

NavIC: Why does a regional navigation system matter to India?

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What's in today's article?

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Why in News?

- The Indian Space Research Organisation (ISRO) will launch the first of the 2nd-generation satellites for its navigation constellation – NavIC (Navigation with Indian Constellation).
- The 2,232 kg satellite, the heaviest in the constellation, will be launched by a Geosynchronous Satellite Launch Vehicle (GSLV) rocket.

About NavIC (Navigation with Indian Constellation):

IRNSS: INDIA'S OWN GPS

IRNSS: NAVIC WILL BE USED TO PROVIDE ACCURATE REAL-TIME POSITIONING AND TIMING SERVICES. IT WILL PROVIDE NAVIGATION SERVICE FOR CIVILIAN AS WELL MILITARY APPLICATIONS.

IRNSS-1A, THE FIRST OF THE SEVEN SATELLITES, WAS LAUNCHED ON JULY 1, 2013

IRNSS-1G, THE LAST SATELLITE WAS LAUNCHED ON APRIL 28, 2016

7
SATELLITES

3
GEOSTATIONARY

4
GEOSYNCHRONOUS



ORBIT ALTITUDE

36,000 KM

COST

**₹1,420 CRORES
(US\$211 MILLION)**

COVERS INDIA AND UP TO **1,500 KM** BEYOND ITS BORDERS

3 EXTREMELY ACCURATE RUBIDIUM ATOMIC CLOCKS IN EACH SATELLITE

GPS RECEIVERS WILL NOT WORK; NEED SPECIAL RECEIVERS (YET TO BE DEVELOPED)



IRNSS PROVIDES STANDARD POSITIONING SERVICE
OPEN TO ALL USERS
ACCURACY BETTER THAN 20 METERS

● **4 SATELLITES IN GEOSYNCHRONOUS ORBIT** – in pairs, move in two inclined orbits – appear from ground to travel in figure '8' – assist in accurate position determination

● **3 SATELLITES IN GEOSTATIONARY ORBIT** – appear from ground to be at fixed positions in the sky

- NavIC, also known as the Indian Regional Navigation Satellite System (IRNSS), is an independent stand-alone indigenous navigation satellite system developed by the **Indian Space Research Organisation (ISRO)**.
- NAVIC was approved in 2006 (at a cost of \$174 million) and was expected to be completed by 2011, but only become operational in **2018**.
- NavIC, which consists of **7 satellites**, covering the whole of India's landmass and up to 1,500 km from its boundaries, is conceived with the aim of removing dependence on foreign satellite systems for navigation, particularly for "strategic sectors."
- Currently, NavIC's **application** in India is limited in –
 - **Public vehicle tracking**, for providing emergency warning alerts to fishermen venturing into the deep sea where there is no terrestrial network connectivity and
 - For tracking and providing information related to natural disasters.
- The next step India is pushing for is to include it in smartphones.
- According to **India's draft satellite navigation policy 2021**, the government will work toward "expanding the coverage from regional to global" to ensure the availability of NavIC signals in any part of the world.

What is the Advantage of having a Regional Navigation System?

- India is the **only country** that has a regional satellite-based navigation system.
- **There are four global** satellite-based navigation systems – the American GPS, the Russian GLONASS (GLObalnaya NAvigatsionnaya Sputnikovaya Sistema), the European Galileo, and the Chinese Beidou.
- **Japan** has a four-satellite system that can augment GPS signals over the country, **similar to India's GAGAN** (GPS Aided GEO Augmented Navigation).
- **With fully operational NavIC** (with ground stations outside India [Japan, France, and Russia] for better triangulation of signals) open signals will be accurate up to 5 metres and restricted signals will be more accurate (GPS ~20 metres).
- Unlike GPS, **NavIC uses satellites in high geo-stationary orbit** – the satellites move at a constant speed relative to Earth, so they are always looking over the same region on Earth.
- NavIC signals **come to India at a 90-degree angle**, making it easier for them to reach devices located even in congested areas, dense forests, or mountains.

Old Satellites of NavIC:

- Each of the 7 satellites currently in the IRNSS constellation, weighed much less (around 1,425 kg at liftoff) and rode the lighter **Polar Satellite Launch Vehicle (PSLV)** – ISRO's workhorse launch rocket.
- The last IRNSS satellite, **IRNSS-1I** was launched in 2018 to replace an older, partially defunct satellite in the constellation.
- **IRNSS-1I was ISRO's 9th** satellite for the NavIC constellation, but is **considered to be the 8th** because the IRNSS-1H launched in 2017 was lost after the heat shield of the payload failed to open on time.

What's New in the 2nd-Generation NavIC Satellite?

- The 2nd-generation satellite named as **NVS-01**, the first of ISRO's NVS series of payloads is **heavier**.
- The satellite will have a **Rubidium atomic clock onboard**, a significant technology (which only a handful of countries possess) developed indigenously by **Space Application Centre-Ahmedabad**.
 - A satellite-based positioning system **determines the location of objects** by accurately measuring the time it takes for a signal to travel to and back from it using the atomic clocks on board.
 - **Currently, only four IRNSS satellites are able to provide location services**. The other satellites can only be used for messaging services.
- The 2nd generation satellites **will send signals in a third frequency, L1**, besides the L5 and S frequency signals that the existing satellites provide, **increasing interoperability with other satellite-based navigation systems**.
 - The L1 frequency is among the most commonly used in the GPS, and will **increase the use of the regional navigation system in wearable devices** and personal trackers that use low-power, single-frequency chips.
- The 2nd-generation satellites **will also have a longer mission life** of more than 12 years (existing satellites – 10 years).

Q1) What is GAGAN (GPS Aided GEO Augmented Navigation)?

The GAGAN uses a system of ground stations to provide necessary augmentations to the GPS standard positioning service (SPS) navigation signal. It was jointly developed by ISRO and AAI to provide the best possible navigational services over Indian FIR (Flight Information Region).

Q2) What is NVS-01?

It is the first of India's second-generation NavIC satellites that accompany enhanced features including terrestrial, aerial and maritime navigation, precision agriculture, location-based services in mobile devices and marine fisheries.

Source: [New NavIC satellite launching today: why a regional navigation system matters to India](#) | [TH](#)

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