

# Chandrayaan-3

India's Historic Leap in Lunar Exploration

## Chandrayaan-3

The successful landing of Chandrayaan-3 on the Moon marked a significant milestone for India's space program, reinforcing its status as a rising power in space exploration. Launched by the Indian Space Research Organisation (ISRO), Chandrayaan-3 aimed to achieve what its predecessor, Chandrayaan-2, narrowly missed—an impeccable soft landing on the lunar surface. On August 23, 2023, India made history as the first nation to land a spacecraft near the Moon's south pole, an unexplored and scientifically crucial region.



## A Mission of Perseverance and Precision

Chandrayaan-3 was launched on July 14, 2023, aboard the LVM3 (Launch Vehicle Mark-III) from the Satish Dhawan Space Centre in Sriharikota. Unlike Chandrayaan-2, which consisted of an orbiter, lander, and rover –

Chandrayaan-3 focused solely on the lander (Vikram) and rover (Pragyan) modules, eliminating the need for an orbiter since Chandrayaan-2's orbiter was still operational. This streamlined approach allowed ISRO to concentrate its resources on achieving a precise landing and conducting crucial scientific studies on the Moon's surface.

The spacecraft followed a meticulously planned trajectory, gradually maneuvering from Earth's orbit to the Moon's gravitational influence before executing a controlled descent. The primary challenge lay in ensuring a soft and stable landing, which was accomplished using cutting-edge navigation, guidance, and propulsion systems.

## Exploring the Lunar South Pole

The choice of landing near the Moon's south pole was strategic. Unlike the equatorial regions explored in previous missions by other nations, the south pole holds immense scientific promise. The permanently shadowed craters in this region are believed to contain water ice—an essential resource for future lunar exploration and potential human settlements.

Chandrayaan-3's Vikram lander and Pragyan rover were equipped with advanced scientific instruments to study the lunar soil composition, analyze seismic activity, and assess surface temperature variations.

One of the primary objectives of the mission was to analyze the presence of minerals and elements, such as magnesium, aluminum, silicon, calcium, and iron.

The rover's instruments, including the Laser-Induced Breakdown Spectroscope (LIBS) and the Alpha Particle X-ray Spectrometer (APXS), provided valuable insights into the Moon's geology, helping scientists understand its evolution and potential resources.

### Technological Innovations and Achievements

Chandrayaan-3 showcased India's technological prowess in multiple ways. The Vikram lander was equipped with multiple hazard detection and avoidance cameras, ensuring a safe landing. Unlike Chandrayaan-2, where the lander lost communication just before touchdown, the new mission incorporated enhanced software and redundancies to mitigate risks. The Pragyan rover, weighing 26 kilograms, was designed to traverse the lunar surface, sending back vital data to ISRO's command center.

Another remarkable achievement was the longevity of the mission. Designed for a 14-day operational period corresponding to a lunar day, the instruments continued to transmit valuable data even beyond their expected lifespan. This resilience underscored the efficiency of Indian engineering and the robustness of the spacecraft.

### Impact and Future Prospects

Chandrayaan-3's success has profound implications for India's space ambitions. It reinforces ISRO's capabilities and strengthens international collaborations in lunar and interplanetary missions.

With this achievement, India has joined an elite group of nations—Russia, the United States, and China—that have successfully landed on the Moon.

The mission also serves as a stepping stone for India's upcoming lunar projects, including the Lunar Polar Exploration (LUPEX) mission in collaboration with Japan, which aims to further explore the Moon's polar regions. Additionally, Chandrayaan-3's findings will contribute to NASA's Artemis program, which seeks to establish a sustainable human presence on the Moon.



### Conclusion

Chandrayaan-3 is more than just a space mission—it is a testament to India's scientific and technological advancements, perseverance, and vision for the future.

By successfully landing on the lunar surface, India has not only made history but has also paved the way for deeper space exploration, resource utilization, and global collaborations. As ISRO continues to push the boundaries of space exploration, the success of Chandrayaan-3 stands as an inspiration for future generations and a beacon of India's growing prowess in space technology.

### Do you know?

The world's smallest robot is smaller than a grain of salt! These microscopic robots can be used in medicine to perform surgeries inside the human body.