India to Launch European Union’s Solar Observatory Satellite Proba-3 in December

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Summary:

Union Minister of State (Independent Charge) for Science and Technology, **Dr. Jitendra Singh,**announced that India will launch the **European Union's Proba-3 satellite** in early December, marking a **significant milestone in Indo-EU space collaboration**.

- Speaking at the 3rd Indian Space Conclave, he highlighted the satellite’s mission to observe the Sun, underscoring both nations’ commitment to advancing scientific knowledge.

Key Developments in Indo-EU Space Collaboration

1. **Announcement of Proba-3 Satellite Launch**:

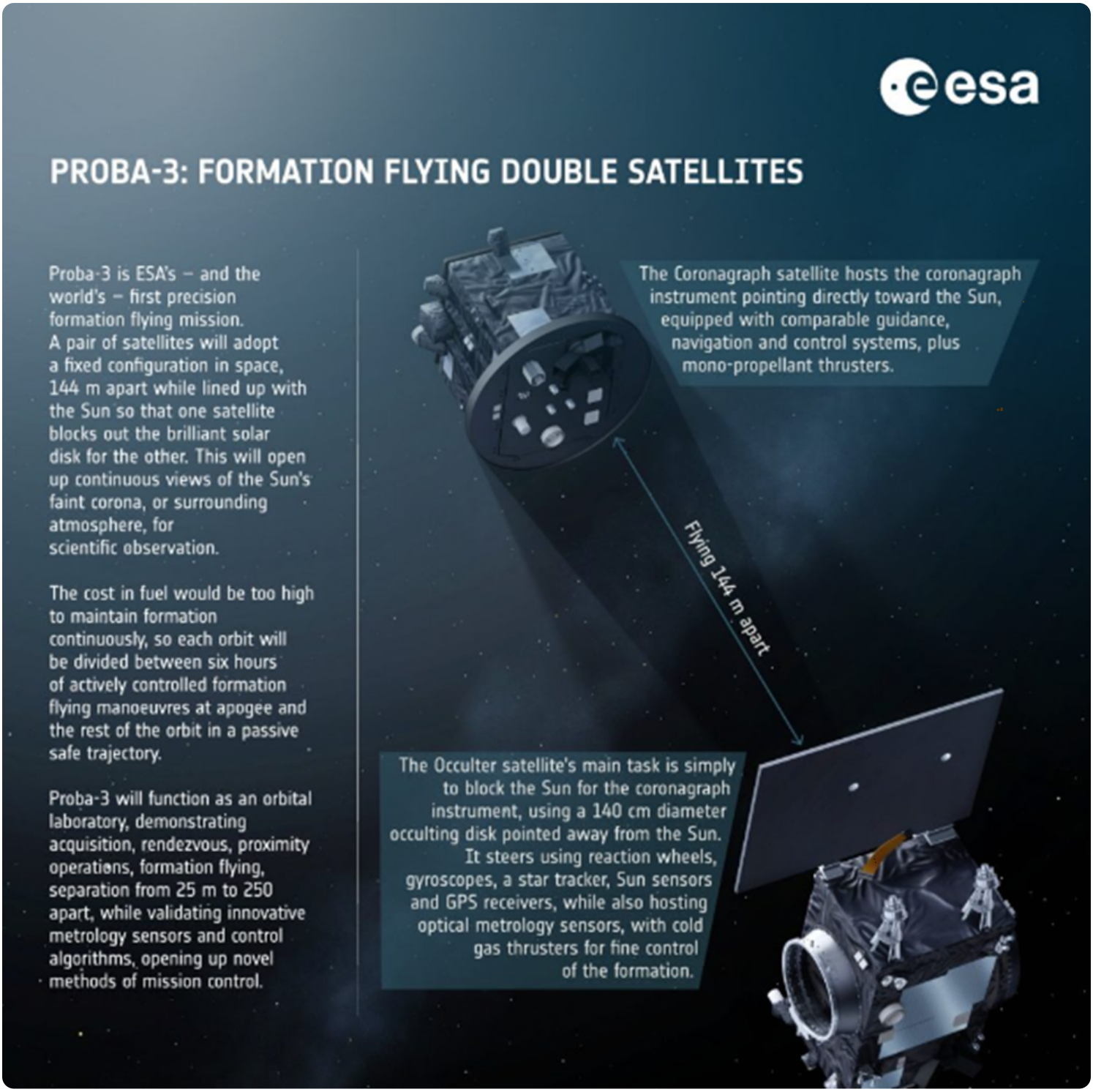
- **Dr. Jitendra Singh**, Union Minister of State for Science and Technology, announced that **India will launch the European Union's Proba-3 satellite** in **early December 2024**.
- This marks a significant milestone in the **Indo-EU space collaboration**.
- The **Proba-3 mission** will focus on **solar research**, specifically observing the Sun, and will further strengthen India-EU space cooperation.

1. **Context of Collaboration**:

- The launch builds on previous **EU-ISRO collaborations** but stands out due to its emphasis on **solar observation**, adding to **ISRO's** growing portfolio of space missions.
- This development follows on the heels of **ISRO’s successful Chandrayaan-3 mission**, continuing India’s momentum in space exploration.

1. **Launch of SPADE and ISpA Awards**:

- During the **3rd Indian Space Conclave**, Dr. Singh also unveiled **SPADE**, a product by **Suhora Technologies**, showcasing India’s growing **space tech capabilities**.
- He presented the **ISpA Awards**, celebrating achievements in the Indian space sector and underscoring India’s **vision for an advanced space industry** contributing to both national and global scientific progress.



Proba-3 Mission Overview

The **Proba-3 mission** is a pioneering space project designed to demonstrate **highly precise satellite formation flying** techniques. It will involve **two small satellites** that will launch together, then separate and fly in tandem to perform a variety of tasks, setting the stage for future **multi-satellite missions**. This mission represents a major leap forward in space science, providing essential technology for a range of applications, including Earth observation and in-orbit satellite servicing.

Mission Details:

1. **Objective**:

2. The primary goal of Proba-3 is to demonstrate **formation flying**—a technology that will enable multiple satellites to operate as a single **virtual structure**. This allows for greater accuracy in tasks that require large apertures, long focal lengths, and baselines that a single satellite cannot achieve alone. Proba-3's precision will advance our ability to detect very faint signals and capture smaller features in space.
3. **Satellites**:

- **Coronagraph spacecraft** and **Occulter spacecraft** are the two satellites that will fly in formation.
- The two will maintain **millimeter-level precision** and **arc-second accuracy** while maintaining a distance of **144 meters or more** for up to **six hours at a time**.
- The satellites will form a **virtual giant satellite** through their highly synchronized movements.

1. **Key Features of Formation Flying**:

- **Formation flying** is crucial for missions requiring a large scale, like **Earth observation** and **in-orbit satellite servicing**.
- Precision in formation flying will also enable future missions to **assemble large-scale structures** in space, such as **space telescopes** and **space stations**.

1. **Mission Orbit and Operations**:

- The Proba-3 satellites will be launched into a **highly elliptical orbit** (600 x 60,530 km with a 59-degree inclination).
- **Preparatory Phase**: The two satellites will begin in a **stack configuration**, and after a brief setup, they will be separated and placed into a **relative tandem orbit**.
- **Collision Avoidance**: The mission will demonstrate a **Collision Avoidance Manoeuvre** during its commissioning phase to ensure the satellites remain safe from each other and avoid any risks of collision.

1. **Scientific and Operational Goals**:

- The Proba-3 mission will use the **solar coronagraph** to block the bright light of the Sun and capture continuous observations of the Sun's **corona** (the Sun's outer atmosphere).
- **Formation Flying Operations**: The mission will alternate between **formation flying** at apogee (the highest point of the orbit) for **six hours**, and passive drifting during the rest of the orbit. This will involve **maneuvers, rendezvous, proximity operations**, and **coronagraph observations**.
- Proba-3 will repeatedly demonstrate the acquisition, rendezvous, and **convoy flying** techniques during each orbit.

1. **Technological Demonstrations**:

- **Satellite Technologies**: Proba-3 will validate key technologies, including **relative GPS navigation**, **guidance**, and **navigation control** systems. These technologies will be instrumental in future space missions.
- **Rendezvous Experiment**: The mission will test **sensors and algorithms** for cooperative and uncooperative rendezvous operations in **elliptical orbits**. This is particularly relevant for **future Mars missions**, like the **Mars Sample Return mission**, and for the **de-orbiting of satellites** from low-Earth orbit.

1. **Fuel Efficiency and Operational Cycle**:

- Due to fuel constraints, the satellites cannot maintain their precise formation throughout the orbit. Therefore, the orbit will be divided into:
- **Six hours of formation flying** at **apogee** (the highest point in the orbit).
- **Passive drifting** during the rest of the orbit.

1. **Proba-3 as a Space Laboratory**:

2. Proba-3 will act as a **space laboratory** to validate strategies and algorithms related to formation flying. The data and technologies developed will have wide applications for **future missions**, particularly those involving multi-satellite systems or precise space operations.

Mission Timeline and Launch:

- **Launch Date**: **2024**.
- **Mission Phases**: The mission's implementation phase (Phase C/D/E1) began in **July 2014**, and it is now nearing launch.

Significance:

- **Proba-3** represents a **world-first** in **precise formation flying**, setting the stage for more ambitious space missions in the future.
- The **technologies** demonstrated by Proba-3 will be critical for future space exploration and scientific missions, especially those involving multiple spacecraft working together as one unit.

Broader Impact:

- **Proba-3** is expected to **revolutionize satellite-based scientific observations**, especially in **solar research** and **space exploration**, and could enable more advanced, large-scale space infrastructure.