Launch Vehicle Mark 3

Why in News?

Recently, the **Indian Space Research Organisation's (ISRO)** heaviest rocket **Launch Vehicle Mark 3 (LVM3 or GSLV Mark 3)** has successfully orbited 36 satellites of **U.K.-based OneWeb**.

- OneWeb is a global communications network powered by a constellation of 648 Low Earth Orbit (LEO) satellites.

What is LMV 3?

- **About:**
  - The LVM3-M2 mission is a dedicated commercial mission for a foreign customer OneWeb, through **NewSpace India Limited (NSIL)**, a Central Public Sector Enterprise (CPSE).
  - It is the first multi-satellite mission with 36 OneWeb Satellites to the LEO as the heaviest Payload mass of 5,796 kg. of LVM3 till date.
  - This newest rocket is capable of **launching 4,000-kilogram class of satellites into GTO (Geosynchronous Transfer Orbit)** and 8,000 kgs of payloads into LEO.
  - It is a **three-stage launch vehicle consisting of two solid propellant S200 strap-ons** on its sides and core stage comprising L110 liquid stage and C25 cryogenic stage.
- **Features:**
  - First Commercial Mission of LVM3
  - First launch of LVM3 to LEO
  - First Indian rocket with six-ton payload
  - First NSIL Mission with LVM3
  - First OneWeb Mission with NSIL/Department of Space.
- **Technical Achievements:**
  - Handling of multiple satellite separation events
  - Increased nominal mission duration
  - Ensuring safe separation distance through C25 (cryo) stage re-orientation & velocity addition
  - Ensuring data availability for entire mission duration
  - Realisation of new payload adaptor and interface ring for the satellites dispenser

What is OneWeb Constellation?

- OneWeb Constellation operates in a LEO Polar Orbit Satellites are arranged in **12 rings (Orbital planes) with 49 satellites in each plane**.
- The orbital planes are inclined to be near polar (87.9 Deg.)
- The orbital planes are 1200 km above the Earth. Each satellite completes a full trip around the earth every 109 minutes.
- The earth is rotating underneath satellites, so they will always be flying over new locations on the ground.

What are other Launch Vehicles Developed by ISRO?

- **Satellite Launch Vehicle (SLV):** The first rocket developed by ISRO was simply called SLV, or

Satellite Launch Vehicle.
    - It was followed by the Augmented Satellite Launch Vehicle or ASLV.
- **Augmented Satellite Launch Vehicle (ASLV):** SLV and ASLV both could carry small satellites, weighing up to 150 kg, to lower earth orbits.
    - ASLV operated till the early 1990s before PSLV came on the scene.
- **Polar Satellite Launch Vehicle (PSLV):** PSLV's first launch was in 1994, and it has been ISRO's main rocket ever since. Today's PSLV, however, is vastly improved and several times more powerful than the ones used in the 1990s.
    - It is the first Indian launch vehicle to be equipped with liquid stages.
    - PSLV is the most reliable rocket used by ISRO to date, with 52 of its 54 flights being successful.
    - It successfully launched two spacecraft – Chandrayaan-1 **in 2008 and** Mars Orbiter Spacecraft **in 2013** – that later travelled to Moon and Mars respectively.
- **Geosynchronous Satellite Launch Vehicle (GSLV):** GSLV is a much more powerful rocket, meant to carry heavier satellites much deeper into space. To date, GSLV rockets have carried out 18 missions, of which four ended in failure.
    - It can take 10,000 kg of satellites to lower the earth's orbits.
    - The indigenously developed Cryogenic Upper Stage (CUS), forms the third stage of GSLV Mk II.
    - Mk-III versions have made ISRO entirely self-sufficient in launching its satellites.
        - Before this, it used to depend on the European Arianne launch vehicle to take its heavier satellites into space.
        - GSLV Mark-III was used to launch the **Chandrayaan-2 mission** to the moon in 2019, which was the first operational flight of the rocket.
    - ISRO has renamed the **GSLV Mark-III as Launch Vehicle Mark-III**.
        - A GSLV – for the Geostationary Orbit (GEO) – will continue to be called so. The LVM3 will go everywhere —GEO, Medium Earth orbit (MEO), LEO, and missions to the moon, sun.

UPSC Civil Services Examination Previous Year Question

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)

Source: TH