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Q16

What is the main task of India's third moon mission which could not be achieved in its earlier mission? List the countries that have achieved this task. Introduce the subsystems in the spacecraft launched and explain the role of the 'Virtual Launch Control Centre' at the Vikram Sarabhai Space Centre which contributed to the successful launch from Sriharikota.

UPSC Civil Services Mains 2023 · GS III · 15 marks · Indian Economy

Indian Economy and issues relating to planning, mobilization of resources, growth, development and employment.

Core demand of the question

- State the main task of India's third moon mission that Chandrayaan-2 did not complete
- List countries that had already achieved a soft landing
- Introduce spacecraft subsystems and the Virtual **Launch** Control Centre at Vikram Sarabhai Space Centre
- **Keep Chandrayaan-3 2023 facts:** south-polar soft landing

Revision summary

Chandrayaan-3's main unfinished task from Chandrayaan-2 was a soft landing and rover work on the Moon.

The United States, the USSR/Russia, and China had already soft-landed; India became the fourth, and the first near the south pole, on 23 August 2023.

The stack was LVM3, a propulsion module, lander Vikram, and rover Pragyan.

Lander and rover carried thermophysical, seismic, ionosphere, and chemistry instruments.

The Virtual **Launch** Control Centre at VSSC let Thiruvananthapuram teams monitor the Sriharikota countdown remotely.

Introduction

Chandrayaan-3 in 2023 was India's third Moon mission. Its main task was a **soft landing** and rover operations on the lunar surface - the step that **Chandrayaan-2's Vikram lander** did not complete in 2019. On **23 August 2023** the new Vikram landed near the **south pole**. Only a few countries had done a soft landing before India.

Body**The task not achieved earlier**

- **Chandrayaan-1** (2008) orbited and impacted; it did not soft-land.
- **Chandrayaan-2** (2019) placed an orbiter successfully; the **Vikram** lander crashed in the terminal descent.

- Chandrayaan-3 therefore flew a **propulsion module, lander, and rover** without a new orbiter (the Chandrayaan-2 orbiter still supported communication). The unachieved task was **soft landing and surface science**.

Countries that had already achieved it

- **United States:** Surveyor and Apollo landers.
- **Soviet Union / Russia:** Luna landers.
- **China:** Chang'e landers.
- India became the **fourth** country to soft-land, and the first to do so in the **south polar region** (a first among all, not only among those three).

Subsystems of the launched spacecraft

- **Launch vehicle: Launch Vehicle Mark-3 (LVM3)** from Satish Dhawan Space Centre, Sriharikota (14 July 2023).
- **Propulsion module:** carries the lander-rover stack from Earth orbit toward the Moon, then stays in lunar orbit; it also carried the **SHAPE** spectro-polarimeter for Earth observation.
- **Lander (Vikram):** legs, throttleable engines, navigation cameras, altimeters and velocity sensors, hazard-detection cameras, and payloads such as **Chandra's Surface Thermophysical Experiment (ChaSTE)**, **Instrument for Lunar Seismic Activity (ILSA)**, and **Radio Anatomy of Moon Bound Hypersensitive Ionosphere and Atmosphere (RAMBHA)**; a NASA laser retroreflector was also on the lander.
- **Rover (Pragyan):** six wheels; **Laser-Induced Breakdown Spectroscope** and **Alpha Particle X-ray Spectrometer** to read surface chemistry.
- Guidance, propulsion, thermal control, and deep-space communication complete the stack.

Virtual Launch Control Centre at VSSC

- The **Virtual Launch Control Centre (VLCC)** at **Vikram Sarabhai Space Centre (VSSC)**, **Thiruvananthapuram**, lets **launch** teams monitor and participate in countdown **remotely** while the vehicle lifts from Sriharikota.
- For Chandrayaan-3 it cut the need for every specialist to travel to the range, kept a second set of eyes on telemetry, and linked design teams at VSSC to the live **launch**. It contributed to a **clean LVM3 launch**, which is the first link in a landing that happens weeks later.

Flow diagram

Chandrayaan-2 2019 -> Landing not completed
Chandrayaan-3 2023 -> Soft landing south pole
LVM3 Sriharikota -> Propulsion module
Propulsion module -> Vikram lander
Vikram lander -> Pragyan rover
VLCC at VSSC at VSSC -> LVM3 Sriharikota

Conclusion

Chandrayaan-3's core task was the soft landing Chandrayaan-2 missed. The United States, the Soviet Union/Russia, and China had already landed. Vikram, Pragyan, and the propulsion module did the 2023 job near the south pole. The Virtual **Launch** Control Centre at VSSC backed the Sriharikota **launch** from Thiruvananthapuram.

Facts & figures

Landing date

Chandrayaan-3 soft-landed on 23 August 2023 in the lunar south polar region.

Launch

LVM3-M4 from SDSC Sriharikota on 14 July 2023.

Prior landers

USA, USSR/Russia, and China had achieved lunar soft landing before India.

Vikram and Pragyan

Lander and rover names; Pragyan studied surface chemistry with LIBS and APXS.

VLCC

Virtual Launch Control Centre at Vikram Sarabhai Space Centre for remote launch monitoring from Thiruvananthapuram.

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