

NASA's Moon Base programme

Mains: *GS III – Space Technology*

Why in News?

Recently, NASA formally invited ISRO to join its ambitious Moon Base programme under the Artemis Accords.

What is NASA's moon base programme?

- **NASA's Moon Base programme** – It is an ambitious plan to establish a long-term human presence on the Moon, especially near the south pole, which has a volatile environment with temperatures ranging from -203°C to 54°C .
- The programme envisages:
 - Ongoing crewed and uncrewed lunar missions
 - Building infrastructure on the Moon
 - Conducting scientific research and experiments
 - Supporting long-duration astronaut activities
 - Developing technologies for lunar surface living and work
 - Using the Moon as a gateway for deep-space exploration, including missions to Mars.

Why choose the lunar south pole?

- **Water potential** – These shadowed regions may contain ice, which could be used for drinking water, oxygen, and hydrogen fuel.

- **Scientific exploration** - Studying these challenging areas may provide insights into the Moon's origins, the evolution of the solar system, and support future missions to Mars and Venus.

Artemis Accords

- These are a non-binding set of international principles launched on October 13, 2020.
- **Established by** - NASA and the U.S. Department of State alongside seven founding countries.
- They guide civil space exploration and resource utilisation on the Moon, Mars, and other celestial bodies.
- **Key principles include:**
 - Peaceful exploration of space
 - Transparency in activities
 - Interoperability among space systems
 - Emergency assistance for astronauts
 - Registration of space objects
 - Sharing scientific data
 - Preservation of space heritage
 - Responsible use of space resources
 - Prevention of harmful interference
 - Sustainable exploration of celestial bodies
- **India and Artemis Accords**
 - India signed the Artemis Accords in 2023.
 - It became the 27th country to join.
 - The agreement provides a framework for enhanced India-U.S. cooperation in lunar exploration.

What are the phases of NASA's moon base programme?

- **Phase 1 - Access and Exploration**

- Establish reliable and consistent access to the lunar surface.
- Conduct comprehensive scientific investigations.
- Characterise and analyse the lunar environment and its challenges.
- Develop the technological foundation necessary for subsequent phases.

- **Phase 2 - Infrastructure Development**

- Construct and deploy essential lunar infrastructure.
- Expand operational capabilities on the lunar surface.
- Apply knowledge and data acquired during Phase 1.
- Enhance cooperation with international partners.

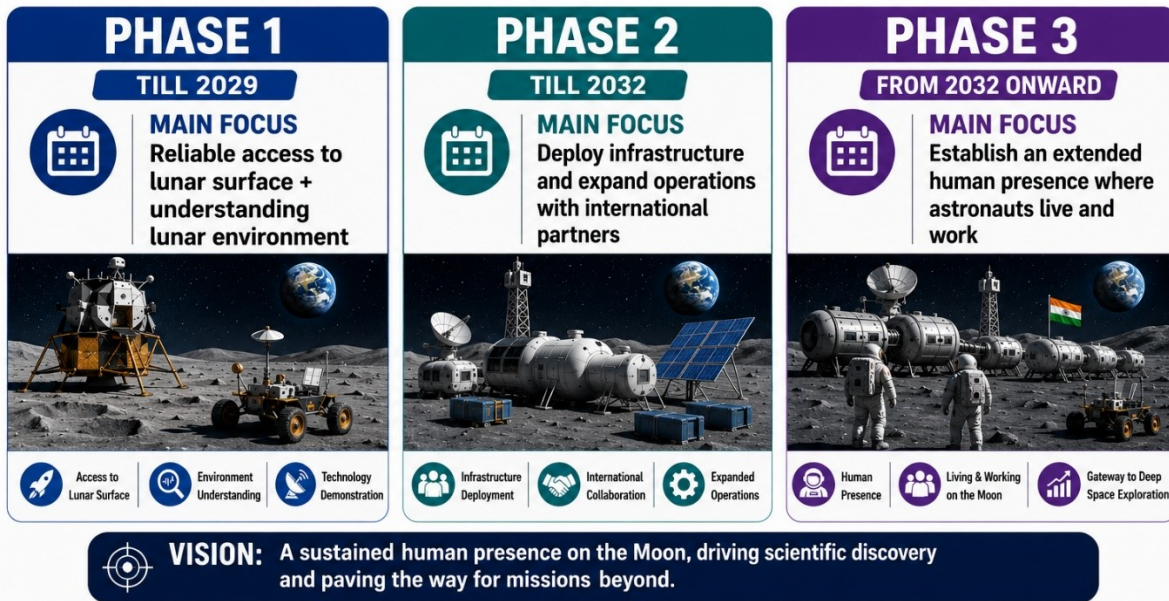
- **Phase 3 - Permanent Human Presence**

- This phase represents the most ambitious stage of the program.
- Establish a sustained human presence on the lunar surface.
- Enable astronauts to live and work on the lunar surface for extended durations.
- Moon becomes a platform for further deep-space exploration.



NASA'S MOON BASE PROGRAMME

THREE PHASES TOWARDS A SUSTAINED HUMAN PRESENCE



What are the rationales for India's participation in NASA's moon base programme?

- **Technological Advancement and Expertise** - India may acquire experience in advanced lunar technologies, including habitat construction, robotics, life-support systems, deep-space communication, and long-duration human missions.
- Such expertise is particularly valuable as India transitions from robotic exploration to human spaceflight and crewed lunar missions.
- **Scientific Collaboration** - India would be able to participate in international lunar research and both access and share scientific data.
- NASA and India have already agreed to advance discussions regarding open scientific data sharing within the Artemis framework.
- **Support for India's Indigenous Lunar Ambitions** - India is planning more advanced Chandrayaan missions and maintains a long-term objective of sending Indian astronauts to the Moon.
- Experience gained through participation in an international lunar programme could assist the Indian Space Research Organisation (ISRO) in developing the capabilities required for these future missions.

- **International Standing and Strategic Influence** - Participation in a major multinational lunar programme would enhance India's status as a leading space power.
- It would also provide India with the opportunity to contribute to discussions regarding future rules, norms, and the responsible utilization of lunar resources.
- **Space Economy and Private Sector Development** - Participation could generate opportunities for Indian space startups and industries in the following areas.
 - Robotics
 - Sensors
 - Communication
 - Propulsion
 - Electronics
 - Lunar Infrastructure
 - Data and Artificial Intelligence (AI)

What lies ahead?

- The Moon is emerging as the primary frontier for international space exploration.
- India's participation in NASA's Moon Base program may facilitate the advancement from its current lunar exploration capabilities toward its long-term objective of becoming a leading human spaceflight and deep-space power.

Reference

[The Hindu | NASA's Moon Base Programme](#)



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