



## Mission Gaganyaan

The Prime Minister of India in his Independence Day address announced that an Indian astronaut would go into space by 2022, when India celebrates her 75th year of Independence.

- If India does launch the Gaganyaan mission, it will be the fourth nation to do so after the United States, Russia and China.
- In 1984, India's first astronaut Wing Commander (retd.) Rakesh Sharma orbited Earth as part of a Soviet mission.
- In pursuance of this, in July 2018, ISRO conducted an experiment for emergency escape of astronauts called the **Pad Abort Test** which demonstrated the safe recovery of the crew module in case of any emergency at the launch pad.

The '**pad abort**' test or **Crew Escape System** is an emergency escape measure that helps pull the crew away from the launch vehicle when a mission has to be aborted.

### The Mission

- R. Lalithambika, a specialist in advanced launcher technologies, will helm the project as Director of the Human Space Flight Project.
- The mission is estimated at Rs.9000 crore.
- The plans in the "demonstration phase" includes undertaking two unmanned flights and one human flight using Indian technology to put a crew of three into a low earth orbit for 5-7 days.
- A manned space mission is very different from all other missions that ISRO has so far completed.
- In terms of complexity and ambition, even the missions to the Moon (Chandrayaan) and Mars (Mangalyaan) are nowhere in comparison.
- For a manned mission, the key distinguishing capabilities that ISRO has had to develop include the ability to bring the spacecraft back to Earth after flight – For this, ISRO, in 2014, successfully tested the Crew module Atmospheric Reentry Experiment (CARE) that came back to Earth after being taken into space.
- Also to build a spacecraft in which astronauts can live in space, the **Environmental Control & Life Support System (ECLSS)** is meant to ensure that conditions inside the crew module are suitable for humans to live comfortably.
- One of the most important requirements is the development of a launch vehicle that can carry heavy payloads into space.
  - The spacecraft carrying human beings, called crew module, is likely to weigh in excess of 5 to 6 tonnes.
  - ISRO's main launch vehicle, the PSLV (Polar Satellite Launch Vehicle), which carried the Chandrayaan and Mangalyaan missions too, can carry payloads that are barely up to 2 tonnes.
  - That is why the development of GSLV Mk-III, a launch vehicle with capabilities to deliver much heavier payloads much deeper into space, was necessary.
- Most of the critical technologies and hardware required for the Human Space Flight Programme (HSP) are ready or have been demonstrated.
- ISRO would now stitch them up into a complete project and present a comprehensive project

report to get a formal approval of the government.

### **GSLV MK-III**

- The Geosynchronous Satellite Launch Vehicle (GSLV)-III is a launch vehicle conceived and designed to make ISRO fully self reliant in launching heavier satellites.
- It is designed to be a three stage **vehicle**, with the first stage comprising two Large Solid Booster with solid propellant, that are strapped on to the second stage, the re-startable liquid stage. The third stage is the Liquid Oxygen/ Liquid Hydrogen cryogenic stage.
- ISRO successfully tested GSLV Mk-III, now called **LVM-3 (Launch Vehicle Mark-3)**, in an experimental flight in December 2014.
- Then, in June 2017, ISRO successfully launched the first “developmental” flight of LVM-3, which carried the GSAT-19 satellite into space.
- The LVM-3 is the declared launch vehicle for taking the manned crew module into space.
- Over the next few years, many more flights of GSLV are scheduled. These will help ISRO in perfecting the cryogenic technology for sending up heavier and heavier payloads.
- In fact, in June 2018, the government approved the funding for the next 10 flights of GSLV Mk-III at an estimated cost of Rs 4,338.2 crore. This was supposed to take care of GSLV Mk-III missions till 2024.

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