



Research Unit
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India's Mission Chandrayaan-3

(Department of Space)

August 25, 2023

“Chandrayaan-3 scripts a new chapter in India's space odyssey. It soars high, elevating the dreams and ambitions of every Indian. This momentous achievement is a testament to our scientists' relentless dedication. I salute their spirit and ingenuity!”

- [Prime Minister Narendra Modi](#)

On Wednesday, August 23, 2023, India created history with the successful soft landing of Chandrayaan 3 on the surface of the Moon in the South Pole area. Prime Minister Narendra Modi remarked that Chandrayaan-3's triumph mirrors the aspirations and capabilities of 140 crore Indians.¹

Sharing a post on X by the Indian Space Research Organisation, the Prime Minister said: *“Chandrayaan-3's triumph mirrors the aspirations and capabilities of 140 crore Indians. To new horizons and beyond! Proud moment for IN.”*

About Chandrayaan 3

Chandrayaan 3, a follow-on mission to Chandrayaan-2, is an ISRO (Indian Space Research Organization) mission with the primary objective of putting a lander and rover in the highlands near the south pole of the Moon and demonstrating end-to-end landing and roving capabilities. It will also make several scientific measurements on the lunar surface and from orbit. It comprises a lander/rover and a propulsion module.

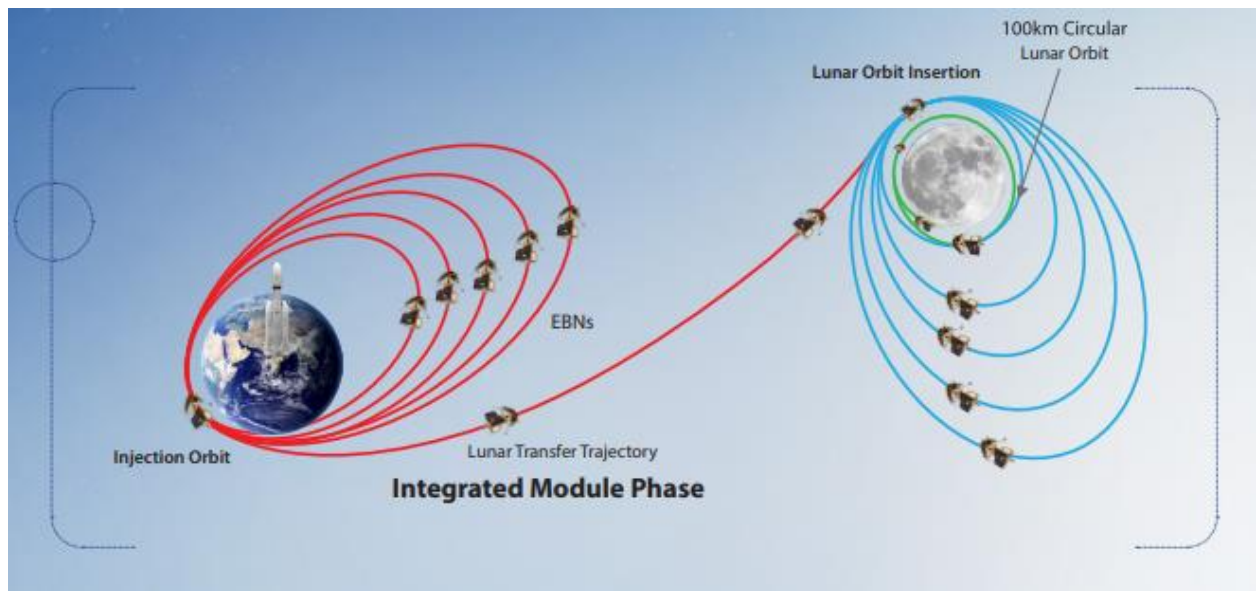
The lander/rover is similar to the **Vikram rover** on Chandrayaan 2, with improvements to help ensure a safe landing. The propulsion module carries the lander and rover configuration and will remain in orbit around the Moon while acting as a communications relay satellite.



¹ <https://pib.gov.in/PressReleasePage.aspx?PRID=1951503>

Mission Profile

Chandrayaan 3 launched on July 14, 2023, at 9:05:17 UT (2:35 p.m. India Standard Time), on a Geosynchronous Satellite Launch Vehicle [GSLV Mark 3 \(LVM 3\)](#) heavy-lift launch vehicle from Satish Dhawan Space Center in Sriharikota, Andhra Pradesh, into an approximately 170 x 36,500 km elliptic parking orbit. It placed Chandrayaan 3 into an approximately 170 x 36,500 km elliptic parking orbit. The propulsion module brought the lander/rover into a 100 km circular polar lunar orbit and separated. The lander then touched down with the rover in the south-polar region of the Moon.



The touchdown occurred on August 23, 2023. Touchdown velocity had been planned to be less than 2 m/s vertical and 0.5 m/s horizontal. The propulsion module/communications relay satellite will remain in lunar orbit to enable communications with Earth. Chandrayaan 2 was also used as a backup relay. The lander and rover are designed to operate for one lunar daylight period (about 14 Earth days).²

Objectives of Chandrayaan-3

- ✓ To demonstrate a Safe and Soft Landing on Lunar Surface
- ✓ To demonstrate Rover exploring the moon's surface, and
- ✓ To conduct in-situ scientific experiments.

² <https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=CHANDRYN3>

Configuration and payloads of Chandrayaan-3

Chandrayaan-3 consists of an indigenous **propulsion module (PM)**, a **lander module (LM)**, and a rover to develop and demonstrate new technologies required for interplanetary missions. The propulsion module carried the lander and rover from injection orbit to 100 km lunar orbit. It also carries a **Spectro-polarimetry of Habitable Planetary Earth (SHAPE)** payload to study the spectral and polarimetric measurements of Earth from the lunar orbit.

The Lander and the Rover have scientific payloads to carry out experiments on the lunar surface. The main function of the PM is to carry the LM from launch vehicle injection to final lunar 100 km circular polar orbit and separate the LM from the PM. Apart from this, the Propulsion Module also has one scientific payload as a value addition which will operate post-separation of the Lander Module.³



Major Specifications of Lander		Major Specifications of Rover	
Mission life	: 1 Lunar day (14 Earth days)	Mission Life	: 1 Lunar day
Mass	: 1749.86 kg including Rover	Mass	: 26 kg
Power	: 738 W (Winter solstice)	Power	: 50 W
Payloads	: 3	Payloads	: 2
Dimensions (mm ³)	: 2000 x 2000 x 1166	Dimensions (mm ³)	: 917 x 750 x 397
Communication	: ISDN, Ch-2 Orbiter, Rover	Communication	: Lander
Landing site	: 69.367621 S, 32.348126 E		

³ https://www.isro.gov.in/Chandrayaan3_New.html

Lander payloads: Chandra's Surface Thermophysical Experiment (ChaSTE) to measure the thermal conductivity and temperature; Instrument for Lunar Seismic Activity (ILSA) for measuring the seismicity around the landing site; Langmuir Probe (LP) to estimate the plasma density and its variations. A passive Laser Retroreflector Array from NASA is accommodated for lunar laser ranging studies.

Rover payloads: Alpha Particle X-ray Spectrometer (APXS) and Laser Induced Breakdown Spectroscope (LIBS) for deriving the elemental composition in the vicinity of the landing site.



Chandrayaan 1

- Chandrayaan 1 was an Indian Space Research Organization (ISRO) mission designed to orbit the Moon over two years with the objectives of upgrading and testing India's technological capabilities in space and returning scientific information on the lunar surface.
- The spacecraft launched on a PSLV C11 (Polar Satellite Launch Vehicle) from the Satish Dhawan Space Center in Sriharikota on the southeast coast of India on **October 22, 2008**, at 00:52 UT (6:22 a.m. local time).
- The Indian Space Research Organization announced on August 31 that the Chandrayaan 1 mission has been officially terminated after contact was lost abruptly at 20:00 UT on August 28.⁴

⁴ [NASA - NSSDCA - Spacecraft - Details](#)

Chandrayaan 2

- Chandrayaan 2 was launched on **July 22, 2019** at 9:13 UT (2:43 p.m. Indian Standard Time) from Satish Dhawan Space Center, Sriharikota on a GSLV Mark III.
- The primary objective of Chandrayaan 2 was to demonstrate the ability to soft-land on the lunar surface and operate a robotic rover on the surface. Scientific goals include studies of lunar topography, mineralogy, elemental abundance, the lunar exosphere, and signatures of hydroxyl and water ice.
- Contact was lost during the lander's descent at an altitude of about 2.1 km. The lander crashed on the surface and remained in one piece, but communications and operations were impossible.
- The rover was to be deployed using a ramp shortly after landing. The lander and rover portions of the mission were planned for 14-15 days, one period of lunar daylight. The orbiter was designed for a mission life of one year but continues to operate.⁵

Here's how Mission Chandrayaan-3 went on as per ISRO's updates:

- **July 14, 2023**

LVM3 M4 vehicle successfully launched Chandrayaan-3 into orbit. Chandrayaan-3, in its precise orbit, has begun its journey to the Moon.

- **July 15, 2023**

The first orbit-raising manoeuvre (Earthbound firing-1) successfully performed at ISTRAC/ISRO, Bengaluru. Spacecraft now in 41762 km x 173 km orbit.

- **July 17, 2023**

The second orbit-raising manoeuvre performed. The spacecraft now in 41603 km x 226 km orbit.

- **July 22, 2023**

The fourth orbit-raising manoeuvre (Earth-bound perigee firing) completed. The spacecraft placed in a 71351 km x 233 km orbit.

- **July 25, 2023**

Orbit-raising manoeuvre performed on July 25, 2023. The next firing (Trans Lunar Injection), planned for August 1, 2023.

- **August 01, 2023**



⁵ [NASA - NSSDCA - Spacecraft - Details](#)

The spacecraft inserted into the translunar orbit. The orbit achieved was 288 km x 369328 km. Lunar-Orbit Insertion (LOI) was planned for Aug 5, 2023.

- ***August 05, 2023***

Chandrayaan-3 was successfully inserted into the lunar orbit. The orbit achieved 164 km x 18074 km, as intended.

- ***August 06, 2023***

Second Lunar Bound Phase (LBN#2) successfully completed. The spacecraft placed in 170 km x 4313 km orbit around the moon.

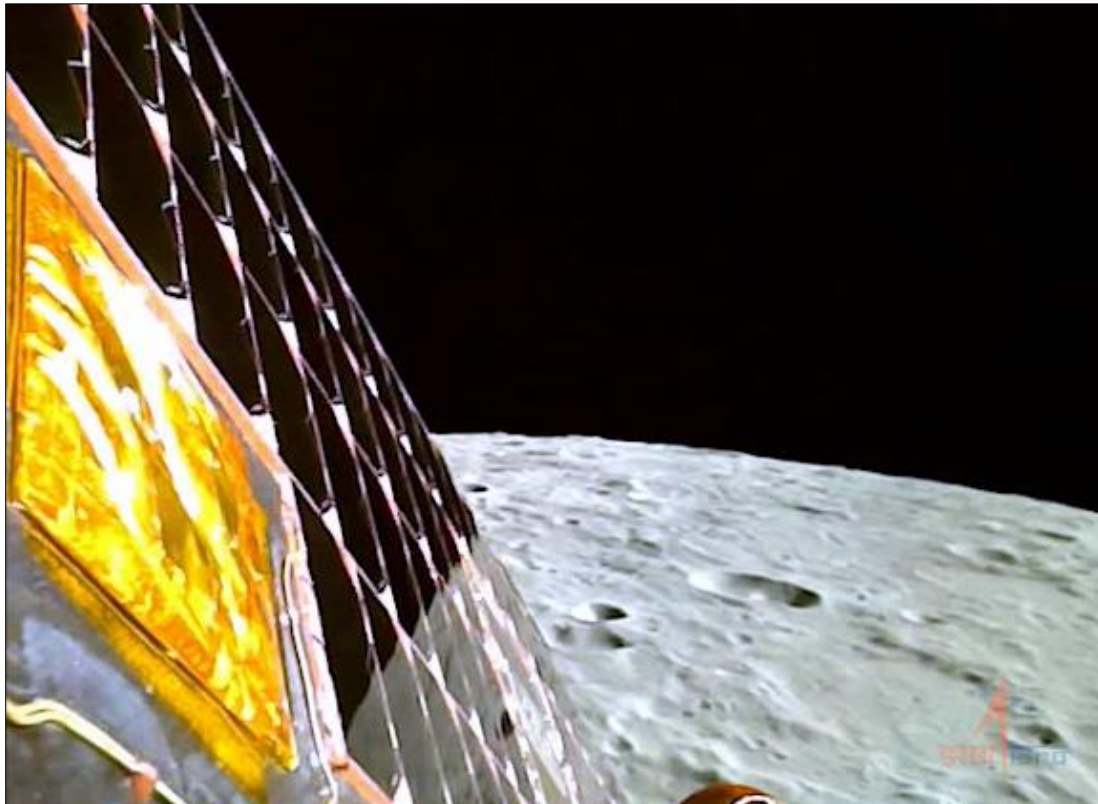
Chandrayaan-3 Video: The Moon, as viewed by Chandrayaan-3 during Lunar Orbit Insertion

- ***August 09, 2023***

Chandrayaan-3's orbit reduced to 174 km x 1437 km following a manoeuvre performed on August 9, 2023.

- ***August 14, 2023***

The mission was in the orbit circularisation phase. The spacecraft was in 151 km x 179 km orbit.



The moon, as seen by Lander Imager Camera 4 on August 20, 2023.

- ***August 16, 2023***

The spacecraft is in an orbit of 153 km x 163 km after the firing on August 16, 2023.

- **August 17, 2023**

Lander Module was successfully separated from the Propulsion Module. Deboosting planned for August 18, 2023.

- **August 20, 2023**

The Lander Module was in 25 km x 134 km orbit. Powered descent was expected to commence on August 23, 2023, around 1745 Hrs. IST

- **August 19, 2023**

The Lander Module was in 113 km x 157 km orbit around the moon. The second de-boosting was planned for August 20, 2023.

- **August 23, 2023**

Chandrayaan-3 successfully soft-lands on the moon.⁶

Message from Chandrayaan:

'I reached my destination and you too!':

Chandrayaan-3

Chandrayaan-3 has successfully soft-landed on the moon. Congratulations, India!

- **August 24, 2023**

Chandrayaan-3 ROVER: Made in India. Made for the MOON! The Ch-3 Rover ramped down from the Lander and India took a walk on the moon!



‘Sky is not the limit’

“Hail India on Moon! Hail ISRO!”. Union Minister of State (Independent Charge) Science & Technology, Dr Jitendra Singh, who is also MoS Incharge Space, said soon after the successful soft landing of Chandrayaan3 on the surface of the Moon in the South Pole area, on August 23, 2023. Further, in a tweet, Dr Jitendra Singh said, “While others fantasize Moon, we have felt the Moon. While others are stuck in the flight of dreams, Chandrayaan3 has actualised the dream. Tricolour flies high in lunar skies affirming India’s resolve, as articulated by PM Modi, **‘Sky is not the limit’**”.

⁶ [Chandrayaan-3 \(isro.gov.in\)](https://www.isro.gov.in)

To conclude, Chandrayaan, India's lunar exploration program, has been a trailblazing endeavour launched by the Indian Space Research Organisation (ISRO). Chandrayaan represents India's dedication to unravelling the mysteries of the Moon and contributing to the global space community's understanding of lunar geology, atmosphere, and resources.

The successful landing of Chandrayaan-3 does not only mark another historic achievement for India but also unlocks new avenues of scientific discovery and exploration, shaping the future of lunar research.⁷

India in space and way forward

In 2020, the Government of India announced Space Sector Reforms – a major transformation of the Indian Space Sector with enhanced participation of private players in the Indian Space programme and playing key roles in boosting India's market share in the Global Space Economy. Setting up of Indian National Space Promotion and Authorisation Centre (IN-SPACE) and enhancing the role of New Space India Limited (NSIL) are the two major thrust areas under these Reforms.

Here are some major achievements so far:

- The establishment of IN-SPACE was announced in June 2020 by the Government of India, as an autonomous agency under the Department of Space, to create an eco-system of industry, academia, and start-ups.
- IN-SPACE Headquarters at Ahmedabad was inaugurated by Prime Minister Narendra Modi in June 2022.
- Launch of Vikram-S (Prarambh mission), a suborbital launch vehicle from M/s Skyroot Aerospace Pvt. Ltd., Hyderabad, was successfully achieved on November 18, 2022, marking launch of the first rocket built by a private company in India.
- The first private launchpad and mission control center was established by M/s Agnikul Cosmos Pvt. Ltd., Chennai in ISRO campus at SDSC, SHAR on November 25, 2022.
- The government has also formulated a composite space sector policy – the Indian Space Policy 2023 – which is meant to lay down the framework for a thriving space sector of 21st century, with active participation of various stakeholders, to create a bright future for India in Space.



Indian space contribution
2% of global market share

Potential to capture
9% of global market share by 2030

% of global market share

US	40%
UK	7%
India	2%

Global space economy (in 2021)	USD 386B
India (in 2021)	USD 7.6B
India to grow (by 2025)	USD 50B

⁷ <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1951137>

References:

- [Chandrayaan-3 \(isro.gov.in\)](http://isro.gov.in)
- https://www.isro.gov.in/Chandrayaan3_New.html
- <https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=CHANDRYN3>
- [NASA - NSSDCA - Spacecraft - Details](#)
- [NASA - NSSDCA - Spacecraft - Details](#)
- <https://pib.gov.in/PressReleasePage.aspx?PRID=1951503>
- <https://pib.gov.in/PressReleasePage.aspx?PRID=1951499>
- <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1951137>

Twitter Links:

- <https://twitter.com/narendramodi/status/1679729203011362816?s=20>
- <https://twitter.com/isro/status/1678700392681709569?s=20>
- <https://twitter.com/isro/status/1679703577261125632?s=20>

Video Links:

- https://www.isro.gov.in/Chandrayaan3_curtainraiser_video.html?s=08
- <https://www.youtube.com/watch?v=q2ueCg9bvvQ>
- [Chandrayaan-3 Mission: The Moon, as viewed by Chandrayaan-3 during Lunar Orbit Insertion \(isro.gov.in\)](#)

NR/HP/RK/PK/JA