

AX-4 MISSION;ISRO AXIOM SPACE COORDINATION: SCIENCE & TECHNOLOGY NEWS: Axiom-4 mission: ISRO coordinating with Axiom Space to refresh time-sensitive experimental specimens

WHAT'S IN THE NEWS:

India is sending Group Captain Shubhanshu Shukla to the International Space Station on June 19, 2025, for a 14-day mission involving 7 ISRO-backed microgravity experiments and joint biomedical studies with NASA, marking India's entry into ISS-based human space research. This mission enhances India's space biosciences capabilities and supports future goals like Gaganyaan and deeper international collaboration.

Mission Timeline & Context

- **Launch Date:** The mission is scheduled to launch on June 19, 2025.
- **Indian Astronaut:** Group Captain Shubhanshu Shukla of the Indian Air Force will be India's representative on this mission.
- **Mission Duration:** He will spend 14 days aboard the International Space Station (ISS), marking a major milestone in India's human spaceflight programme.
- **Launch Partner:** The mission is being conducted in collaboration with *Axiom Space*, a US-based private aerospace company known for its commercial spaceflight missions.
- **Delays:** The launch has been rescheduled four times due to various technical and logistical complications, showing the complexity of coordination in international crewed missions.

ISRO's Role & Coordination

- **Microgravity Research Coordination:** ISRO is actively engaged in supporting Indian scientists to prepare their experiments for microgravity conditions aboard the ISS.
- **Support for Sample Preparation:** Time-sensitive experimental samples are being readied with precision to withstand the microgravity and radiation conditions aboard the ISS.
- **Institutional Collaboration:** Coordination is taking place with Indian Principal Investigators from national laboratories and top academic institutions to ensure scientific robustness and success.

7 ISRO-Backed Microgravity Experiments on ISS

1. Microalgae in Space:

- Study how space radiation and zero gravity affect edible microalgae, which may play a role in future space-based food systems.

2. Sprouting Salad Seeds:

- Investigate the germination of salad vegetable seeds in zero-gravity to assess their viability for space farming.

3. **Tardigrades Study:**

- Tardigrades (extremophilic micro-animals) will be monitored for survival, reproduction, and genetic expression changes in microgravity.

4. **Muscle Regeneration:**

- Examine the impact of specific metabolic supplements on muscle tissue repair in microgravity, useful for astronaut health.

5. **Human–Machine Interaction:**

- Analyze how astronauts interact with digital interfaces under altered gravity, which can inform the design of future space systems.

6. **Cyanobacteria Proteomics:**

- Explore protein-level changes in cyanobacteria grown using different nitrogen sources (urea vs. nitrate) in space conditions.

7. **Food Crop Seeds:**

- Assess how spaceflight conditions affect germination, root-shoot development, and nutritional output of agricultural seeds.

ISRO–NASA Human Research Collaboration

- ISRO and NASA are collaborating on five additional biomedical experiments aboard the ISS.
- These fall under NASA’s **Human Research Program** and focus on long-term physiological changes in space, such as:
 - Bone density loss
 - Radiation effects on human DNA
 - Cardiovascular behavior
 - Neurovestibular responses
 - Circadian rhythm adjustments

Scientific & Strategic Significance

- **Historic Milestone:** This marks the first time Indian-designed experiments will be conducted on the ISS.
- **Strategic Advancement:**
 - Enhances India’s preparedness for *Gaganyaan*, India’s own crewed spaceflight mission.

- Strengthens India's position in *space biosciences* and *microgravity research*.
- Deepens collaboration with global space agencies, especially NASA.
- **Future Prospects:**
 - Lays the groundwork for India's potential participation in future international space station projects.
 - Enables India to contribute significantly to global human spaceflight missions and space medicine.

Source: <https://www.thehindu.com/sci-tech/science/axiom-4-mission-isro-coordinating-with-axiom-space-to-refresh-time-sensitive-experimental-specimens/article69701001.ece>