



## Aditya-L1 Mission

**For Prelims:** [Indian Space Research Organisation](#), [Aditya-L1](#), [ISRO's Launch Vehicles](#), Lagrange Points in the Sun-Earth System, Solar flares, Coronal mass ejections.

**For Mains:** Significance of Exploring the Sun, India's achievements in the field of Space Science and Technology.

**Source:** [IE](#)

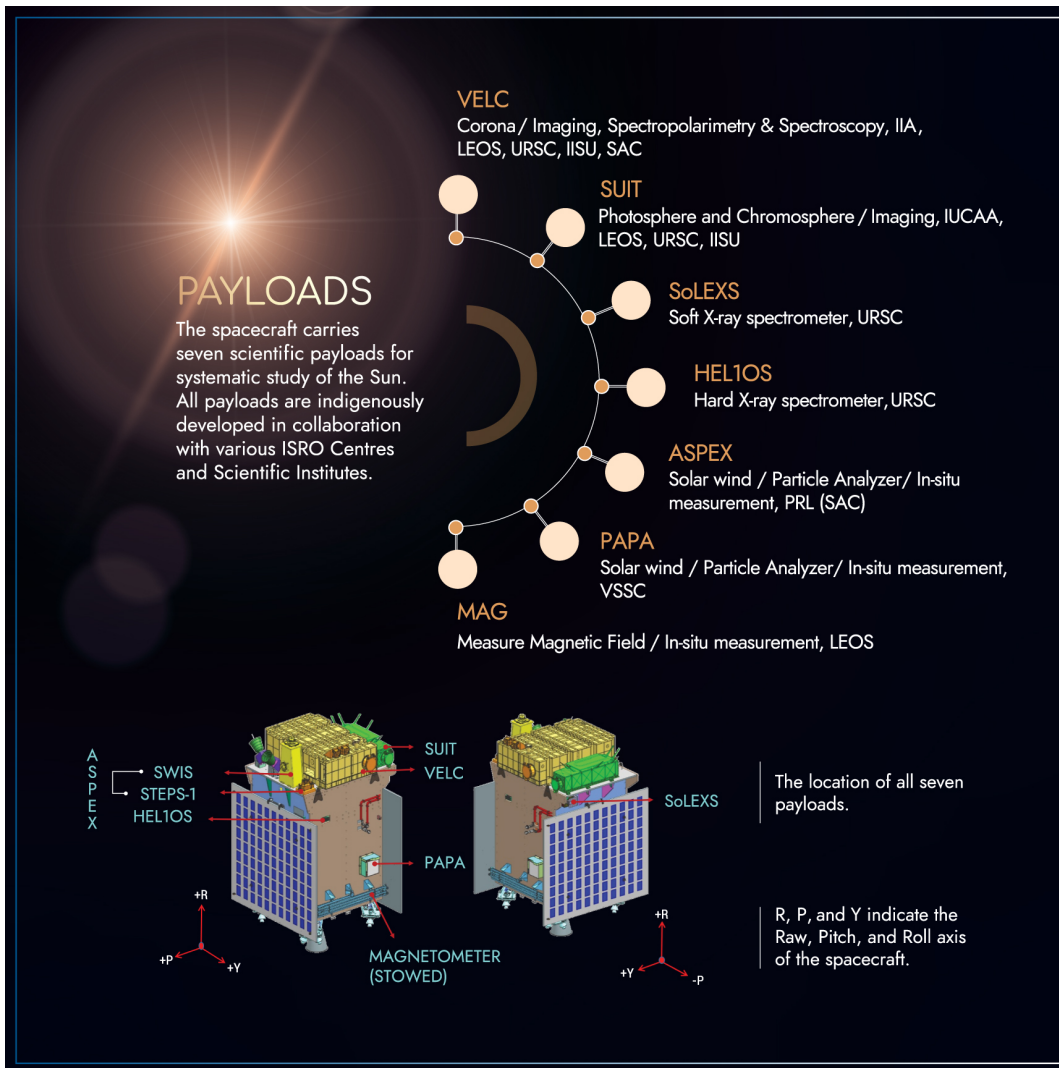
### Why in News?

Recently, the [Indian Space Research Organisation \(ISRO\)](#) has accomplished the launch of [Aditya-L1](#), its **inaugural Solar Mission**.

- The launch was conducted using the [PSLV-C57 rocket](#). The PSLV's **fourth stage was fired twice**, a first in ISRO's history, to **precisely insert the spacecraft into its elliptical orbit**.

### What is Aditya-L1 Mission?

- **About:**
  - **Aditya-L1** is the first space based observatory class Indian solar mission to study the Sun from a substantial distance of **1.5 million kilometers**. It will take approximately **125 days** to reach the L1 point.
    - Aditya-L1 is also ISRO's second astronomy observatory-class mission after **AstroSat (2015)**.
    - The mission's journey is notably shorter than India's previous [Mars orbiter mission, Mangalyaan](#).
  - The spacecraft is planned to be **placed in a halo orbit** around the **Lagrangian point 1 (L1) of the Sun-Earth system**.
- **Payloads:**



### Objective:

- The mission aims to provide valuable insights into the **solar corona, photosphere, chromosphere, and solar wind**.
- The primary objective of Aditya-L1 is to gain a deeper understanding of the Sun's behavior, including its **radiation, heat, particle flow, and magnetic fields**, and how they impact Earth.

## What are Lagrange Points?

### About:

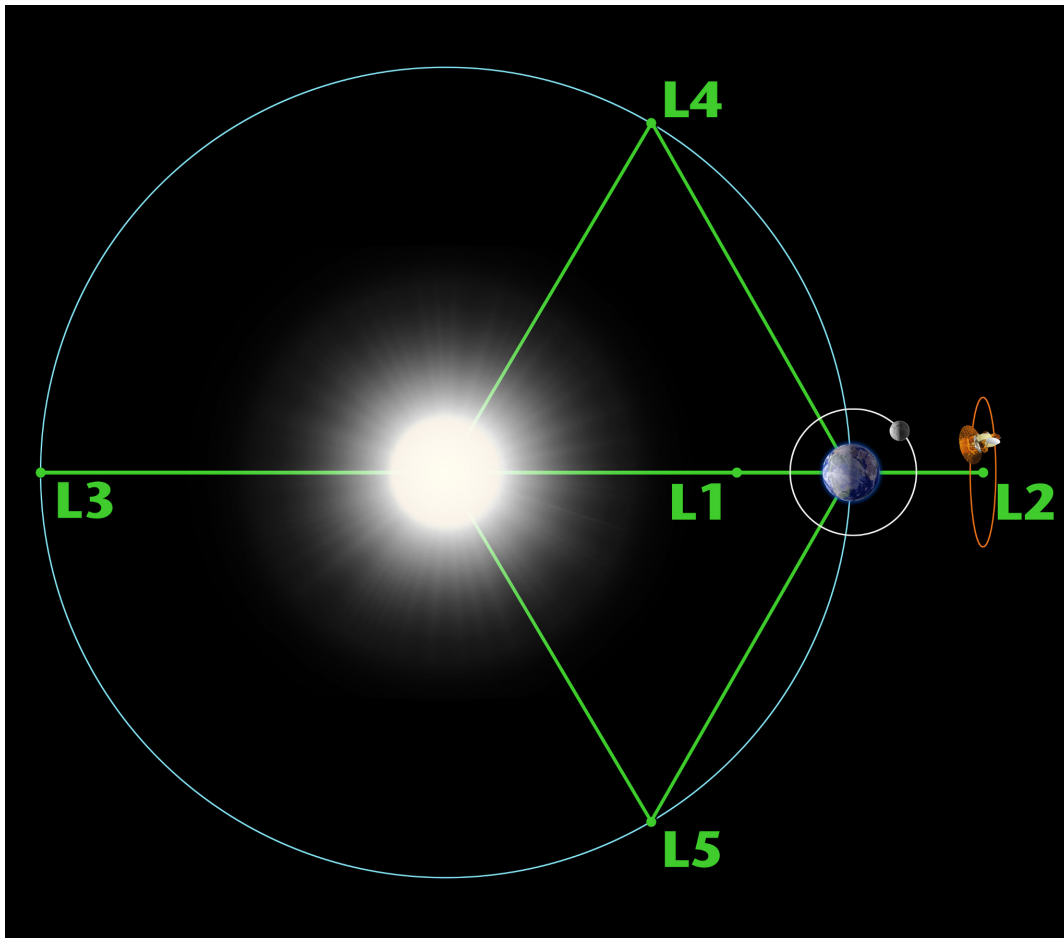
- Lagrange points** are special positions in space where the **gravitational forces of two large orbiting bodies**, such as the **Sun and the Earth**, balance each other out.
  - This means that a small object, such as a **spacecraft**, can stay at these points without using much fuel to maintain its orbit.
- There are **five Lagrange Points**, each with distinct characteristics. These points enable a small mass to orbit in a stable pattern amid two larger masses.

### Lagrange Points in the Sun-Earth System:

- L1:** L1 is considered the most significant of the Lagrange points for solar observations. A satellite placed in the **halo orbit around the L1 has the major advantage of continuously viewing the Sun** without any occultation/ eclipses.
  - It is currently home to the **Solar and Heliospheric Observatory Satellite (SOHO)**.
- L2:** Positioned directly 'behind' Earth as viewed from the Sun, L2 is excellent for **observing the larger Universe without Earth's shadow interference**.
  - The **James Webb Space Telescope** orbits the Sun near L2.
- L3:** Positioned behind the Sun, opposite Earth, and just beyond Earth's orbit, it

offers **potential observations of the far side of the Sun**.

- **L4 and L5:** Objects at L4 and L5 maintain stable positions, forming an **equilateral triangle with the two larger bodies**.
  - They are often used for space observatories, such as those studying asteroids.



**Note:** L1, L2, and L3 points are unstable, meaning that a small perturbation can cause an object to drift away from them. Therefore, **satellites orbiting these points need regular course corrections to maintain their positions**

## What is the Significance of Exploring the Sun?

- **Understanding Our Solar System:** The Sun is the **center of our solar system**, and its characteristics greatly influence the behavior of all other celestial bodies. Studying the Sun enhances our understanding of the dynamics of our solar neighborhood.
- **Space Weather Prediction:** Solar activities, such as [solar flares](#) and [coronal mass ejections](#), can impact Earth's space environment.
  - Understanding these phenomena is crucial for **predicting and mitigating potential disruptions to communication systems**, navigation, and power grids.
- **Advancing Solar Physics:** Exploring the Sun's complex behavior, including its **magnetic fields**, heating mechanisms, and plasma dynamics, contributes to advances in **fundamental physics and astrophysics**.
- **Enhancing Energy Research:** The Sun is a **natural fusion reactor**. Insights gained from studying its core and nuclear reactions can **inform our pursuit of clean and sustainable fusion energy on Earth**.
- **Improving Satellite Operations:** Solar radiation and solar wind affect the functioning of satellites and spacecraft. Understanding these solar interactions **allows for better spacecraft design and operation**.

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

**Q.** Discuss India's achievements in the field of Space Science and Technology. How has the application of this technology helped India in its socio-economic development? **(2016)**

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