Integrated Air Drop Test for Gaganyaan Mission

Source: TH

Why in News?

Indian Space Research Organisation (ISRO) successfully conducted its **first Integrated Air Drop Test (IADT-1)** for the **Gaganyaan mission**.

- IADT-1 aimed to validate the performance of the parachute-based deceleration system for the **Crew Module (CM) of the Gaganyaan mission** in a real-world scenario.
- The test involved collaborations between ISRO, **Defence Research and Development Organisation (DRDO)**, the Indian Air Force, Indian Navy, and Indian Coast Guard.

What is Gaganyaan Mission?

- **Overview:** India's first human spaceflight program, aiming to send a crew of **3 astronauts** to **Low Earth Orbit (LEO)** **at 400 km** for **3 days** and return them safely to Earth.
- **Mission Phases:** Includes **two unmanned test missions** followed by the **first manned mission** expected to happen in early 2027.
- **Significance:** Gaganyaan success will place India among the **elite group of nations** (US, Russia, China) with human spaceflight capability.
- **Crew training for Gaganyaan: Group Captain Prasanth Balakrishnan Nair, Group Captain Ajit Krishnan, Group Captain Angad Pratap, and Wing Commander Shubhanshu Shukla are India's astronauts-designated for Gaganyaan.**
- **Key Technologies for Crew Safety:**
  - **Human-Rated Launch Vehicle (HLVM3):** It is a modified version of **ISRO's LVM3 rocket**. It includes **solid, liquid, and cryogenic stages**, re-configured to meet human rating requirements.
    - The rocket is capable of launching the **Orbital Module to a Low Earth Orbit (400 km)** and features a **Crew Escape System (CES)** with high burn rate solid motors to ensure crew safety during emergencies at launch or ascent.
    - CES ensures safe abort in case of emergencies during launch or ascent.
  - **Orbital Module (OM):** Houses the **Crew Module (CM)** and **Service Module (SM)** with life support, avionics, and propulsion systems.
    - The CM is a habitable space with an **Earth-like environment**, with a pressurized inner structure and unpressurized external structure. It houses crew interfaces, life support systems, and avionics, and is designed for re-entry.
    - The **SM supports the CM in orbit,** providing thermal, propulsion, power systems, avionics, and deployment mechanisms, but remains unpressurized.
- **Mission Preparatory Tests:**
  - **Integrated Air Drop Test (IADT)**: Validate parachute and deceleration systems.
  - **Test Vehicle Missions (TV)**: Test abort and launch systems.
  - **Pad Abort Test (PAT)**: Check crew module safety from various altitudes.
  - **Water Survival Test Facility (WSTF)**: Recovery trials with Navy support.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. With reference to India's satellite launch vehicles, consider the following statements: (2018)

1. PSLVs launch the satellites useful for Earth resources monitoring whereas GSLVs are designed mainly to launch communication satellites.
2. Satellites launched by PSLV appear to remain permanently fixed in the same position in the sky, as viewed from a particular location on Earth.
3. GSLV Mk III is a four-staged launch vehicle with the first and third stages using solid rocket motors; and the second and fourth stages using liquid rocket engines.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 and 3
(c) 1 and 2
(d) 3 only

Ans: (a)

Q. Consider the following statements: (2016)

1. The Mangalyaan launched by ISRO
2. is also called the Mars Orbiter Mission
3. made India the second country to have a spacecraft orbit the Mars after USA
4. made India the only country to be successful in making its spacecraft orbit the Mars in its very first attempt

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (c)

Mains

Q. India has achieved remarkable successes in unmanned space missions including the Chandrayaan and Mars Orbiter Mission, but has not ventured into manned space mission. What are the main obstacles to launching a manned space mission, both in terms of technology and logistics? Examine critically. (2017)