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Satellite Based Augmentation System – Benefits to Aviation



The Safety Case

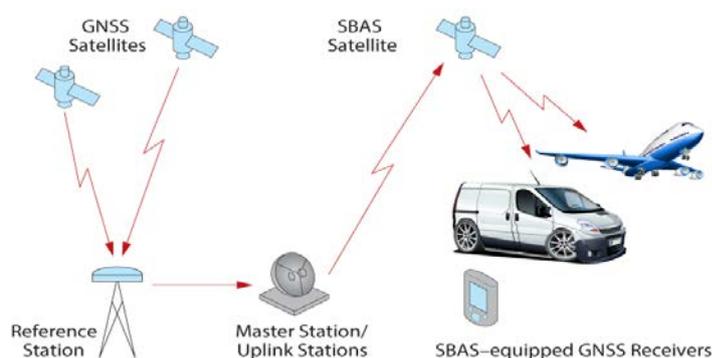
Controlled Flight into Terrain (CFIT) on approach to landing is a leading source of fatal accidents worldwide.

CFIT on approach accidents in Australia (and PNG), that an Approach with Vertical Guidance (APV) could have likely prevented, include Kokoda (PNG 2009), Lockhart River (FNQ 2005), Hotham (Vic 2005), Benalla (Vic 2004), Coffs Harbour (Qld 2004) and Young (NSW 1993).

A straight in approach is some 25 times safer than a circling approach and an approach with vertical guidance (APV) is an additional 8 times safer.

The International Civil Aviation Organisation (ICAO) Resolution (Air Navigation Commission 37/11) called for the worldwide adoption of vertically guided approaches by 2016. Australia supported this resolution but is not yet compliant.

What is a Satellite Based Augmentation System (SBAS)?



A SBAS is a system that supports wide-area additional satellite-broadcast messages. Such systems are composed of multiple ground (reference) stations, located at accurately-surveyed points.

A SBAS provides corrections to a Global Navigation Satellite System

(Global Positioning System) [GNSS(GPS)] receiver which are then used to calculate a revised position and thereby increases the accuracy and reliability of the GNSS (GPS) for users; including aircraft. Many parts of the world (USA, Europe, Japan, India, China, Russia) already benefit from a SBAS service, but **NOT** Australia.

How Would a Satellite Based Augmentation System Help?

A Localiser Performance with Vertical Guidance (LPV) approach is a 3 Dimension (3D) design that uses a Satellite Based Augmentation System (SBAS) to enhance the accuracy and integrity of Global Positioning System (GPS).

LPV procedures based on SBAS use GPS with SBAS corrections for both lateral and vertical guidance.

LPV approach minima are similar to that of Category I precision approaches, such as an Instrument Landing System (ILS) and a Ground Based Augmentation System Landing System (GLS).

- SBAS ready GA aircraft (i)



SBAS is available on regional and small aircraft including charter, smaller/older business aircraft, general and recreational aviation as well as helicopters. These aircraft represent about 85% of the Australian Instrument Flight Rules (IFR) fleet and transport about 4% of paying passengers.

A Barometric Vertical Navigation (Baro-VNAV) APV Approach Procedure may be

flown by an aircraft equipped, approved and operating in an SBAS service area using GPS/SBAS guidance. These Regular Public Transport (RPT) aircraft transport about 96% of paying passengers.

Localizer performance with vertical guidance (LPV) approaches for any aircraft type can be designed for anywhere in the SBAS service area – e.g. water, helicopter pads, rigs etc.

Operational Benefits

Regional

LPV approaches, utilising SBAS, will improve the likelihood of regional aircraft being able to land at regional airports in poor weather conditions rather than having to divert to an alternate airport. LPVs can also provide a back-up to out of service ILS and GLS systems.

A SBAS service would thus enable a great continuity of services at Regional Airports.

Major/International Airports



Ground Based Augmentation System Landing System (GLS) can provide CAT I approaches to all runways for appropriately equipped aircraft (normally the larger RPT aircraft) rather than an ILS which is runway specific.

SBAS will be required to enable the GLS to provide CAT II approaches thereby enabling aircraft to land in low visibility conditions.

GLS is a much cheaper and more flexible option than the traditional ILS (GLS can provide up to 26 (48) runway approaches, whilst a separate ILS is required for each runway end.)

Conclusions

Australia does not have an SBAS service. In the absence of an SBAS service, SBAS based LPV operations cannot be undertaken

SBAS would provide a safer and more operational efficiency for a considerable number of aircraft, including smaller RPT and charter, and General Aviation aircraft.

GLS offers a more cost effective and flexible solution to major airports compared with ILS and, with SBAS, will be upgradable to provide CAT II approaches in low visibility operations. SBAS should be assessed as part of the National Positioning Infrastructure Plan (NPIP). The non-aviation cost benefits of SBAS need to be included in any objective study and the experience of the USA and Europe in utilizing SBAS not only for other industries, but for social and personal usage, needs to be considered.

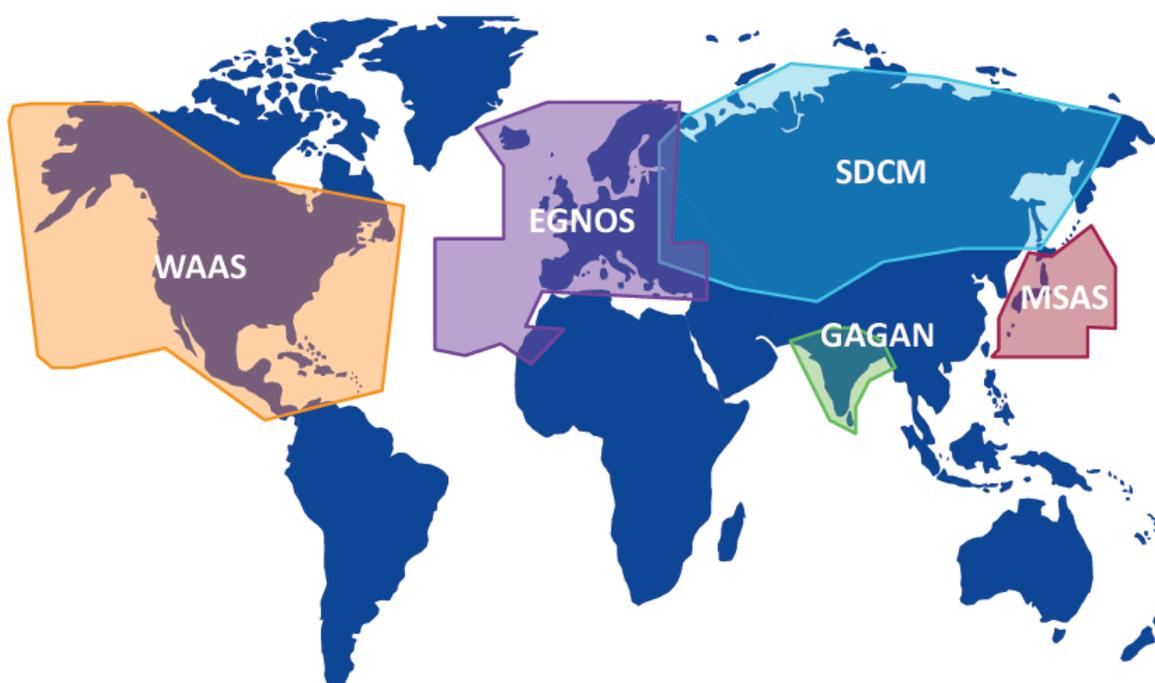


Figure 1: The map above depicts the current world SBAS coverage. There is no present coverage for Australia.
Worldwide SBAS Coverage (Source: GENEQ)