



## ISRO's Small Satellite Launch Vehicle Mission

This editorial is based on [“Space to learn | On the failure of ISRO's maiden small satellite launch vehicle mission”](#), which was published in The Hindu on 10/08/2022. It talks about the ISRO's maiden small satellite launch vehicle mission.

**For Prelims:** Indian Space Research Organisation (ISRO), Small Satellite Launch Vehicle, Earth Observation Satellite-2 (EOS-2), AzadiSAT, Space Kidz India, Velocity Trimming Modules

**For Mains:** Purpose of the Mission, Difference Between Circular and Elliptical Orbits, Upcoming Projects of ISRO

The [Indian Space Research Organisation \(ISRO\)](#) launched the first flight of its new satellite launcher, [Small Satellite Launch Vehicle](#) from the [Satish Dhawan Space Centre](#) in Sriharikota, Andhra Pradesh carrying two satellites - [Earth Observation Satellite-2 \(EOS-2\)](#) and [AzadiSAT](#).

**Satellites carried by the vehicle**, however, **failed to reach the desired orbit** due to an **error in the terminal stage**.

### What was the Purpose of the Mission?

- The purpose of this mission was to place the two satellites in circular low-earth orbits at a height of about **350 km** above the Equator.
  - **EOS-2:** An **optical remote sensing satellite** designed and developed by ISRO.
  - **AzadiSAT:** Array of **75 tiny payloads** integrated by students, to measure the **ionising radiation**, integrated by the student team of [Space Kidz India](#).
    - It is **ISRO's attempt at popularising [Science Technology Engineering Mathematics \(STEM\)](#) among girl students at the school level** as it pushes for further exploration of the cosmos.

### What went Wrong During the Satellite Launch?

- The **SSLV was composed of three stages with [velocity trimming modules](#) powered by solid fuels** and **these three performed their function as planned**.
- The **problem appeared to be the SSLV's terminal stage**, called the **velocity trimming module (VTM)**.
  - According to the launch profile, the **VTM was supposed to have burned for 20 seconds**.
  - However, **it burnt for only 0.1 seconds**, denying the rocket of the requisite altitude boost.
- According to **ISRO**, the **malfunctioning of a sensor** resulted in **placing the satellites in an elliptical orbit, rather than a circular orbit**.

## What is the Difference Between Circular and Elliptical Orbits?

- **Orbit:** An orbit is a **regular, repeating path** that one object in space takes around another one.
  - **Elliptical:** When an object moves around another object in an **oval-shaped path**.
    - **Most planets in our solar system have [elliptical orbits](#)** rather than circular orbits due to the **[gravitational interactions](#)** of other planets and stars.
  - **Circular:** A circular orbit is an orbit with a **fixed distance around the barycenter**, in the shape of a circle.
    - Artificial **satellites** that orbit the Earth are mostly placed in **circular orbits**.
- Circular path is favourable for artificial satellites because **it is easier to image the Earth if the satellite is at a fixed distance** from it.
  - If the distance keeps changing as in an elliptical orbit, keeping the cameras focussed can become complicated.

## How is SSLV Different From PSLV?

- **Cost-effective and Payload Capacity:** SSLV has been designed to launch a **500-kilogram payload** into a **500-kilometre planar orbit** plus it is **less expensive** than PSLV.
  - As the **[PSLV \(Polar Satellite Launch Vehicle\)](#)** can carry huge loads, **small projects don't have a high cost-benefit ratio**.
- **Solid Propellant:** The **SSLV uses [solid propellants](#)** and this is more economical and easier to handle than the **liquid propellant stages of the PSLV**.
- **Faster Launch on Demand Service:** PSLV's long turnaround time (**over 60 days**) makes scaling up launch on demand launches difficult.
  - The **SSLV has the flexibility to launch multiple satellites**. It has a low turnaround time (**72 hours**) and can be assembled within a fortnight, allowing the space agency to provide **[launch on demand service](#)** in the **fast growing low earth orbit launch sector**.

## What are the Upcoming Projects of ISRO?

- **[Gaganyaan](#)**- Indian Human Spaceflight Programme.
- **[Aditya-L1](#)**: To Study the Sun's atmosphere.
- **[NASA-ISRO Synthetic Aperture Radar Mission](#)**: To study hazards and global environmental change.
- **[Shukrayaan-1](#)**: Orbiter to Venus.

## What are the Future Potentials?

- **Doorway Commercial Satellite Launch Market:** The **SSLV** is India's official doorway into the commercial small satellite launch market around the world.
  - The rocket is expected to be operated by **[New Space India Limited \(NSIL\)](#)**, India's **commercial space operations arm**.
    - Attractive for commercial earth observation and communication.
- **Launch of the SSLV from Pole to Pole:** ISRO intends to launch the SSLV in future from its **[upcoming spaceport in Kulasekarapattinam in Tamil Nadu](#)**.
  - Doing so would allow SSLV to enter into a **pole-to-pole**, or polar orbit around the Earth.
    - The **SSLV will take off over the Lakshadweep Sea without manoeuvring around Sri Lanka, saving fuel and payload capacity**.
- **Towards Nano-Satellites Launch Vehicle:** With the advancement of technology, the size of satellites has come down significantly with **[CubeSats](#)** and **nano-satellites** becoming the norm of the day.
  - **ISRO has the opportunity to lead** the development of cost-effective **nano-satellite launch vehicles**.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

**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)**

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**Q. Consider the following statements: (2016)**

**The Mangalyaan launched by ISRO**

1. is also called the Mars Orbiter Mission
2. made India the second country to have a spacecraft orbit the Mars after USA
3. 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)**