out on PM related to future missions:
 - Planning and execution of trajectory and maneuvers to return from Moon to Earth.
 - Development of a software module to plan such a maneuver and its preliminary validation.
 - Planning and execution of a gravity assisted flyby across a planet/celestial body.
 - Avoiding uncontrolled crashing of the PM on the Moon's surface at the end of life of PM thus meeting the requirements of no debris creation.
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Q1) What is the meaning of Low Earth Orbit?

A low Earth orbit (LEO) is an orbit around Earth with a period of 128 minutes or less (making at least 11.25 orbits per day) and an eccentricity less than 0.25.

Q2) What is meant by space debris?

Space debris, artificial material that is orbiting Earth but is no longer functional. This material can be as large as a discarded rocket stage or as small as a microscopic chip of paint.

Source: <https://vajiramandravi.com/current-affairs/chandrayaan-3-2/>

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