



Research Unit
Press Information Bureau
Government of India

SpaDeX Mission: Revolutionising Space Exploration

Pioneering India's Future in Space

Department of Space

16th January, 2025

“Congratulations to our scientists at ISRO and the entire space fraternity for the successful demonstration of space docking of satellites. It is a significant stepping stone for India’s ambitious space missions in the years to come.”

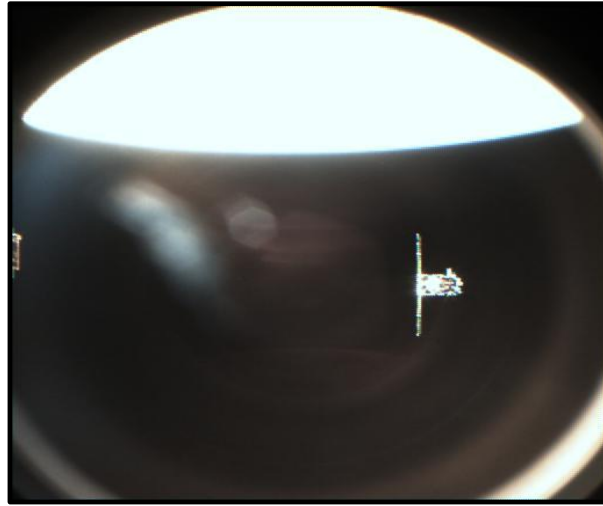
- Shri Narendra Modi, Prime Minister of India

In a historic achievement, the **Space Docking Experiment (SpaDeX) mission’s** docking operation was successfully completed on **16th January, 2025** marking **India’s entry into the elite group of nations capable of executing space docking operations**. With this success, India becomes the **fourth country** in the world to achieve this technological feat. ISRO started the mission on **30th December 2024**, with the successful launch of the **SpaDeX spacecrafts** using **Polar Satellite Launch Vehicle (PSLV)-C60**, from the **Satish Dhawan Space Centre, Sriharikota**. This groundbreaking mission aims to showcase India’s technological prowess in spacecraft rendezvous, docking, and undocking — a critical capability for future advancements such as satellite servicing, space station operations, and interplanetary exploration.

The docking process was executed with exceptional precision. The spacecraft manoeuvred seamlessly from the 15-metre to 3-meter hold point, initiating docking with accuracy leading to successful spacecraft capture. After this, retraction was completed smoothly, followed by rigidisation for stability. Post-docking, the integrated control of the two satellites as a single object has been successfully achieved, showcasing India's technological expertise. In the coming days, undocking operations and power transfer checks are scheduled to further validate the system's performance.

‘India docked its name in space history! ... ISRO’s SpaDeX mission accomplishes historic docking success. Proud to witness this moment!’

- ISRO



One of the SpaDeX satellites holding position at 15m

SpaDeX is a **cost-effective technology** demonstrator mission designed to showcase in-space docking using two small spacecrafts launched by **62nd PSLV flight**. This mission is pivotal for India's future space ambitions, including lunar missions, sample returns, and the development of the **Bharatiya Antariksh Station (BAS)**.

The main goals of the SpaDeX mission are:

- Develop and demonstrate technology for rendezvous and docking using two small spacecrafts.
- Showcase controllability in the docked condition.
- Demonstrate the potential for extending the life of the target spacecraft.
- Test power transfer between docked spacecraft.

The mission demonstrates India's growing self-reliance in cutting-edge space technologies and reaffirms ISRO's commitment to advancing its capabilities to meet future challenges in the rapidly evolving field of space exploration.

SpaDeX Spacecrafts

The SpaDeX mission involves two small satellites, **SDX01**, which is the Chaser and **SDX02**, the Target, each weighing approximately **220 kilograms**. These spacecrafts are androgynous in nature i.e. either of the spacecraft can act as chaser (active spacecraft) during docking. They are equipped with solar panels, lithium-ion batteries, and a robust power management system. The Attitude and Orbit Control System (AOCS) includes sensors such as star sensors, sun sensors, magnetometers and actuators like reaction wheels, magnetic torquers and thrusters.

The satellites will execute a series of complex manoeuvres to demonstrate the docking process in orbit. Post-docking, the two satellites will operate as a single spacecraft. Electrical power will be transferred from one satellite to the other to confirm the success of the docking. After successful docking and undocking, the

spacecraft will separate and be used for application missions. During undocking, the spacecraft will separate to begin individual payload operations. These payloads will provide high resolution images, natural resource monitoring, vegetation studies and on orbit radiation environment measurements which find numerous applications.

Indigenous technologies incorporated in the SpaDex Mission:

- Docking mechanism.
- A suite of four rendezvous and docking sensors.
- Power transfer technology.
- Indigenous novel autonomous rendezvous and docking strategy.
- **Inter-satellite communication link (ISL)** for autonomous communication between spacecrafts, incorporated with inbuilt intelligence to know the state of the other spacecraft.
- **GNSS-based Novel Relative Orbit Determination and Propagation (RODP)** processor to determine the relative position and velocity of the other spacecraft.
- Simulation test beds for both hardware and software design validation and testing.



The SPADEX Mission Consists of Two Small Spacecraft

Names :
SPADEX-A (SDX01) and SPADEX-B (SDX02)

Mass :
Approximately 220kg

Design :
Built on an extended Microsat Bus

Capabilities :
Androgynous in nature, allowing either spacecraft to act as the chaser during docking.





SpaDeX: Advancing India's Space Exploration

The SpaDeX mission represents a significant leap in India's space capabilities, positioning ISRO for more complex and ambitious space endeavours in the future. Emphasising the significance of this accomplishment, **Union Minister of State for Science and Technology, Dr. Jitendra Singh**, underscored that SpaDeX establishes India as a global leader in space docking technology. He also highlighted a significant **collaboration** between the **Department of Biotechnology** and ISRO to explore the **application of biology in Space**. Shri Singh also highlighted the significance of the **indigenous 'Bharatiya Docking System'** used for the docking experiment and emphasized that this milestone paves way for smooth conduct of ambitious future missions including the Bharatiya Antriksha Station, Chandrayaan 4 and Gaganyaan.

Space docking is a critical prerequisite for upcoming space missions, such as lunar exploration and the operation of space stations. By successfully executing this mission, ISRO is laying the foundation for **autonomous docking**—a vital capability for future missions like **Chandrayaan-4**. Additionally, the SpaDeX mission will play a key role in supporting India's ambitious space goals, such as the Gaganyaan mission, sending an Indian astronaut to the Moon and setting up the Bharat Antariksh Space Station.



This technological breakthrough not only highlights India's progress in the space sector but also opens up new opportunities for more complex missions, strengthening the nation's position as a key player in the global

space community. SpaDeX is a testament to India's strides in indigenous innovation, further solidifying its position on the global space map.

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