



## NAVIC SATELLITE: SCIENCE & TECHNOLOGY

**NEWS:** 100th launch from Satish Dhawan Space Centre scheduled on January 29

### WHAT'S IN THE NEWS?

India is set to launch its 100th mission, the NVS-02 satellite, aboard the GSLV in January 2025. The NVS-02 is a key 2nd-generation satellite for NavIC, India's regional navigation system, aimed at enhancing navigation capabilities and strategic autonomy.

### About NVS-02 Satellite

- **2nd-Generation Navigation Satellite:**
  - Ninth satellite in the NavIC constellation.
  - Second satellite in the 2nd-generation series (following NVS-01, launched in May 2023).
- **Launch Vehicle:** GSLV Mark II.
- **Mission Life:** Over 12 years, higher than the 10-year life of the 1st-generation satellites.

### Payloads of NVS-02

1. **Navigation Payload:**
  - Uses L1, L5, and S bands for signal transmission.
  - Equipped with a Rubidium atomic clock for ultra-precise time measurement (error < 10 nanoseconds).
  - Accurate ranging for position determination.
2. **Ranging Payload:**
  - Includes a transponder for time-stamped signals to ground stations.
  - Supports seamless services under varying weather conditions.

### Significance of 2nd-Generation Satellites

- **Enhanced Frequencies:** L1 band addition improves interoperability with global systems like GPS and Galileo.
- **Advanced Encryption:** Robust security for restricted communication.
- **Prolonged Mission Life:** Extends operational capabilities.



## What is NavIC?

- **Full Form:** Navigation with Indian Constellation (previously IRNSS).
- **Structure:**
  - Constellation of 7 satellites (3 geostationary, 4 geosynchronous).
  - First satellite launched in 2013; seventh in 2016.
  - NVS-01 replaced IRNSS-1G; NVS-02 will replace another satellite in the constellation.
- **Coverage:** India and a 1,500 km radius around it.
  - Position accuracy: < 20 meters.
  - Timing accuracy: < 50 nanoseconds.



## NavIC Services

1. **Standard Positioning Service (SPS):**
  - Open to all users with ~20-meter accuracy.
2. **Restricted Service (RS):**
  - Encrypted for government and military applications.

## Applications of NavIC

- Military and strategic operations.



- Navigation for land, air, and sea.
- Precision agriculture and geodetic surveys.
- Emergency and disaster management services.
- Internet-of-Things (IoT) and fleet management.
- Timing services for critical sectors like banking and energy grids.

## Why NavIC over Global Systems?

- **Independence:** Regional autonomy without dependence on GPS or GLONASS, especially during conflicts.
- **Signal Advantage:**
  - NavIC signals reach India at a 90-degree angle, better for dense forests and mountainous areas.
  - GPS signals (from Medium Earth Orbit) reach India at lower angles.
- **Strategic Security:** Enhances national security and defence capabilities.

## Global Satellite Navigation Systems

1. **United States:** GPS.
2. **Russia:** GLONASS.
3. **China:** BeiDou.
4. **European Union:** Galileo.
5. **Japan:** Quasi-Zenith Satellite System (regional).

**Source:** <https://www.thehindu.com/sci-tech/science/100th-launch-from-indias-space-port-satish-dhawan-space-centre-in-sriharikota-scheduled-for-january-end/article69135828.ece>