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ISRO's new NavIC satellite

Why in news?

The Indian Space Research Organisation (ISRO) launched the first of the second-generation satellites for its navigation constellation successfully.

What is NavIC?

- NavIC (Navigation with Indian Constellation) is a regional navigation satellite system of India.
- NavIC is erstwhile known as the Indian Regional Navigation Satellite System (IRNSS).
- NavIC is designed with a constellation of 7 satellites, all launched by PSLV rockets.
- Three satellites of the constellation are placed in geostationary orbit and the other 4 satellites are placed in inclined geosynchronous orbit.
- NavIC offers two services: Standard Position Service (SPS) for civilian users and Restricted Service (RS) for strategic users.
- NavIC satellites will broadcast SPS signals in L1, L5 and S bands after the addition of [NVS-01](#).
- RS signals will be broadcasted in L5 and S bands.

What are the current issues with IRNSS constellation?

- **Atomic clock** - Satellite-based positioning system determines the location of objects by using the atomic clocks on board.
- The atomic clocks accurately measures the time it takes for a signal to travel to and back from it.
- In 2018, ISRO started the launch of the replacement satellites after their onboard atomic clock failed and it stopped providing accurate location data.
- **Mission Life** - IRNSS-1A which was launched into orbit in 2013, is almost defunct.
- All the 3 oldest satellites in the constellation are close to the end of their 10-year mission lives.
- At least three new satellites must be put into orbit to keep the seven-satellite constellation fully functional.
- **Signal Band** - The L1 frequency is among the most commonly used in the Global Positioning System (GPS).
- Earlier IRNSS used only L5 and S frequencies, this limits the interoperability with other global navigation satellite system (GNSS).

What is second generation satellites?

- They are replacement satellite for the Indian Regional Navigation Satellite System.
- The second generation satellites will replace satellites located at a geosynchronous orbit with additional features.
- NVS series of satellites will sustain and augment the NavIC with enhanced features.
- **NVS-01** - It is the first of the second-generation satellites envisaged for NavIC services.
- NVS-01 was launched by a Geosynchronous Satellite Launch Vehicle (GSLV) rocket.
- It is the heaviest satellite in the constellation weighing 2,232 kg.

What's new in the second-generation NavIC satellite?

- **Mission Life** - The second-generation satellites will also have a longer mission life of more than 12 years.
- The existing satellites have a mission life of 10 years.
- **New band (L1)** - The NVS series incorporates L1 band signals additionally to widen the services.
- The existing satellites provide L5 and S frequency signals.
- L1 signals increases the interoperability with other satellite-based global navigation systems.
- It will increase the use of NavIC in wearable devices and personal trackers that use low-power, single-frequency chips.
- **Atomic clock** - For the first time, an indigenous atomic clock will be flown in NVS-01.
- The satellite will have a Rubidium atomic clock onboard, indigenously developed by Space Application Centre-Ahmedabad.

What practical purpose does the NavIC constellation serve for users?

- After the development of the user receivers, NavIC is used for practical public applications.
- NavIC is in use for projects like public vehicle safety, power grid synchronisation, real-time train information systems, and fishermen's safety.
- Initiatives such as common alert protocol based emergency warning and unmanned aerial vehicles are in the process of adopting NavIC system.
- The Ministry of Electronics and IT urging smartphone companies to make their handsets NavIC compatible.

What is the advantage of having a regional navigation system?

- There are four global satellite-based navigation systems
 - The American GPS
 - The Russian GLONASS
 - The European Galileo
 - The Chinese Beidou
- Japan has a 4-satellite system that can augment GPS signals over the country, similar to India's GAGAN.
- India is the only country that has a regional satellite-based navigation system.

- **Accuracy** - GPS signals are accurate up to around 20 metres whereas NavIC open signals will be accurate up to 5 metres and restricted signals will be even more accurate when fully operational.
- **Coverage** - NavIC provides coverage over the Indian landmass and up to a radius of 1,500 km around it.
- **Consistency** - NavIC uses satellites in high geo-stationery orbit which enables the satellite to look over the same region on Earth always.
- **Penetration** - 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.

References

1. [IE - ISRO's new NavIC satellite launches successfully](#)
2. [ISRO - Navigation with Indian Constellation \(NavIC\)](#)
3. [ISRO - GSLV-F12/NVS-01 Mission](#)



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