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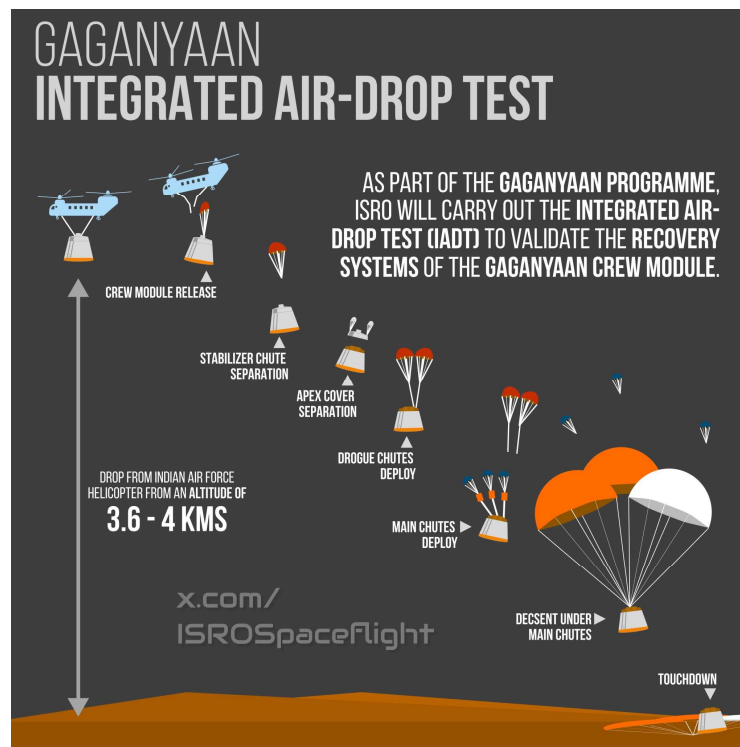
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Integrated Air Drop
Test (IADT-1)
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INTEGRATED AIR DROP TEST (IADT-1)

On August 24, the Indian Space Research Organisation (ISRO) successfully carried out its first Integrated Air Drop Test (IADT-1), a crucial milestone in the preparation for the country's maiden human spaceflight mission, Gaganyaan. A dummy crew capsule weighing nearly five tonnes was dropped from a helicopter to test whether its parachute system could slow it safely for splashdown.



Integrated Air Drop Test (IADT-1)

- The Integrated Air Drop Test (IADT-1) is a critical test conducted by ISRO as part of the Gaganyaan human spaceflight mission to validate the parachute-based deceleration system of the Crew Module (CM).
- In this test, a simulated crew module weighing about 4.8 tons was dropped from an altitude of around 3 km using an Indian Air Force Chinook helicopter.
- The test demonstrated the deployment of 10 parachutes in a precise sequence to safely reduce the module's descent speed to about 8 meters per second for a safe splashdown into the sea.
- This test simulated possible abort scenarios during launch and validated the end-to-end performance of the parachute system designed to ensure astronaut safety during the terminal descent phase of the Gaganyaan mission.

- The test involved collaboration with DRDO, Indian Air Force, Indian Navy, and Indian Coast Guard, and the module was successfully recovered after splashdown.

Key Features of IADT-1:

- Simulated crew module dropped from 3 km altitude by helicopter.
- Deployment of a suite of 10 parachutes: Apex Cover Separation, drogue, pilot, and main parachutes.
- Parachutes slowed the module for safe splashdown at around 8 m/s.
- Test replicated launch pad abort and terminal phase descent scenarios.
- Validated onboard avionics and parachute deployment sequencing.
- Successful recovery of the module post splashdown.

The test marks a significant milestone in ISRO's preparations for the Gaganyaan mission, with the uncrewed first mission planned by late 2025 and the first crewed mission targeted in 2027.

How was the test conducted?

The Integrated Air Drop Test (IADT-1) was conducted by ISRO on August 24, 2025, at the Satish Dhawan Space Centre as an essential step in the Gaganyaan mission. The test involved dropping a simulated Crew Module (weighing around 4.8 tons) with the parachute-based deceleration system from an altitude of about 3 kilometers using an Indian Air Force Chinook heavy-lift helicopter. This test was designed to validate the entire end-to-end performance of the parachute system that would slow down and safely land the crew module during its terminal descent phase.

The sequence of the test was as follows:

- Upon release, the onboard avionics autonomously activated the deceleration system.
- First, two Apex Cover Separation (ACS) parachutes (~2.5 m diameter) were deployed by firing ACS Mortars, which decelerated and separated the apex cover from the module.
- Then two Drogue parachutes (~5.8 m diameter) were deployed using Drogue Mortars to provide the initial stage of deceleration to the module.
- After releasing the Drogue parachutes, three Pilot parachutes (~3.4 m diameter) were deployed through Pilot Mortars.
- The Pilot parachutes extracted and deployed three large Main parachutes (~25 m diameter) that further slowed the module.
- The parachutes worked in a precise sequence to reduce the terminal velocity of the crew module to around 8 m/s, allowing a safe splashdown.

- After touchdown, the main parachutes were released using parachute releasers.

The test simulated an abort scenario at the launch pad and successfully demonstrated the parachute system's reliability. Onboard avionics recorded various parameters, which were telemetered to the ground and stored onboard. The splashdown and recovery of the module were successfully executed with the support of Indian Navy and Coast Guard vessels.

This test is crucial for qualifying the parachute system, which is vital for astronaut safety during re-entry and landing in the Gaganyaan missions.

Roadmap for Integrated Air Drop Test (IADT-1)

The roadmap for the Integrated Air Drop Test (IADT-1) is a critical milestone in ISRO's Gaganyaan human spaceflight mission. The first IADT-1 was conducted on August 24, 2025, where a five-tonne dummy crew capsule was dropped from about 3 km altitude using a Chinook helicopter to test the parachute-based deceleration system essential for safe splashdown after re-entry. This test validated the deployment sequence and performance of parachutes that slow down the crew module from high speeds to a safe landing velocity, critical for astronaut safety.

In the broader Gaganyaan roadmap, IADT-1 comes after the Test Vehicle Abort Mission (TV-D1) in 2023 and before the G1 uncrewed mission planned for late 2025. ISRO plans to conduct multiple IADT tests to ensure system reliability and address any issues before the first crewed flight scheduled in 2027. The parachute system includes several types of parachutes (apex cover separation, drogue, pilot, and main chutes) deployed in sequence to decelerate and stabilize the crew module during descent. The test also involved collaboration with DRDO, Indian Air Force, Indian Navy, and Indian Coast Guard for recovery operations.

Roadmap highlights:

- IADT-1 focuses on end-to-end parachute system validation under real-world conditions.
- It simulates launch pad abort and terminal descent scenarios.
- The test verifies autonomous onboard avionics triggering parachute deployment.
- Following IADT-1, further IADT trials and system qualification tests will continue.
- Subsequent missions include additional abort and escape system tests and uncrewed Gaganyaan flights.
- The ultimate goal is to human-rate the spacecraft for the 2027 crewed mission.

This stepwise testing sequence in the Gaganyaan roadmap ensures thorough validation of crew safety and landing systems before human spaceflight is attempted.

Gaganyaan Mission

The Gaganyaan Mission is an Indian crewed orbital spacecraft project by the Indian Space Research Organisation (ISRO) aimed at demonstrating India's human spaceflight capability. Key details of the mission are:

- The spacecraft is designed to carry three astronauts and orbit the Earth at an altitude of 400 kilometers for a duration of about three days in its maiden crewed mission.
- The mission includes development of a human-rated launch vehicle, life support systems, crew escape and safety systems, and astronaut training.
- The spacecraft is expected to safely return the crew back to Earth, splashing down in Indian sea waters.
- The launch vehicle known as Human Rated LVM3 (HLVM3) is a heavy-lift rocket configured specifically for crewed missions.
- Uncrewed test flights preceded the crewed mission to validate critical technologies, including Integrated Air Drop Test, Pad Abort Test, and Test Vehicle Abort Missions.
- Astronaut training has been conducted in collaboration with Russia, with Indian pilots undergoing ongoing health and simulation preparations.
- The first uncrewed orbital test mission (Gaganyaan-1) is expected to orbit Earth for approximately three days to validate safety and life-support systems before the crewed launch.
- The crewed mission launch timeline has shifted, with the first crewed flight now expected no earlier than 2027.
- The mission is seen as a major leap for India's space ambitions and global stature, with longer-term goals including space station development and interplanetary human missions.
- The estimated program cost is under ₹10,000 crore, noted for cost efficiency compared to similar programs globally.

The Gaganyaan Mission aims to make India the fourth country to independently send humans into space, after the US, Russia, and China, symbolizing India's rise as a self-reliant space power with indigenous technology.