The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy

NVS-03 Satellite:

Can ISRO Revive India's NavIC Navigation System?

NVS-03 Satellite Latest News

ISRO successfully launched NVS-03, its third new-generation navigation satellite, aboard GSLV-F18 from the Satish Dhawan Space Centre, Sriharikota.

The launch is crucial: NavIC, India's regional satellite navigation system, had stopped providing positioning data after repeated atomic clock failures and failed replacement satellite launches.

NVS-03 aims to restore the minimum four operational satellites NavIC needs to function.

What Is NavIC?

NavIC (Navigation with Indian Constellation) is the operational name for the Indian Regional Navigation Satellite System (IRNSS).

A seven-satellite constellation covering India and up to 1,500 km beyond its borders — similar in concept to the US's GPS, but regional rather than global.

With all satellites functional, it offers public accuracy up to 10 metres, plus a more accurate restricted service (for authorised users like the military) — roughly ten times more precise.

Origins: Development began in 1999, after the Kargil War, when the US reportedly restricted GPS data access to India — exposing the risks of depending on a foreign-controlled navigation system during conflict.

Applications: Civilian navigation, transportation, disaster management, telecommunications, financial clock synchronisation, and real-time tracking of ~12,000 trains (8,700 already equipped).

NavIC also offers better coverage over Indian terrain (valleys, forests) compared to GPS, whose signals arrive at India at an angle.

Why NavIC Stopped Working

Since July 2013, ISRO has launched 11 navigation satellites — but six have failed, mainly due to defective imported atomic clocks and some orbital issues.

July 2025: Five satellites were found completely defunct, with all onboard clocks non-functional.

March 2026: The last functioning clock aboard IRNSS-1F failed — just three days after completing its 10-year mission life — leaving only three operational satellites (minimum four needed for positioning service).

Government told Parliament the constellation cannot provide standalone positioning service, though timing service remained functional.

Delayed consumer rollout: A 2018 CAG report found that development of consumer-end receivers (for devices like phones) began only in 2017 — wasting years of satellite mission life.

The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy

Replacement Failures

IRNSS-1H couldn't reach orbit — its heat shield failed to open.

NVS-02 (January 2025) was placed in transfer orbit but its thrusters/propulsion system failed, preventing it from reaching final orbit.

A review committee found the cause: a signal failing to reach the pyro valve of the oxidiser line, likely due to a disengaged connector contact ("loose connection").

What's Different About NVS-03 and the Second-Generation Satellites

Carry at least one indigenously developed rubidium atomic clock (by ISRO's Space Applications Centre), replacing imported clocks from Swiss firm SpectraTime.

Longer mission life: 12 years (vs. 10 for first-generation satellites).

Added L1 frequency band (alongside existing L5, S frequencies) — improves interoperability with GPS and enables use in low-power devices like smartwatches.

ISRO plans to increase atomic clocks per satellite from 3 to 5 for added redundancy.

Launch details: GSLV-F18 placed the 2,250 kg NVS-03 satellite into its intended geosynchronous transfer orbit within 18 minutes of liftoff.

Pipeline: NVS-04 and NVS-05 are expected to follow, purportedly by December 2026, to fully restore the constellation.

Deeper Structural Challenges

Indigenous clock supply issues: Despite moving to domestic rubidium clocks, procurement of flight-ready equipment remains unreliable.

Institutional gap: Unlike the US GPS Directorate or the EU Agency for the Space Programme, ISRO acts as both designer and operator of NavIC, with no dedicated counterpart agency.

Resource strain: ISRO simultaneously juggles human spaceflight, Earth observation, new launch vehicles, and R&D — alongside the absence of a national space law.

Broader launch setbacks: Two consecutive PSLV failures (May 2025 — EOS-09; January 2026 — N1 satellite) forced a pause. Of seven major missions scheduled since December 2025, only two succeeded before NVS-03.

How NavIC Compares Globally

India is the only country with a regional-only navigation system; Japan's Quasi-Zenith Satellite System merely augments GPS in Asia-Oceania.

Four global systems exist: GPS (USA, ~32 satellites), GLONASS (Russia, 24), Galileo (EU, 27), BeiDou (China, 30).

Most use middle-earth orbit (19,000-24,000 km); BeiDou uniquely combines middle and higher orbits — NavIC, like Japan's system, uses higher orbits.

The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy The Tutors Academy

Conclusion

NVS-03's successful launch marks a critical, if partial, step toward restoring NavIC's operational capability after a string of technical setbacks exposed deep vulnerabilities in India's indigenous navigation ambitions.

Beyond the immediate fix of adding a functional satellite, the episode highlights structural issues — ISRO's dual role as both builder and operator, reliance on still-maturing indigenous clock technology, and an overstretched space agency juggling multiple missions simultaneously.

With NVS-04 and NVS-05 expected by December 2026, India's path to a fully self-reliant, strategically significant regional navigation system remains promising but incomplete — a reminder that technological sovereignty in space requires not just successful launches, but sustained institutional and manufacturing reliability.

