



# Launch Vehicle Mark 3

## Why in News?

[Indian Space Research Organization \(ISRO\)](#) will launch its [Chandrayaan-3 Mission](#) in [LVM \(Launch Vehicle Mark\) 3](#) on 14<sup>th</sup> July 2023.

## What are the Launch Vehicles of ISRO?

- ISRO has **3 classes** of Launch Vehicles,
  - [PSLV \(Polar Satellite Launch Vehicle\)](#): It has a famous reputation as a workhorse with a very low failure rate, the PSLV can lift up to 3.8 tonnes of [Low Earth Orbit](#).
  - [GSLV \(Geostationary Launch Vehicle\)](#): ISRO developed and uses the GSLV to launch heavier payloads and if required in higher orbits. Like the PSLV, GSLV also has multiple configurations.
    - The most Powerful **configuration is LVM-3**.
  - [SSLV \(Small Satellite Launch Vehicle\)](#): It is a 3 stage Launch Vehicle configured with three **Solid Propulsion Stages and liquid propulsion based Velocity Trimming Module (VTM)** as a terminal stage.

## What is LVM 3?

- The LVM-3 has 3 stages,
  - **The first (or bottom most stage)** is in the form of 2 S200 boosters straps to the sides of the rocket body. They combust a solid fuel called hydroxyl-terminated polybutadiene,
  - **The second stage** is powered by Vikas Engines, which combust a **liquid fuel**, either nitrogen tetroxide or unsymmetrical dimethylhydrazine.
  - The **Uppermost final stage** is Powered by a cryogenic engine. It combusts **liquified hydrogen with liquified oxygen**.
- It can lift upto 8 tonnes in low earth orbit.
- **Some of the LVM 3 Missions launched are,**
  - [OneWeb India-2 Mission](#)
  - OneWeb India-1 Mission
  - [Chandrayaan-2 Mission](#)
  - [GSAT-29 Mission](#)
  - GSAT-19 Mission
  - [CARE Mission](#)

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# ISRO LAUNCH VEHICLES

## BACKGROUND

◆ First rocket developed by ISRO - SLV (Satellite Launch Vehicle)

◆ Successor of SLV - Augmented Satellite Launch Vehicle (ASLV)

## Polar Satellite Launch Vehicle (PSLV)

### ◆ About

- The **Workhorse of ISRO**
- 3<sup>rd</sup> gen, 4-Stage launch vehicle (1<sup>st</sup>, 3<sup>rd</sup> stages - solid fuel; 2<sup>nd</sup>, 4<sup>th</sup> stages - liquid fuel)

### ◆ Capacity

- Delivers **earth-observation/remote-sensing satellites**
- Used to launch satellites of **lower mass (~1400 Kg)**

### ◆ 4 Variants:

- PSLV-CA ● PSLV-QL ● PSLV-DL ● PSLV-XL

### ◆ Launches Satellites in

- Low inclination LEO ● Sub-GTO ● GTO

### ◆ Important Launches

- First successful launch - October 1994
- Chandrayaan-1 (2008)
- Mars Orbiter Spacecraft (2013)

PSLV is 1<sup>st</sup> Indian launch vehicle to be equipped with liquid stages



## Geosynchronous Satellite Launch Vehicle (GSLV)

### ◆ About

- 4<sup>th</sup> Gen, 3-staged launched vehicle
- Much more powerful rocket, carries satellites much deeper into space
- Has an **indigenous Cryogenic Upper Stage**

### ◆ Capacity

- Delivers **communication-satellites**
- Carries heavier satellites (~2200 kg to GTO)
- Carries 10,000-kg satellites to LEO

### ◆ Launches Satellites in

- Primarily Geosynchronous Transfer Orbit (GTO) (~36000 Km altitude)

### ◆ Important Launches:

- Chandrayaan-2 ● Upcoming Gaganyaan



## Launch Vehicle Mark-III

### ◆ About

- Aka **GSLV Mk-III**
- 3-stage launch vehicle (2 solid propellant and 1 core stage comprising liquid and cryogenic stages)

### ◆ Capacity

- 4,000-kg of satellites into **GTO**
- 8,000 kg of payloads into **LEO**

### ◆ Launches Satellites in

- GTO ● Medium Earth orbit (MEO)
- LEO ● Missions to moon, sun

Mk-III versions have made ISRO entirely self-sufficient in launching its satellites



## Small Satellite Launch Vehicle (SSLV)

### ◆ About

- Developed specifically for **small and micro-satellites**

### ◆ Capacity

- Satellites up to 500 kg

### ◆ Launch Limit

- 500 km **planar orbit (LEO)** from Satish Dhawan Space Centre



## What is the Chandrayaan-3 Mission?

- Chandrayaan-3 is India's **third moon mission and is a follow-up of Chandrayaan-2** of July 2019, which aimed to land a rover on the lunar South Pole.
- The mission is scheduled to be launched later in 2023 by LVM3 from the Satish Dhawan Space Centre at Sriharikota.
- The subsequent failure of the Vikram lander led to the pursuit of another mission to demonstrate the landing capabilities needed for the **Lunar Polar Exploration Mission** proposed in partnership with Japan for 2024.
- The Mission will **have three major modules- the Propulsion module, Lander module and Rover.**
- The propulsion module will carry the lander and rover configuration till 100 km lunar orbit.
- The Lander will have the capability to soft land at a specified lunar site and deploy the Rover which will carry out in-situ chemical analysis of the lunar surface during the course of its mobility.

Source: TH

