India’s Approach to Safeguarding Satellites

Source: TH

Why in News?

India is now planning **“bodyguard satellites”** along with multiple layers of protection to safeguard its **space assets**, as satellites have become indispensable for communication, navigation, security, internet services, and climate monitoring.

- **Bodyguard Satellites** are dedicated spacecraft designed to **escort and protect high-value satellites** by monitoring close approaches, detecting threats, and countering hostile manoeuvres in orbit.

Key Threats to Satellites

- **Physical Risks**: Space is filled with **debris**, and even a small piece can damage a satellite traveling at speeds of up to 28,000 km per hour.
- **Digital Risks**: Satellites are vulnerable to **radio signal jamming**, **spoofing**, and **cyberattacks** targeting ground systems.
- **Natural Threats**: Solar storms can damage satellite electronics and affect their orbits.
- **Geopolitical Threats**: Satellites can be **shadowed** or targeted by hostile actors using proximity operations.

How is India Protecting Its Satellites with Advanced Technologies and Multilayered Defense?

- **ISRO System for Safe and Sustainable Operations Management (IS4OM):** India established the **ISRO’s IS4OM** center in Bengaluru to track satellites and space debris, issuing collision warnings and coordinating maneuvers.
- **Project NETRA**: India's **Project NETRA** aims to improve space surveillance capabilities by deploying new **radars** and **telescopes** for better tracking of objects in orbit.
    - The Multi-Object Tracking Radar at Sriharikota is already operational, with more sites planned across the country.
- **Navigation Message Authentication (NMA)**: For its **Navigation in Indian Constellation (NavIC) system**, India is testing **Navigation Message Authentication** to prevent spoofing and ensure the authenticity of navigation signals.
- **Cybersecurity Measures**: India’s **CERT-In (Indian Computer Emergency Response Team)** has issued guidelines for satellite operators to enhance security, including **strong encryption**, **network segmentation**, and **regular patching** to protect satellite systems from cyberattacks.
- **Solar Storm Preparedness**: The **Aditya-L1 mission** provides early solar storm warnings to protect satellites.
- **LiDAR Satellites**: India is exploring the use of **LiDAR** **satellites** to detect potential threats and

provide more time for response to **hostile satellite maneuvers**.

- **International Cooperation**: India actively participates in global forums like **UN Committee on the Peaceful Uses of Outer Space (COPUOS)** and the **Inter-Agency Debris Coordination Committee (IADC)** focusing on debris management and responsible space operations

International Space Protection Systems

- **UN Committee on the Peaceful Uses of Outer Space (COPUOS)**: Adopted voluntary guidelines in 2019 for long-term space sustainability, focusing on **debris mitigation** and space safety.
- **Inter-Agency Debris Coordination Committee (IADC)**: Coordinates global efforts to manage space debris and develop best practices to prevent collisions in space.
- **Combined Space Operations Initiative (CSO)**: A partnership of **10 countries**, including the **US**, to promote **responsible behavior** in space and set operational norms for satellite activities.
- **NATO's Space Policy**: Declares space as an operational domain, emphasizing **cooperation** and **responsible use of space** among nations.
- **US**:
  - **Space Fence**: A radar system tracking space objects as small as a marble
  - **Protected Tactical Waveform**: Ensures secure satellite communications by preventing jamming.
  - **Advanced Extremely High Frequency (AEHF) Satellites**: Use resistant frequencies for secure communication.
  - **Encrypted GPS M-code**: Enhances GPS signal security to prevent unauthorized access.
  - **Space Information Sharing and Analysis Centre (ISAC)**: Coordinates cyber threat intelligence to safeguard satellite communications.
- **Europe**:
  - **EU Space Surveillance and Tracking (EUSST)**: Monitors space debris and warns satellite operators of potential threats.
  - **Galileo OSNMA**: Authenticates navigation messages to reduce spoofing and ensure signal integrity.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. In the context of space technology, what is "Bhuvan", recently in the news? (2010)

(a) A mini satellite launched by ISRO for promoting the distance education in India
(b) The name given to the next Moon Impact Probe, for Chandrayaan-II
(c) A geoportal of ISRO with 3D imaging capabilities of India
(d) A space telescope developed by India

Ans: (c)