

NavIC (Navigation with Indian Constellation)

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Why in News?

India's indigenous navigation system NavIC has faced an operational setback after the atomic clock failure in the IRNSS-1F satellite.

- NavIC is India's **regional satellite navigation system** to provide accurate positioning, navigation, and timing services.
- It is earlier known as Indian Regional Navigation Satellite System (IRNSS) changed as "NavIC" in 2016.
- **Developed by** - The Indian Space Research Organisation (ISRO).
- **Components**
 - **Constellation Structure** - NavIC is designed with a 7-satellite constellation in high Earth orbit (36,000 km).
 - **Orbital Configuration** - 3 Geostationary Orbit (GEO) satellites, 4 Inclined Geosynchronous Orbit (IGSO) satellites to ensure continuous regional coverage over India.
 - **Ground Segment** - The ground network includes Control centres, Precise timing facilities, Range and integrity monitoring stations and Two-way ranging stations
 - These stations operate **24×7** to monitor satellite signals and maintain accuracy.
- **Frequencies**- NavIC operates on dual frequencies L5 band and S band.
- **Coverage** - Primary coverage is Entire India and Extended coverage is 1500 km beyond Indian borders.
- **Offered Services**

| Standard Positioning Service (SPS) | Restricted Service (RS) |
|------------------------------------|--|
| Open for civilian users | Encrypted high-precision service |
| Position accuracy ~10-20 metres | Available only for military and authorised users |

- **Major Applications** - Defence (missile guidance and military navigation)
- Disaster management (cyclone and tsunami alerts for fishermen)
- Transport (AIS-140 compliant vehicle tracking systems)
- Public services (railway tracking and fleet management)
- Civilian (smartphone navigation and IoT devices)
- **Interoperability** - NavIC signals are interoperable with major Global Navigation Satellite Systems (**GNSS**)
 - **GPS** - USA
 - **GLONASS** - Russia
 - **Galileo** - European Union
 - **BeiDou** - China

Reason for recent setback

- As of now, only 3 satellites are fully operational for navigation - IRNSS-1B (2014), IRNSS-1I (2018), NVS-01 (2023) after the atomic clock failure in the IRNSS-1F satellite.
- This is *below the minimum requirement* of 4 satellites, to determine an accurate 3D position (latitude, longitude, and altitude).

References

1. [Indian Express | NavIC](#)
2. [ISRO | NavIC](#)