



## Chandrayaan-3

**For Prelims:** [Chandrayaan-3](#), Spectro-polarimetry of Habitable Planet Earth, [Satish Dhawan Space Center](#), Elliptic Parking Orbit, LVM3 M4, Flybys, Orbiters, Impact Missions, [NASA's Artemis Program](#)

**For Mains:** Space Technology, Chandrayaan 3 Mission and its Significance

**Source:** [IE](#)

### Why in News?

With the launch of [Chandrayaan-3](#), the [Indian Space Research Organisation \(ISRO\)](#) is embarking to achieve a successful soft landing on the moon.

- India aims to become the fourth country in the world to achieve this feat, joining the ranks of the **United States, Russia, and China.**

### What is Chandrayaan-3 Mission?

- **About:**
  - Chandrayaan-3 is **India's third lunar mission and second attempt at achieving a soft landing on the moon's surface.**
  - The mission took off from the [Satish Dhawan Space Center \(SDSC\)](#) in Sriharikota on **July 14, 2023, at 2:35 pm.**
  - It consists of an **indigenous Lander module (LM), Propulsion module (PM) and a Rover** with an objective of developing and demonstrating new technologies required for Inter planetary missions.
- **Mission Objectives of Chandrayaan-3:**
  - To demonstrate Safe and Soft Landing on Lunar Surface
  - To demonstrate Rover roving on the moon and
  - To conduct in-situ scientific experiments.
- **Features:**
  - The six payloads on the Vikram lander and rover Pragyan remain the same **as the [Chandrayaan-2 mission.](#)**
  - The scientific payloads on the lander aim to study various aspects of the lunar environment. These payloads include studying **lunar quakes, thermal properties of the lunar surface, changes in plasma near the surface,** and **accurately measuring the distance between Earth and the moon.** //



- The propulsion module of Chandrayaan-3 features a new experiment called **Spectro-polarimetry of Habitable Planet Earth (SHAPE)**.
  - SHAPE aims to search for smaller planets with potential habitability by analyzing reflected light.

#### ▪ **Changes and Improvements in Chandrayaan-3:**

- The landing area has been expanded, providing flexibility to land safely within a larger designated area.
- The **lander has been equipped with more fuel to enable longer-distance travel** to the landing site or alternate locations.
- The Chandrayaan-3 Lander has **solar panels on four sides**, instead of **only two in Chandrayaan-2**.
- High-resolution images from the Chandrayaan-2 orbiter are used to determine the **landing location, and physical modifications** have been made to enhance stability and sturdiness.
- Additional navigational and guidance instruments are on board Chandrayaan-3 to continuously monitor the Lander's speed and make the necessary corrections.
  - This includes an instrument called **Laser Doppler Velocimeter**, which will fire laser beams to the lunar surface to calculate the Lander's speed.

#### ▪ **Launch and Timeline:**

- The **LVM3 M4 launcher** has been successfully utilized to launch Chandrayaan-3
  - Around 16 minutes after the LVM-3 lifted off, the spacecraft separated from the rocket. **It entered into an elliptic parking orbit (EPO)**.
- Chandrayaan-3's journey is estimated to take approximately **42 days**, with a landing scheduled for **August 23, 2023 at the lunar dawn**.
- The lander and the rover will have a **mission life of one lunar day (about 14 Earth days) as they work on solar energy**.
  - The **landing site for Chandrayaan-3 is near the lunar south pole**.

# CHANDRAYAAN-3 MOON MISSION

Chandrayaan-3, the succeeding mission to Chandrayaan-2, is set to launch on Friday, July 14, 2023 at 2.35 pm



## What is the Importance of Landing Near the Lunar South Pole?

- Historically, spacecraft missions to the Moon have primarily **targeted the equatorial region due to its favorable terrain and operating conditions.**
  - However, the lunar south pole presents a vastly different and more challenging terrain compared to the equatorial region.
- Sunlight is scarce in certain polar regions**, resulting in perpetually dark areas where temperatures can reach to **-230 degrees Celsius.**
  - This lack of sunlight and extreme cold pose difficulties for instrument operation and sustainability.
- The lunar south pole offers **extreme and contrasting conditions that pose challenges for humans** but it make them potential repositories of valuable information about the early Solar System.
  - It is crucial to explore this region which could impact future **deep space exploration.**

## What is India's Other Chandrayaan Missions?

- **Chandrayaan-1:**
  - India's lunar exploration missions began with [Chandrayaan-1](#) in **2008**, which aimed to create a **three-dimensional atlas of the moon** and conduct mineralogical mapping.
    - Launch Vehicle: **PSLV - C11.**
  - Chandrayaan-1 made significant discoveries, including the **detection of water and hydroxyl on the lunar surface.**
- **Chandrayaan-2: Partial Success and Discoveries:**
  - Chandrayaan-2 consisted of an **Orbiter, Lander, and Rover**, with the goal of exploring the lunar south pole.
    - Launch Vehicle: **GSLV MkIII-M1**
  - Although the **lander and rover crashed on the moon's surface, the Orbiter successfully collected data** and found signatures of water at all latitudes.

## Types of Moon Missions:

- **Flybys:** These missions involve **spacecraft passing near the moon without entering its orbit**, allowing for observations from a distance.
  - Examples include **Pioneer 3 and 4 by the United States and Luna 3 by the USSR.**
- **Orbiters:** These spacecraft enter lunar orbit to conduct prolonged studies of the moon's surface and atmosphere.
  - **Chandrayaan-1 and 46 other missions** have utilized orbiters.
- **Impact Missions:** Extensions of orbiter missions, impact missions involve **instruments making an uncontrolled landing on the lunar surface**, providing valuable data before being destroyed.
  - **Chandrayaan-1's Moon Impact Probe (MIP)** followed this approach.
- **Landers:** These missions aim for a soft landing on the moon's surface, allowing for **close-quarter observations.**
  - **Luna 9 by the USSR** was the first successful landing on the moon in 1966.
- **Rovers:** Rovers are specialized payloads that **detach from landers and move independently on the lunar surface.**
  - They gather valuable data and overcome the limitations of stationary landers. **Chandrayaan-2's rover was called Pragyan**( same name is retained for Chandrayaan-3 as well).
- **Human Missions:** These missions involve the landing of astronauts on the moon's surface.
  - Only NASA has achieved this feat, with **six successful landings between 1969 and 1972.**
  - [NASA's Artemis III](#), **planned for 2025**, will mark humanity's return to the moon.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

**Q.** Discuss India's achievements in the field of Space Science and Technology. How the application of this technology has helped India in its socio-economic development? **(2016)**