e-NAV10 Information paper

Agenda item 8.5

Task Number 9

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GNSS update

# Summary

This paper gives an update on the status and developments of Global Navigation Satellite Systems and their augmentations. The information is obtained from publicly available websites and on-line publications.

## Purpose of the document

The Committee is invited to note the information and use it as appropriate.

## Related documents

None.

# Background

This was originally a rapporteur item, but is now provided on an informal basis to assist the Committee in its work.

# Discussion

## GPS

There are currently 28 operational satellites, of these, half are more than 10 years old and beyond their design life. The second Block IIF (carrying the operational L5 signal payload) was launched on 16 July and is undergoing testing. There are 10 more Block IIF satellites to be launched.

The GPS III satellites are still under development and are due to start launching in about 2014.

## GLONASS

There are 23 operational GLONASS satellites, one in commissioning and a further 3 in maintenance. All satellites are less than six years old, but the design life is shorter than for GPS. Further launches are expected, with CDMA signals (like GPS and Galileo) on L1 & L5 frequencies from the new GLONASS K satellites.

## Galileo

Two test satellites continue to operate. The first two out of four In Orbit Validation (IOV) satellites are due for launch on 20 October. Contracts for a further 14 satellites and their navigation payloads have been awarded. Initial operational capability is expected in about 2015, with FOC predicted in 2018.

## Beidou/Compass

Nine satellites of the Chinese Beidou/Compass system have now been launched, the most recent on 27 July was the fourth in inclined geosynchronous orbit. There are plans for a further seven before the end of 2012, providing navigation, time and short message services across the Asia and Pacific region. It is intended to build a global navigation network by 2020 with 35 satellites in orbit: 27 MEOs, 3 IGSOs and 5 GEOs.

## QZSS

The Japan Space Agency launched the first Quasi-Zenith Satellite in September 2010 and the full 3 satellite system is due for completion in 2013. This will cover Japan, using highly elliptical orbits, providing high accuracy navigation and timing by augmentation of GPS.

## SBAS

### The WAAS Performance Standard defines the signal in space characteristics, navigation message and performance requirements. The service, provided for aircraft approach, is designed to give 16 m horizontal and 20 m vertical accuracy, with 6.2 sec time to alert. WAAS is now fully operational again with three geo-stationary satellites available.

### EGNOS is operating on three GEOs, two belonging to Inmarsat over the Atlantic and Indian Oceans and the ESA satellite Artemis over Africa. The Open Service now available provides correction data to improve the accuracy of a GPS position from the nominal 10 m down to better than 2 m. No guarantee of service is given and no liability is accepted.

### The Safety of Life Service of EGNOS was declared operational for aviation earlier this year, leading to its use for CAT 1 approaches. The European Satellite Services Provider, a consortium of Air Traffic Management bodies, has been given certification as an Air Navigation Service Provider. The SoL service should give a warning message within 6 seconds if the system is malfunctioning.

### The Japanese MSAS has been commissioned for aviation use, with two MTSATs operating.

### The Indian GAGAN system has carried out test transmissions with one Inmarsat 4 satellite and a contract has been awarded for the ground stations, but the launch of the first satellite failed. However, India has announced its intention of deploying a full GNSS.