



ISRO's FIRST ANALOG SPACE MISSION – SCIENCE & TECHNOLOGY

NEWS: Indian Space Research Organisation (ISRO) has started the country's first analog space mission at Leh in Ladakh, where space agency will simulate life in an interplanetary habitat.

WHAT'S IN THE NEWS?

Mission Overview

- **Location:** Leh, Ladakh – India's first analog space mission site.



- **Objective:** Simulate life in an interplanetary habitat, supporting India's future human Moon mission aspirations.
- **Collaborators:** Human Spaceflight Centre (ISRO), AAKA Space Studio, University of Ladakh, IIT Bombay, and the Ladakh Autonomous Hill Development Council.

Key Mission Features

- **Focus:** Address challenges of establishing a base station beyond Earth, including astronaut needs and mental well-being.



• Technologies Integrated:

- **Airlock and EVA Zone:** Prepares astronauts for Extra-Vehicular Activities while maintaining habitat integrity.
- **Circadian Lighting System:** Mimics natural daylight cycles to support astronauts' sleep-wake patterns.
- **Hydroponics and Food Prep:** Enables fresh food production and sustainable nutrition.
- **Stand-alone Power System:** Utilizes renewable energy for continuous power supply.
- **Environmental Monitoring System:** Monitors habitat conditions to ensure optimal function.

Why Ladakh?

- **Environmental Similarities to Mars and the Moon:**
 - **Temperature Extremes:** Diurnal shifts between 15°C to -10°C help test habitat thermal insulation.
 - **High Altitude and Low Oxygen:** Ladakh's altitude (3,500+ meters) with oxygen at 40% of sea level allows for testing life-support systems.
 - **Soil Composition:** Sandy, rocky soil similar to Martian and lunar regolith, ideal for testing rover mobility and in-situ resource use.

Understanding Analog Missions

- **Definition:** Analog missions simulate space conditions on Earth to test various space-exploration technologies.
- **Tests Conducted:**
 - **Technological:** Includes robotic equipment, vehicles, habitats, communication systems, power generation, and storage.
 - **Behavioral:** Observes psychological impacts like isolation, team dynamics, and potential for menu fatigue.
- **Historical Context:** Used historically for Moon and orbit missions; today, space agencies partner with private entities for faster R&D and commercialization.
- **Current Trend:** Private companies contribute to human space exploration, driven by commercial incentives and accelerated development processes.

Some earlier Analog space missions by other countries:

1. HI-SEAS (Hawaii Space Exploration Analog and Simulation)

- **Conducted by:** NASA and University of Hawaii



- **Location:** Mauna Loa, Hawaii, USA
 - **Objective:** Simulate Mars surface conditions to study crew dynamics, isolation, and resource management
 - **Duration:** 4 to 12 months
 - **Initiated:** 2013
2. **NEEMO (NASA Extreme Environment Mission Operations)**
- **Conducted by:** NASA
 - **Location:** Aquarius Reef Base, Florida Keys, USA
 - **Objective:** Underwater mission to simulate microgravity and confined living
 - **Duration:** Typically 10–21 days
 - **Initiated:** 2001
3. **Mars Desert Research Station (MDRS)**
- **Conducted by:** The Mars Society
 - **Location:** Utah Desert, USA
 - **Objective:** Simulate Mars environment to test equipment and study group dynamics
 - **Duration:** 2 weeks per crew rotation
 - **Initiated:** 2001
4. **SIRIUS (Scientific International Research In Unique Terrestrial Station)**
- **Conducted by:** Russian Academy of Sciences & NASA
 - **Location:** Moscow, Russia
 - **Objective:** Simulate Moon and Mars missions, focusing on crew interactions in isolation
 - **Duration:** 4, 8, and 12-month missions
 - **Initiated:** 2017
5. **Human Exploration Research Analog (HERA)**
- **Conducted by:** NASA
 - **Location:** Johnson Space Center, Houston, USA
 - **Objective:** Simulate deep-space missions like trips to asteroids or Mars
 - **Duration:** 45-day missions



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- **Initiated:** 2014

Source: <https://economictimes.indiatimes.com/news/science/isros-analogue-space-mission-kicks-off-at-ladakhs-leh/articleshow/114844119.cms?from=mdr>

<https://www.innovaspace.org/analog-missions.html>



**P.L. RAJ IAS & IPS ACADEMY | 1447/C, 3rd floor, 15th Main Road,
Anna Nagar West, Chennai-40. Ph.No.044-42323192, 9445032221
Email: plrajmemorial@gmail.com Website: www.plrajiacademy.com
Telegram link: <https://t.me/plraji2006> YouTube: P L RAJ IAS & IPS ACADEMY**