Centre for Air Power Studies

INDIA INCHES CLOSER TO ITS INDIGENISED VERSION OF GPS WITH SUCCESSFUL LAUNCH OF NAVIGATION SATELLITE IRNSS – 1C

Wg Cdr PA Patil

Research Fellow, CAPS

ISRO successfully launched its third IRNSS (Indian Regional Navigation Satellite System) on October 16, 2014 from Satish Dhawan Space Centre, Sriharikota. IRNSS – 1C was launched aboard Polar Satellite Launch Vehicle, PSLV- C26, and is the twenty seventh consecutive successful launch of PSLV.[1] With this, India now is one more step closer to developing its own version of Global Positioning System (GPS). IRNSS is an independent and indigenous project of ISRO with a constellation of seven satellites planned to be in place by the end of year 2015. Of the seven satellites, three satellites would be positioned in geo-stationary orbit and four in inclined geosynchronous orbit.[2] While the IRNSS – 1A and 1-B have been launched in geosynchronous orbits on July 01, 2013 and April 04, 2014 respectively, the IRNSS- 1C has been launched in geostationary orbit.[3] Each of these satellites is equipped with two payloads, a navigation payload (for transmitting position information and navigation service signals) and a ranging payload that utilises a C-band transponder to ascertain the range of satellite. Though the satellites IRNSS- 1A and IRNSS- 1B have started operating, the complete system will become functionally operational once the fourth satellite IRNSS- 1D is launched. Once the constellation is in place, ISRO plans to augment this system with three more additional satellites.

The satellite navigation services over the past decades have increasingly become integral in day to day services and are progressively being used in personal applications ranging from navigation devices, mobile services, communication systems and information

technology. The commercial applications besides navigation services include tracking of men, material and consignments, land surveys, security services, automotive business and location based services. On the military front, navigational data and services are now integral to the logistic support, network centric operations, for force applications using smart munitions and also play a decisive role in deployment, employment and force restructuring of military personal and units during peacetime and in times of conflicts.

The concept of Global Positioning System was conceived by the USA in the year 1973 and the system with 24 satellites achieved initial operational capability providing Standard Positioning Services (SPS) in the year 1993.[4] The system was declared fully operational in the year 1995 with the secure Precise Positioning Services (PPS) made available for military use.[5] While the GPS was originally intended exclusively for military use, the system was cleared for worldwide civilian and commercial applications in the mid 1990's.[6] However, the US government at the time carried a rider on the selective availability of GPS use for public by deliberate degradation of GPS signals citing national security reasons. It was on May 01, 2000 that President Clinton waved off the selective availability criterion to bring tangible benefits for promoting and integrating the GPS usage in support of societal and scientific applications worldwide.[7] With the new policy, not only the accuracy of GPS positioning increased many folds for users across the globe, but as envisioned by President Bill Clinton, the private and government sectors benefitted immensely in advancing productivity, efficiency, security, knowledge and enhanced quality of life.[8] This also gave a boost to global economy. Since then, a number of other nation states have come with their own version of space navigation systems like Global Navigation Satellite System GLONASS (Russia), Galileo (European Union), BeiDou (China), and Japans regional Quasi-Zenith satellite system. While these navigation constellations are progressing in phases, the United States continues to dominate the global space navigation market. While services of GPS are being used worldwide, and there are nation states including India which utilise the services of multiple satellite navigation providers, it is to be noted that the complete control of these systems rests with the respective governments. One should not forget that these services can be degraded or stopped particularly in conflict situations.

As of now all applications for navigational services in India are met using the global navigational systems under the control of global service providers and the continuation of services in times of hostilities is thus not guaranteed. The use of navigational satellite system is not only being used for commercial services, but this data is now integral to the success of terrestrial, aerospace and maritime military operations. As the Indian dependence on GPS and GLONASS started growing, the Indian government authorised the autonomous satellite navigation project, IRNSS in year 2006 for the Indian sub-continent and its surroundings. The IRNSS series of satellites, like the United States GPS would provide the Standard Positioning Services (SPS) which can be utilised by all users and the Restricted Services (RS) which employ data encryption for the authorised users. The indigenously developed IRNSS constellation will be providing an accuracy of 20 meter[9] and would enable a wide range of applications to include navigation, tracking of vehicles, mobile phone services, mapping and landscaping. In addition, it will also cater to visual and voice navigation services. The broad IRNSS architecture planned for implementation is shown in figure 1.

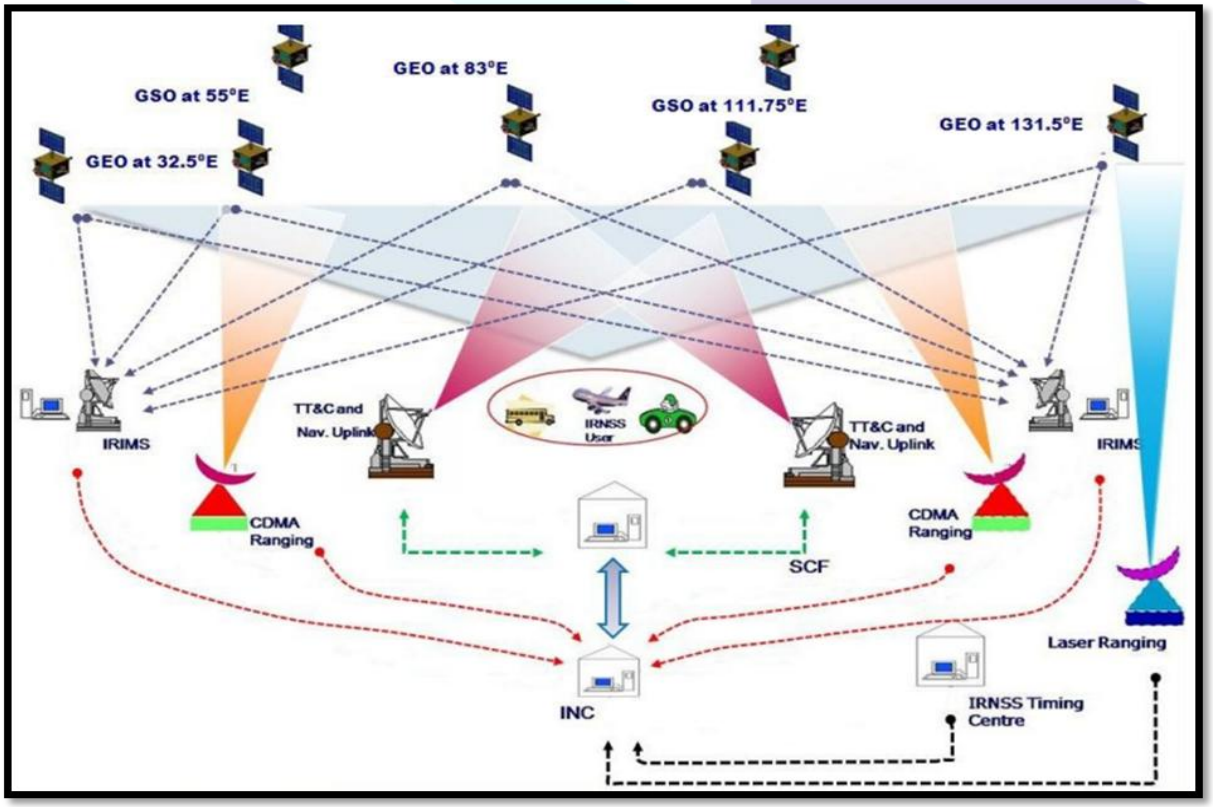

Figure 1. IRNSS architecture[10]

When compared to navigational systems like GPS, GLONASS and Galileo which utilise semi-synchronous medium earth orbit (altitude at range of 20000 km) and provide global coverage using in excess of 24 satellites in constellation, the Indian IRNSS constellation is aimed to provide position information services to Indian sub continent and its neighbourhood. As global positioning data is now essential for military and civil aviation, marine operations, road and rail networks, agricultural support, mining operations, mineral explorations, disaster management, personal navigation etc., the dual use indigenous technology will absolve the Indian government of dependence on the services provided by the third party and will increase the self reliance in commercial and military domains at varied levels.

ARTICLES BY SAME AUTHOR

INDIA'S MAIDEN MARS MISSION PUTS ISRO ON A NEW HIGH

X-37B: ORBITAL TEST VEHICLE COMPLETES 625 DAYS IN ORBIT

ANTRIX CORPORATION: CAN IT PROVIDE IMPETUS TO SPACE MARKET

INDO-ISRAEL COLLABORATION FOR ANTI-MISSILE SYSTEM

RIPE TIME FOR INDIA FOR TO EXPLOIT INTERNATIONAL SPACE MARKET

More Articles

End Notes

[1] "PSLV-C26 Successfully Launches India's Third Navigation Satellite IRNSS-1C", at http://www.isro.org/pressrelease/scripts/pressreleasein.aspx?Oct16_2014 accessed on October 16, 2014

[2]" Indian Regional Navigation Satellite System (IRNSS)", at http://www.isro.org/satellites/irnss.aspx accessed on October 16, 2014

[3] "Navigation Satellites", at http://www.isro.org/satellites/irnss-1a.aspx, http://www.isro.org/satellites/irnss-1b.aspx and http://www.isro.org/satellites/irnss-1c.aspx accessed on October 16, 2014

[4]"Global Positioning System", at http://en.wikipedia.org/wiki/Global_Positioning_System accessed on October 16, 2014

[5] ibid

[6] http://www.ebay.com/gds/6-Popular-GPS-Units-for-Commercial-Use-/10000000177634182/g.html accessed on October 16, 2014

[7] "Statement by the president regarding the United States' decision to stop degrading global positioning system accuracy", Office of the press secretary, White House, May 01, 2000 at http://clinton3.nara.gov/WH/EOP/OSTP/html/0053_2.html accessed on October 17, 2014

[8] President Bill Clinton, "Improving the Civilian Global Positioning System (GPS)", May 01, 2000 at http://clinton3.nara.gov/WH/EOP/OSTP/html/0053_4.html accessed on October 17, 2014

[9] ibid

[10] "IRNSS SIS ICD for standard positioning service", document issued in public interest by ISRO, Jun 14

----------**XXX**----------