All about Gaganyaan Mission

Why in news?

Indian Space Research Organisation (ISRO) successfully demonstrated the TV D1 mission, the first uncrewed developmental flight of 'Gaganyaan' human spaceflight mission.

To know more about the brief history of ISRO click here

What is Gaganyaan Mission?

- India's first human space mission.
- **Mission of -** Indian Space Research Organisation (ISRO)
- **Objective-** To send humans into space on a *Low Earth Orbit of 400 km for 3 days* and bring them safely back to the Earth
- **Timeline -** By 2025
- **Components** - Crew module (CM) and the service module (SM), which together will form the orbital module.
    - **Crew Module**- It is the habitable space with Earth like environment in space for the crew and is designed for re-entry to ensure safety of the crew during descent till touchdown.
    - **Service Module**- It is an unpressurized structure that will be used for providing necessary support to CM while in orbit.

- **Launch Vehicle** - *Launch Vehicle Mark III (LVM3)*
- **Other features** - For Gaganyaan, ISRO signed an agreement with Russia's Glavkosmos to select and train Indian astronauts.
- The US has also offered to provide advanced training to the astronauts selected for the Gaganyaan.
- The second phase of this mission will involve the launch of ***Vyommitra,*** a female spacefaring half humanoid robot that will function as a prototype for the Gaganyaan missions.
- Astronaut training facility is established in *Bengaluru.*

If it succeeds, India will become only the 4th country to send a human into space after the Soviet Union, the US, and China.

LVM3 & HLVM3

• LVM3 - It is the heaviest rocket of ISRO.
• It was earlier called Geosynchronous Launch Vehicle Mark III (GSLV Mk III).
• It consists of 3 stages - solid, liquid and cryogenic stage.
• **HLVM3**- All systems in LVM3 launch vehicle are re-configured to meet human rating requirements and christened Human Rated LVM3.
• It consists of Crew escape system powered by a set of quick acting, high burn rate solid motors which ensures that Crew Module along with crew is taken to a safe distance in case of any emergency.

What tests were planned as a part of the mission?

- **Integrated Air Drop Tests-** It involve dropping a simulated crew module from an aircraft and deploying parachutes to slow down its descent and land safely in the sea.
- The tests also verify the performance of the flotation system.
- **Test Vehicle Missions-** It involve launching a single-stage liquid propulsion rocket, equipped with a crew module and a crew escape system.
    - Test Vehicle Abort Mission-1 (TV-D1) was successfully demonstrated by the ISRO recently.
- **Pad Abort Tests (PAT)-** It is a test of a launch escape system, which is designed to quickly get the crew and spacecraft away from the rocket in case of an emergency on the launch pad.
- **Uncrewed mission-** Its purpose is technology demonstration, safety and reliability verification and studying the performance of systems before crewed flight.
- **Manned flight mission-** It carries human crew members who operates its control and performs various tasks.

Test Vehicle Abort Mission-1 (TV-D1)

• It is an in-flight *abort demonstration of Crew Escape System (CES)* at Mach number 1.2 followed by Crew Module separation and safe recovery.
• TV- D1 features a *single-stage rocket* powered by liquid propellants for this mission.
• It carries payloads including the
- **Crew Module (CM)-** It will take the crew to the space which is under development and is being tested.
- **Crew Escape System (CES)**- In case of any damage to the rocket, the crew will have to be taken away from the rocket and saved.

What are the benefits of undertaking Gaganyaan mission?

- **Future explorations**- It will make a progress towards a sustained and affordable human and robotic programme to explore the solar system and beyond.
- **Technology**- Advanced technology capability for undertaking human space exploration, sample return missions and scientific exploration.
- **Future capability**- To actively collaborate in global space station development & to carry out scientific experiments of interest to the nation.
- **Partnership**- Create a broad frame work for wider Academia – Industry partnership in taking up development activities for national development.
- **Job creation**- It provides for an ample scope for employment generation and human

resource development in advanced science and R&D activities.

- **Foster scientific temper**- It will provide unique opportunity to inspire and excite Indian youth and steer many students towards career in science and technology.
- **Global leader** -The programme will strengthen international partnerships and global security through the sharing of challenging and peaceful goals.
- Having a vibrant human spaceflight programme can be leveraged as a potent foreign policy.

References

1. The Hindu- The Progress of India's human spaceflight mission
2. ISRO- Gaganyaan mission

