GBAS/SBAS IMPLEMENTATION CHALLENGES
System Development Certification and Implementation

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INTRODUCTION

- focus = CHALLENGES
- layout
  - GENERAL CHALLENGES
  - GBAS
  - SBAS
  - RELATED NAV/SUR
GENERAL CHALLENGES

- GAIN SUPPORT FROM PAYING USERS
- SYNCHRONISED ACTION OF STAKEHOLDERS
- OVERCOMING UNFAMILIARITY w/TECHNOLOGY
GBAS – Background

➢ 2000s = Company developing first-of-type GBAS

➢ FAA starts certification of such GBAS

➢ FAA team structured around two broad areas:
  o Compliance with the relevant standards.
  o Novel technical risk.
GBAS – Addressing the challenges (1)

➢ Priorities Reorganized
  o Australian airline = strong supporter
  o Airservices = ANSP = strong interest
  o CASA supports

➢ Most effective/efficient
  o Small Regulatory Team observes FAA certification
  o Small Professional Team leads implementation
GBAS – Addressing the challenges (2)

➢ Activities beyond FAA system certification
  o Local ionospheric study
  o TIFP Design and Validation
  o Airline Staff Training, Airline Operational Approval
  o ANSP Staff Training, ANSP Operational Approval
  o General Industry Education and Communication

➢ Result = Regulator, ANSP and Users cooperated along journey to ‘commissioning’
SBAS – Background (1)

➢ SBAS expected to:

  o Enhance vertical positioning of aircraft
  o Reduce Risk of Controlled Flight Into Terrain (CFIT)
  o Benefit regional airports that may never be equipped with Instrument Landing System (ILS)
SBAS – Background (2)

➢ SBAS Expected to:

  o Mitigate against ILS outages

  o Improve ability to land in a greater range of conditions particularly where cloud cover is low or visibility compromised

  o Reduce delays, diversions, and cancellations with benefits to aircraft operation costs and passenger time lost
SBAS – Addressing the challenges (1)

- SBAS will service sectors other than aviation
- Aviation will not be the main user
- Government decides to acquire a SBAS
  - Geoscience Australia = lead
  - Airservices Australia = ANSP
  - CASA = Safety Regulator
  - Program Executive Board + Technical Leadership and Assurance Groups
SBAS – Addressing the challenges (2)

- PRN and service name = reserved

- SBAS Test Bed to verify:
  - availability, accuracy, integrity and coverage
  - compatibility of SBAS signals with current generation avionics in operational context.
  - safety/efficiency benefits of SBAS instrument approach procedures
SBAS – Addressing the challenges (3)

➤ SBAS Test Bed Challenges:

- Suitably equipped aircraft
- TIFP designed
- TIFP Design Organisation
- Fly on VMC
SBAS – Addressing the challenges (4)

➤ CASA Approval Process:

- CASA will observe process from the beginning
- Safety Cases to be presented progressively
- Safety Cases => solid results; traceable application of tailored Systems Engineering Process (SEP)
SBAS – Addressing the challenges (5)

➢ CASA Approval Process (ctd):
  o Systems Engineering Process (SEP):
    • tailored to maturity of final product/service
    • starting with top level performance needs
    • cradle to grave, fully integrating, stakeholders, criteria, disciplines, etc.
    • as advised by ICAO Global ATM Operational Concept Annex F (Doc 9854)
SBAS – Addressing the challenges (6)

➢ Activities expected beyond ‘system’ certification (similar to GBAS):
  o TIFP Design and Validation
  o Airline Staff Training, Airline Operational Approval
  o ANSP Staff Training, ANSP Operational Approval
  o General Industry Education and Communication

➢ Expected Result = Regulator, ANSP and Users cooperate along journey to ‘commissioning’
RELATED NAV/SUR (1)

- GNSS/ADS-B Mandate Challenges
  - Note: This is not an SBAS mandate.
  - See below

- Navigation Rationalization Project:
  - industry support
  - joint action,
  - overcoming unfamiliarity
RELATED NAV/SUR (1)

- Backup Navaid Network (BNN) Challenges:
  - forecast evolution of overall navigation system
  - weaknesses to back-up against
  - most/effective backup

- PBN Challenges:
  - Not be a mere overlay of the past
WRAP UP

 ➢ GENERAL CHALLENGES

 o GAIN SUPPORT FROM PAYING USERS

 o SYNCHRONISED ACTION OF STAKEHOLDERS

 o OVERCOMING UNFAMILIARITY w/TECHNOLOGY

 o CONSIDER GBAS/SBAS WITHIN BROADER ATM/CNS SYSTEM
END
SPARE SLIDES
SBAS – Test Bed Characteristics (1)

- SBAS Test Bed:
  - began transmitting an RTCA/DO-229D-compliant L1 SBAS signal on the 1 June 2017,
  - uses Message Type 0 (MT0) instead of MT2 for fast corrections to prevent users engaged in Safety-of-Life (SoL) operations from using the service.
SBAS – Test Bed Characteristics (2)

- SBAS Test Bed:
  - uses PRN 122 (temporary allocation ended in 31 Jan 2019, subsequently extended to 31 Jan 2020)
  - SBAS Service Provider ID (SPID) of 8, the first spare SPID in Appendix B, Section 3.5.4.4.1 of Annex 10.
  - MT27 is used instead of MT28.
SBAS – Test Bed Characteristics (3)

➢ SBAS Test Bed (ctd)

- began transmitting Dual Frequency Multi Constellation (DFMC) L5 SBAS based on the draft ICD v1.4 developed by the SBAS Interoperability Working Group.

- The DFMC service makes use of all available Galileo E1 and E5a signals, and GPS L1 ranging signals.
SBAS – Test Bed Characteristics (4)

➢ SBAS Test Bed (ctd)

- due to the low number of L5-capable satellites deployed in the GPS constellation, the testbed relies on a L1/L2 codeless method to perform the ionosphere-free solution.
SBAS – Test Bed Characteristics (5)

➢ SBAS Test Bed (ctd)

 o clock and ephemerides corrections are broadcast on L5.

 o transmits Precise Point Positioning (PPP) corrections on L1 and L5 for non-aviation applications using a proprietary format developed by GMV.