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Article For Reading: Gates in the sky: On ISRO and SpaDeX

On December 30, 2024, the Indian Space Research Organisation (ISRO) launched its PSLV-C60 mission. Its primary payload was a pair of satellites for the Space Docking Experiment, or SpaDeX, to demonstrate orbital **rendezvous** and **docking**. The ability to execute it in orbit is an essential stepping stone to more complex missions. The launch was also hailed as ISRO ending the year on a high, but SpaDeX reminded us that sophisticated spaceflight missions care little for arbitrary deadlines. The satellites successfully docked on January 16 after a few **abortive** attempts. They were expected to dock on January 7, which ISRO postponed to January 9, then brought them close without docking on January 12 in an apparent data-taking effort. It nixed the January 9 attempt after the satellites were found to have drifted more than expected, prompting measures to arrest the **displacement** and reinitialise the experiment. Once docked, ISRO began tests to verify if the satellites could exchange electric power, then undock and separate, followed by testing their own payloads that would be spread over two years. The C60 mission also launched the fourth stage of the rocket as an orbital platform. It carried 24 payloads from various ISRO centres and private enterprises testing various technologies.

The Vikram Sarabhai Space Centre's Compact Research module for Orbital Plant Studies was able to have cowpea seeds **germinate** in orbit, capturing the popular imagination.

Docking allows spacefaring components to be launched separately and assembled in space to form a larger module. This allows a space agency to plan interplanetary missions whose spacecraft are heavier than what the heaviest rockets can launch. Docking is thus a **symbolic** gateway to new opportunities, with the Chandrayaan-4 lunar sample return mission being a good example. In **anticipation**, ISRO loaded the SpaDeX satellites with enough fuel for multiple tries and also continuously collected data. Its own nervousness became evident, too: after the first two attempts, it backed down from its promise to live-stream the successful one. Docking technology has become desirable thanks to the perceived inevitability of long-duration spaceflight. The pressure to lower costs imposed by, say, crewed missions to Mars or space-mining operations has rendered ideas such as in-space satellite servicing and orbital **resupply** platforms, both of which require docking, more **lucrative**. ISRO plans to start launching the 'Bharatiya Antariksh Station' (BAS) later this decade. As it embarks on a new phase of operations, with V.

Narayanan as its new chairman, ISRO should also describe a **coherent** vision for the ex ante utility expected of BAS. Without this context, the larger pieces of the Indian space programme and their purpose relative to other countries' plans seem adrift.

Summarization:

The Indian Space Research Organisation (ISRO) achieved a significant milestone with its PSLV-C60 mission, which launched the Space Docking Experiment (SpaDeX) on December 30, 2024. SpaDeX successfully demonstrated orbital rendezvous and docking on January 16, 2025, after overcoming several challenges. Docking technology is crucial for assembling large spacecraft in orbit, enabling complex missions like Chandrayaan-4 and interplanetary exploration. The mission also showcased innovative payloads, including experiments with plant germination in space. As ISRO prepares for ambitious projects like the Bharatiya Antariksh Station (BAS), it must articulate a clear long-term vision to align its goals with global advancements in space exploration.

Vocabulary –

1. Rendezvous (Noun) (मुलाकात)

Meaning: A meeting at an agreed time and place, typically between two parties.

Synonyms: Meeting, appointment, encounter

Antonyms: Separation, disbanding

Example: The satellites successfully performed a rendezvous in orbit.

2. Docking (Noun) (जोड़ने की प्रक्रिया)

Meaning: The act of joining two spacecraft in orbit.

Synonyms: Linking, connecting, coupling

Antonyms: Detaching, disconnecting, separating

Example: Docking technology is essential for assembling large spacecraft in orbit.

3. Abortive (Adjective) (असफल)

Meaning: Failing to produce the intended result.

Synonyms: Failed, futile, unproductive

Antonyms: Successful, effective, fruitful

Example: The initial docking attempts were abortive due to technical issues.

4. Displacement (Noun) (विस्थापन)

Meaning: The moving of something from its place or position.

Synonyms: Shift, relocation, movement

Antonyms: Stability, immobility, stasis

Example: Measures were taken to arrest the unexpected displacement of satellites.

5. Resupply (Verb) (पुनः आपूर्ति करना)

Meaning: To provide with a fresh supply of something.

Synonyms: Replenish, refill, restock

Antonyms: Deplete, exhaust, consume

Example: Orbital resupply platforms are crucial for long-duration space missions.

6. Lucrative (Adjective) (लाभदायक)

Meaning: Producing a great deal of profit.

Synonyms: Profitable, advantageous, rewarding

Antonyms: Unprofitable, disadvantageous, unproductive

Example: Space mining operations are seen as lucrative opportunities.

7. Symbolic (Adjective) (प्रतीकात्मक)

Meaning: Serving as a symbol or representation.

Synonyms: Representative, emblematic, indicative

Antonyms: Literal, actual, direct

Example: Docking is symbolic of new opportunities in space exploration.

8. Germinate (Verb) (अंकुरित होना)

Meaning: To begin to grow or develop.

Synonyms: Sprout, grow, develop

Antonyms: Wither, die, stagnate

Example: Cowpea seeds successfully germinated during the experiment in orbit.

9. Anticipation (Noun) (प्रत्याशा)

Meaning: The action of expecting or predicting something.

Synonyms: Expectation, foresight, prediction

Antonyms: Surprise, ignorance, unawareness

Example: ISRO prepared the SpaDeX satellites with ample fuel in anticipation of multiple attempts.

10. Coherent (Adjective) (सुसंगत)

Meaning: Logical and consistent.

Synonyms: Logical, clear, organized

Antonyms: Incoherent, chaotic, disorganized

Example: ISRO should present a coherent vision for its upcoming space station project.