ISRO's 100th LAUNCH – SCIENCE & TECHNOLOGY

NEWS: The Indian Space Research Organisation (ISRO) launched its historic **100th launch** from the Satish Dhawan Space Centre in Sriharikota.

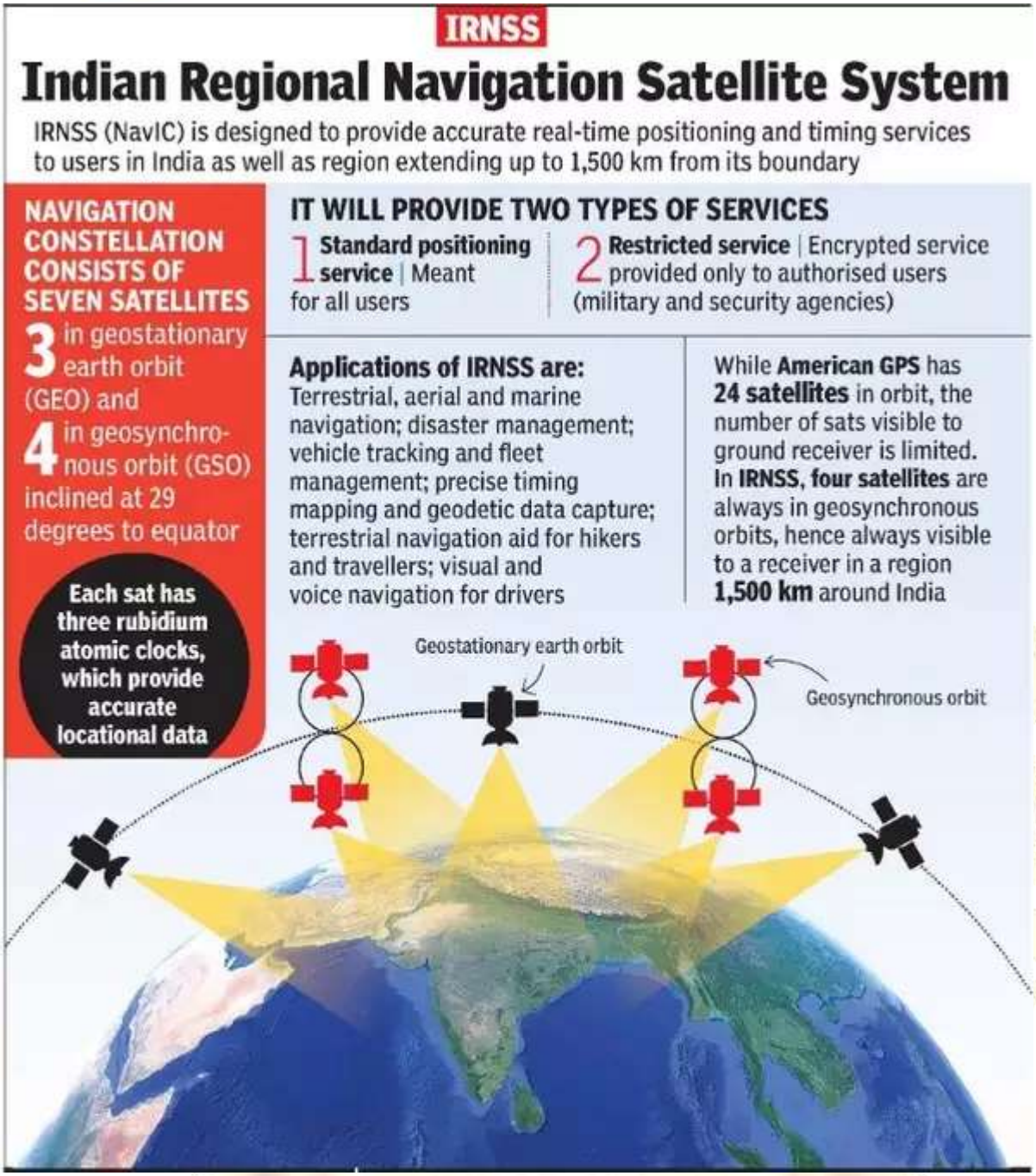
WHAT'S IN THE NEWS?

About

- **GSLV F15 carried the NVS-02 navigation satellite** placing it into a Geosynchronous Transfer Orbit.
    - The NVS-02 is the **second satellite in the NVS series,** and **part of India's Navigation with Indian Constellation (NavIC).**
    - It is designed to **provide accurate positioning services across India.**
- **GSLV-F15** is the **17th flight of India's Geosynchronous Satellite Launch Vehicle** (GSLV) and **11th flight with Indigenous Cryo stage.**
- Over these **100 launches ISRO has lifted 548 satellites to orbit**.

NVS Series

- These are **five second-generation NavIC satellites — NVS-01 to NVS-05** and are **planned to enhance the existing constellation.**
    - These satellites incorporate **L1 band communication**, which **broadens NavIC's compatibility and usability for diverse applications.**
- **NVS-01,** the first of the second-generation satellites, was launched in **2023.**
    - For the first time, an indigenous **atomic clock was flown in NVS-01.**
- **NVS-02** will help improve NavIC's services, which are used for navigation, precision agriculture, emergency services, fleet management, and even mobile device location services.
    - It also has a precise atomic clock called the **Rubidium Atomic Frequency Standard (RAFS)** for accurate timekeeping.



Other important launches

- The GSLV-F15 is the **17th GSLV flight, and 11th with an Indigenous Cryogenic stage.**
- The first launch from SDSC took place in **August 1979** carrying the **Rohini Technology Payload** (partially successful).
- Key Launches of ISRO include **Chandrayaan-1** (2008), **Mars Orbiter Mission** (2013), **PSLV-C37** (2017, World record: **104 satellites launched**), **Chandrayaan-2** (2019), and **Chandrayaan-3** (2023), **Aditya-L1** (2023).

What is NavIC?

- **About:**
    - NavIC or the IRNSS is designed with a constellation of 7 satellites and a network of ground stations operating 24×7.
        - There are a **total of eight satellites however only seven remain active.**
        - Three satellites in geostationary orbit and four satellites in geosynchronous orbit.
    - The constellations' first satellite (IRNSS-1A) was launched on 1st July 2013 and the eighth satellite IRNSS-1I was launched in April 2018.
        - With the seventh launch of the constellation's satellite (IRNSS-1G), IRNSS was renamed NavIC by India's Prime Minister in 2016.
    - It was recognised by the **International Maritime Organization (IMO)** as a part of the World-Wide Radio Navigation System (WWRNS) for operation in the Indian Ocean Region in 2020.
- **Potential Uses:**
    - Terrestrial, aerial and marine navigation;
    - Disaster management;
    - Vehicle tracking and fleet management (especially for mining and transportation sector);
    - Integration with mobile phones;
    - Precise timing (as for ATMs and power grids);
    - Mapping and geodetic data capture.

What is the Advantage of Having a Regional Navigation System?

- **Regional Navigation System:**
    - NavIC is India's own regional navigation system developed by ISRO. It covers the **Indian landmass and extends up to 1,500 km around it.** The primary purpose of NavIC is to cater to the positioning and navigation needs of users in this specific region.
- **Ground Stations:**
    - ISRO is working on setting up ground stations in countries like Japan, France, and Russia. These additional ground stations will enhance the accuracy and coverage of NavIC signals through better triangulation.

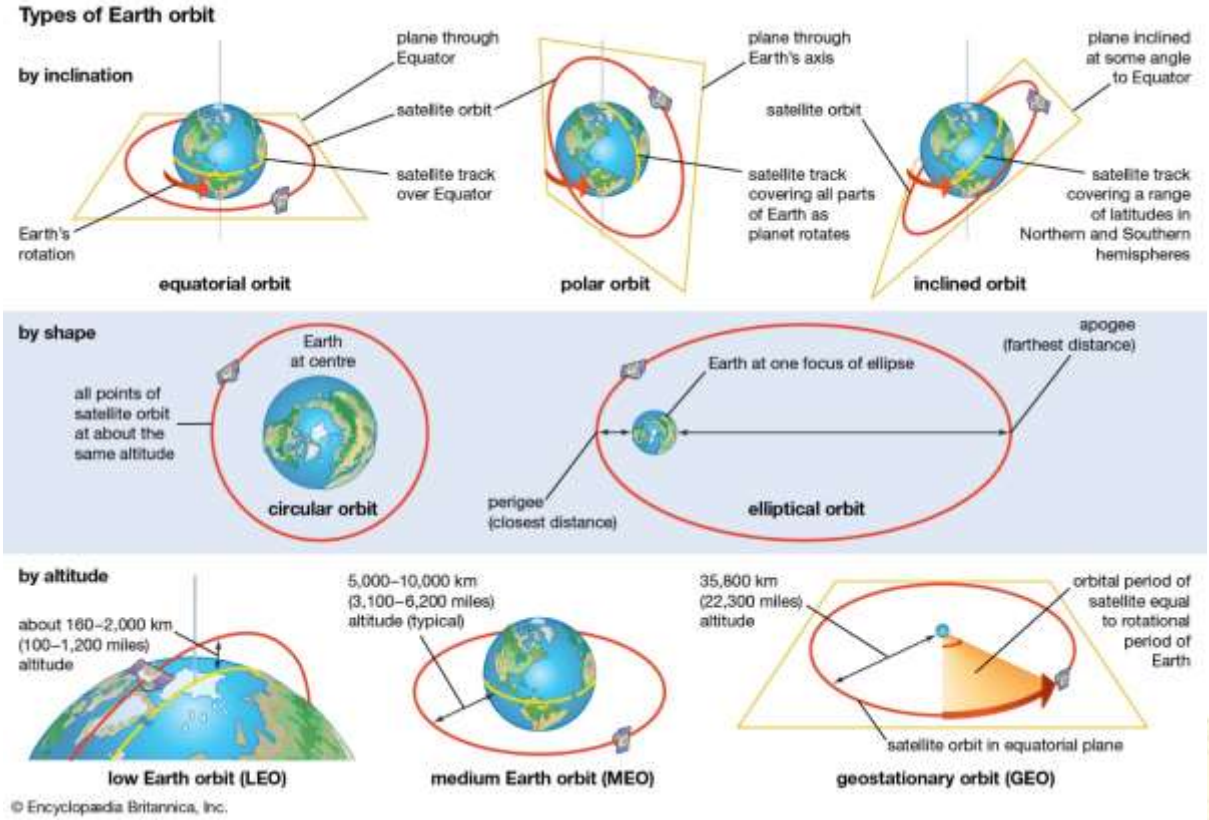
- **Signal Reception:**
    - NavIC signals reach India at a **90-degree angle, making it easier for the signals to penetrate** congested areas, dense forests, and mountainous terrain. In contrast, GPS signals arrive at an angle, which can sometimes pose challenges for reception in certain locations.
- **Availability:**
    - NavIC signals are primarily designed to serve the Indian region. Therefore, users within the coverage area can expect reliable access to NavIC signals, even in remote or hard-to-reach areas.

Which are the other Navigation Systems operational in the world?

- **Four Global Systems:**
    - GPS from the U.S.
    - GLONASS from Russia.
    - Galileo from European Union
    - BeiDou from China.
- **Two Regional Systems:**
    - NavIC from India
    - QZSS from Japan.

Geosynchronous orbit

- A satellite in a geosynchronous orbit orbits the Earth with the same angular velocity as the Earth
- A satellite in a geosynchronous orbit appears to stay in one position over a particular region of the Earth
- A satellite in a geosynchronous orbit is at an altitude of about 35,786 kilometers above mean sea level
- A satellite in a geosynchronous orbit takes 23 hours, 56 minutes, and 4 seconds to complete one orbit



Geostationary orbit

- A satellite in a geostationary orbit is in a specific type of geosynchronous orbit that orbits over the Earth's equator
- A satellite in a geostationary orbit has zero inclination angle and zero eccentricity
- A satellite in a geostationary orbit appears to be stationary over one fixed spot on the Earth
- Geosynchronous orbits are used for communications and weather monitoring.

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