



Mission Chandrayaan



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Why in News?

- ❑ On 22 July 2019, ISRO launched Chandrayaan-2
- ❑ India's second lunar exploration mission after Chandrayaan-1 (launched in Oct 2008)
- ❑ Lunar orbiter, lander, rover type mission, expected to do soft-landing on the Moon
- ❑ India to become the fourth country to soft-land after the USSR, USA and China
- ❑ Core objective is to map the location, and abundance of lunar water

Chandrayaan-1

- ❑ **Design and objectives:**
 - ISRO's first exploratory mission to moon
 - Operated for 312 days as opposed to the intended two years
 - Mission achieved 95% of its planned objectives
 - Confirmed presence of lunar water
 - Evidence of lunar caves formed by an ancient lunar lava flow
 - Faults and fractures on lunar surface as a result of past tectonic activity coupled with meteorite impacts

Chandrayaan-2: Design and Mission Profile

- ❑ **Lander (Vikram):**
 - Will remain stationary after touching down
 - Will mainly study the moon's atmosphere and its seismic activity
- ❑ **Rover (Pragyan):**
 - Solar-powered vehicle, will slowly crawl on the surface
 - Making observations and collecting data for 14 days(1 lunar day)
 - Will study the composition of the surface near the landing site, and determine the abundance of various elements
- ❑ **Orbiter:**
 - Onboard cameras will create high-resolution 3-D maps of the surface
 - Will study mineral composition, lunar atmosphere, and also to assess the abundance of water

Mission Objectives

- ❑ Study the extent and distribution of water on the Moon following evidences of Chandrayaan-1
- ❑ Study topography, seismography, composition of lunar surface and the lunar atmosphere
- ❑ Study of ancient rocks and craters to understand origin and evolution of the Moon
- ❑ Study fossil records at South Pole region to improve understanding of the early solar system
- ❑ Map the lunar surface and prepare 3D maps of it

Mission Challenges

- ❑ Launching its heaviest rocket GSLV-Mark III
- ❑ Ensuring trajectory accuracy during successive orbital manoeuvres
- ❑ Performing soft-landing on safe hazard free zone which ISRO has never performed earlier
- ❑ Extremely hostile environment for lander and rover operations: craters, rocks, dust, hot gases, extreme surface temperature variations
- ❑ Less sunlight in South Pole region, can affect solar-powered instruments

Importance and Benefits of the Mission

- ❑ Help in understanding the origin of the solar system
- ❑ Can help in future advanced space missions
- ❑ Can boost national pride in citizens
- ❑ Can boost the morale of scientists, motivate youth to develop scientific temper
- ❑ Invoke the spirit of innovation in Indian manufacturing industry
- ❑ Encourage Indian startup industry in space sector, promote entrepreneurship
- ❑ Chandrayaan-2 mission is led by two women. Thus, a symbol of women empowerment

Way Forward

- ❑ Precursor to future missions like Gaganyaan, Aditya-L1, permanent space station in line with the ISS
- ❑ In talks with Japan's JAXA for a future mission Chandrayaan-3 in 2024, to bring back soil and rock samples from the South Pole of the Moon
- ❑ Moon as perfect test-bed to explore new areas in deep space technology
- ❑ Extracting water from the Moon will pave the way for colonization of the Moon.
- ❑ Hydrogen and Oxygen from water can be used as fuel for interplanetary missions, particularly to Mars
- ❑ Show the capability of Indian scientists to protect the interest of mankind and future generations

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