GBAS/SBAS IMPLEMENTATION in APAC
AUSTRALIA’S PERSPECTIVE

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PERSPECTIVES

- OVERALL
- GBAS
- SBAS
- RELATED NAV/SUR
OVERALL (1)

- Aviation is self funding in Australia

- Government Policy Task
  - Influence infrastructure investment and operating costs at the service of society
  - Whole of Government Approach

- Australia
  - Departments/Agencies under State Safety Program
  - Industry
OVERALL (2)

➢ Australia ‘thinks’

- Global ATM Concept (GATMOC, Doc 9854)
- Balancing GATMOC’s
  - Performance Service Asset Package (PSAP) (Cir335)
  - across its 11 KPA (Doc 9883)
  - using the GANP
OVERALL (3)

- GBAS/SBAS =
  - part of Navigation Equation, which is
  - part of ATM/CNS, which is
  - part of Aviation Transport System, which is
  - part of Transport System
GBAS

- **2006-2011** = SYD GBAS trials
- **2012(06)** = SYD GBAS – restricted operators
- **2014(06)** = SYD GBAS – all operators
  - RWY: 07, 16L, 16R, 25, 34L, 34R
- **2017(06)** = MEL GBAS – all operators
  - RWY 09, 16, 27, 34
- **FUTURE** = Potentially BN, PH and AD
2019(Q3): Cost benefit analysis across 10 industry sectors (including aviation)

- Benefits expected = several billions AUD

Test bed indicates performance compatible with cost benefits analysis

Important to know the user base

- SBAS = potential APV to 1000 RWY Ends
RELATED NAV/SUR (1) – Context

- GNSS/ADS-B mandate IFR (2013 => 2017)
- Navigation Rationalization Project (NRP) (2016)
- PBN
- TIFP
- Surveillance
- ADS-B Data Sharing
RELATED NAV/SUR (1) – Context

- GNSS/ADS-B mandate IFR (2013 => 2017)
  - Most IFR flights GNSS as primary
  - Extend surveillance coverage substantially
  - Progressive Steps: 2013; 2014 (2); 2016; 2017
  - GNSS/ADS-B Mandate ≠ SBAS equipped
2016 – Decommissioned ~50% ground-based navaids

Backup Navaid Network (BNN):

- Allow recovery of “flight in progress” if unable to access GNSS (e.g. localized jamming; aircraft fault)
- Support aircraft without fault detection and exclusion (all SBAS receivers have FDE)
- Provide limited ongoing network capacity in the case of a sustained failure (balance between flexibility and resilience)
**BNN Limitations**

- Cost of IFR training that is not used
  - E.g. recency on NDB/VOR approaches
- Proximity of alternate airports for aircraft without FDE
- Network architecture needs review
RELATED NAV/SUR (4) – PBN (1)

Navigation specifications

**RNP specifications**
(includes a requirement for on-board performance monitoring and alerting)

- Oceanic and remote specifications:
  - RNP 4
  - RNP 2

- En route and terminal specifications:
  - RNP 2
  - RNP 1
  - A-RNP
  - RNP APCH
  - RNP AR APCH
  - RNP 0.3

**RNAV specifications**
(no requirement for on-board performance monitoring and alerting)

- En route and terminal specifications:
  - RNAV 5
  - RNAV 2
  - RNAV 1

- Oceanic and remote specifications:
  - RNAV 10 (RNP 10)
## Navigation Specifications used in Australia

<table>
<thead>
<tr>
<th>Specification</th>
<th>Intended Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RNAV 10 (RNP 10)</strong> Oceanic Operations Supported in Australia</td>
<td>• Supports 50 NM lateral and longitudinal separations in oceanic / remote continental airspace.</td>
</tr>
<tr>
<td><strong>RNP 4</strong> Oceanic Operations Preferred in Australia</td>
<td>• Supports 30 NM lateral and longitudinal separations in oceanic / remote continental airspace.</td>
</tr>
<tr>
<td><strong>RNP 2</strong> Enroute Operations</td>
<td>• Oceanic and enroute use.</td>
</tr>
<tr>
<td><strong>RNP 1</strong> Terminal Operations</td>
<td>• Provides connectivity between enroute airspace and Instrument Approach Procedures in terminal airspace (SIDs and STARs).</td>
</tr>
<tr>
<td><strong>RNP APCH</strong> Approach Operations Charted “RNAV GNSS”</td>
<td>• Provides RNAV GNSS approach operations:</td>
</tr>
<tr>
<td></td>
<td>• NPA = LNAV (MDA/H) and APV = LNAV/VNAV (DA/H)</td>
</tr>
<tr>
<td><strong>RNP AR APCH</strong> Approach Operations Charted “RNAV RNP”</td>
<td>• Authorisation Required (AR) for such operation.</td>
</tr>
<tr>
<td></td>
<td>• Supports RNP 0.3—0.1 and curved paths.</td>
</tr>
</tbody>
</table>
Related NAV/SUR (6) – TIFP

- Total ≈ 300 aerodromes (certified or registered)

- TIFP figures (now/planned)
  - Baro-VNAV ≈ 105/337
  - RNP-AR ≈ 40/44
  - GLS ≈ 10/18
  - SBAS Potentially
    - to all ≈ 1100 Runway Ends
    - depending on benefits for each individual case
RELATED NAV/SUR (7)

- SUR Coverage 10000 ft
RELATED NAV/SUR (8)

➢ ADS-B Data Sharing – Australia/Indonesia
WE ‘THINK’

- balance ICAO Performance Service Asset Package (PSAP)
- for 11 KPA in ICAO GATMOC
- across known user base
- with stakeholders moving in synchronism
- using the GANP
- Ref: Docs 9854, 9883, Circ. 335
WRAP UP (2)

- GBAS: proved net benefits in specific cases
- SBAS: viable for user-base > than aviation
- RELATED NAV/SUR: GBAS/SBAS within context
  - navigation rationalisation and backup
  - PBN, TIFP
  - surveillance needs
SPARE SLIDES
### GNSS/ADS-B Mandate – Schedule (1)

#### AIRCRAFT EQUIPMENT

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Applicable to</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 December 2013</td>
<td>Aircraft operating at or above FL 290</td>
</tr>
</tbody>
</table>
| 1 January 2014      | New aircraft registered on or after 1 January 2014  
  • MCTOW >5700 kg or >19 passengers |
| 6 February 2014     | New aircraft registered in Australia on or after 6 February 2014                                    |
|                     | Existing aircraft modified on or after 6 February 2014 and:                                         |
|                     | Operating in class A, B, C, or E airspace, or Operating above 10,000ft in class G airspace.         |
|                     | Note: Not applicable to aircraft operating in class E airspace or above                               |
|                     | 10,000ft in class G airspace if the aircraft has no engine or insufficient                           |
|                     | electrical power capacity to operate a transponder.                                                |
|                     | New aircraft operating in RPT or charter operations                                                  |
|                     | New aircraft operating in aerial work or private operations                                          |
|                     | Existing aircraft operating in RPT or charter operations,                                           |
|                     | if modified on or after 6 February 2014                                                            |
|                     | Existing aircraft operating in aerial work or private operations                                    |
|                     | if modified on or after 6 February 2014                                                            |
### GNSS/ADS-B Mandate Schedule (2)

<table>
<thead>
<tr>
<th>Date</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 February 2016</td>
<td>Aircraft operating in class A, B, C or E airspace in the 500nm quadrant north and east of Perth</td>
</tr>
<tr>
<td></td>
<td>Aircraft operating at Brisbane, Sydney, Melbourne, or Perth aerodromes</td>
</tr>
<tr>
<td>2 February 2017</td>
<td>Existing aircraft operating in RPT or charter operations</td>
</tr>
<tr>
<td></td>
<td>Existing aircraft operating in aerial work or private operations</td>
</tr>
<tr>
<td></td>
<td>Existing aircraft on the Australian register before 6 February 2014</td>
</tr>
</tbody>
</table>

**Notes**

1. Requirements are applicable to aircraft conducting IFR operations only.
2. Refer to CAO 20.18 and 20.91 for full details of requirements.