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ISRO and Department of Atomic Energy Collaborate on Advanced Lunar Lander Technology

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The Indian Space Research Organisation (ISRO) and the Department of Atomic Energy (DAE) have collaborated to develop an advanced lunar lander capable of surviving the harsh lunar environment for up to 100–200 days, a significant improvement over the 14-day operational life of the Chandrayaan-3 Vikram lander.?

The collaboration focuses on developing an artificial heating system that can protect spacecraft electronics and systems during the extremely cold lunar night, enabling long-duration lunar exploration missions.

Why is the New Technology Needed?

Challenge of Lunar Nights

The Moon experiences:

Approximately 14 Earth days of daylight followed by 14 Earth days of darkness.

Temperatures can rise to about 121°C during the lunar day.

Temperatures can fall to around –129°C during the lunar night.

The Chandrayaan-3 Vikram Lander, powered primarily by solar energy, functioned for one lunar day (about 14 Earth days). It could not continue operations during the lunar night due to the absence of sunlight and extremely low temperatures.

Key Features of the Collaboration

Artificial Heating System

ISRO and DAE are developing advanced artificial heaters that can:

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Protect onboard electronics during freezing lunar nights.

Enable survival through multiple lunar day-night cycles.

Extend mission duration from 14 days to 100–200 days.

Long-Duration Lunar Exploration

The technology is expected to:

Allow extended scientific experiments on the Moon.

Increase data collection opportunities.

Support future robotic and human lunar missions.

Strengthen India's long-term lunar exploration programme.

Chandrayaan-3 Mission:

Launched: 14 July 2023

Soft Landing: 23 August 2023

Landing Site: Near the Moon's South Pole

India became the first country to land near the lunar south pole and the fourth country to achieve a soft landing on the Moon.

ISRO–DAE Cooperation

ISRO and DAE have collaborated earlier on:

Radioisotope Heater Units (RHUs).

Space nuclear power technologies.

Long-duration deep-space mission concepts.

About the Department of Atomic Energy (DAE)

Established in 1954.

Functions directly under the Prime Minister of India.

Responsible for:

Nuclear energy development.

Atomic research.

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Strategic nuclear technologies.

Future Lunar Mission: LUPEX

Lunar Polar Exploration Mission (LUPEX) is a joint mission of ISRO and the Japan Aerospace Exploration Agency (JAXA).

Objective:

Study lunar water ice deposits.

Explore the Moon's south polar region.

India will provide the lander, while Japan will provide the rover.

Exam Focus Points (Quick Revision Notes):

Organisations Involved ? ISRO and Department of Atomic Energy (DAE)

Technology ? Advanced Lunar Lander with Artificial Heating System

Objective ? Survive Lunar Night and Extend Mission Life

Current Lander Life ? 14 Days (Chandrayaan-3)

Proposed Mission Life ? 100–200 Days

ISRO Chairman ? V. Narayanan

Related Mission ? Chandrayaan-3

Future Mission ? LUPEX (ISRO–JAXA)

Significance ? Long-Duration Lunar Exploration