SBAS Australian-NZ Testbed - Exploring New Services

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Key words: GNSS/GPS; Positioning; SBAS, DFMC, PPP, Septentrio, GMV

SUMMARY

Satellite Based Augmentation Systems have been used to provide improved navigation services for many years in the civil aviation domain. With more than 20 years of operation, WAAS has become one of the backbones of the civil aviation infra structure in the US. Followed by the Japanese MSAS and the European EGNOS, they were the first systems to implement public differential and integrity services defined by the DO-229 standards. In those times there was practically no overlap between the areas served by these systems; the word 'SBAS' meant an isolated regional feature.

The GNSS panorama has drastically changed during the last years: now there exists not only a multitude of constellations providing PNT services, but also a number of augmentation systems, either deployed or under development, often offering coverage of the same geographical region, although not necessarily using the same set of monitored satellites. Adding up to the complexity, SBAS systems are being redesigned to support Dual Frequency and Multiple Constellations (DFMC). Amongst various prototype DFMC's, The Australia-NZ SBAS test bed is probably the most advanced.

Within this scope of evolving and improving diverse GNSS services, the Australian and New Zealand SBAS test bed is broadcasting SBAS and PPP corrections over the Asia-Pacific and Australasia areas from September 2017 until end of January 2019. Two different SBAS signals are used: first, a Legacy SBAS L1 signal which meets the RTCA/DO-229D standard and is open to current mass-market receivers implementing SBAS positioning mode. Secondly, an SBAS L5 DFMC prototype signal aligned with WG62 GAL GPS SBAS MOPS (March 2017), a draft standard that defines future dual-frequency multi-constellation services. While the SBAS L1 service transmits range, orbit, clock and ionospheric delay corrections, applicable to the service area covering the complete Australian and New Zealand territories, the SBAS L5 DFMC provides GPS

and Galileo dual-frequency augmentation applicable to the whole footprint of the GEO Inmarsat 4F1 satellite located at longitude of 143.4 degrees East. In addition to the SBAS services, both the L1 and L5 signals include precise orbit and clock information in proprietary format, enabling Precise Point Positioning (PPP) services to authorized receivers. The SBAS L1 signal provides services for GPS PPP users whereas SBAS L5 signal broadcasts PPP corrections for GPS and Galileo PPP users.

The early availability of DFMC SBAS and PPP found in the Australia-NZ test bed enables the industry to experiment, suggest improvements and propose new solutions on top of the use cases currently drafted by the civil aviation community. It also helps manufacturers to prepare their products for these new services.

In this paper, we will analyze the client-side (rover) implementation of the services provided by the Australia-NZ SBAS test bed (legacy DO229, DFMC and PPP) using a commercial Septentrio receiver. Finally, performance of the different test bed services will be assessed and discussed.