सत्यमेव जयते

नागर विमानन मंत्रालय, भारत सरकार

MINISTRY OF CIVIL AVIATION, GOVERNMENT OF INDIA

भारतीय विमानपत्तन प्राधिकरण

AIRPORTS AUTHORITY OF INDIA

ICAO APAC SBAS-GBAS IMPLEMENTATION WORKSHOP FOR AIRSPACE USERS

"Enhancing airport accessibility and safety on final approach with SBAS and GBAS"

14th to 16th October 2025

Bengaluru, India

SouthPAN Programme Update

Matt AMOS

Technical Director, Land Information New Zealand

Vincent ROOKE

Technical Director, Geoscience Australia

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Programme Objectives and Service Offering

Programme Objectives

- Improve and augment the accuracy, integrity and availability of basic GNSS signals in Australia and New Zealand.
- Positively contribute to the aviation, maritime, road, rail, agriculture, construction, resource and utility sectors.
- Positively impact all users of satellite positioning, particularly citizens in regional and remote areas without mobile phone coverage

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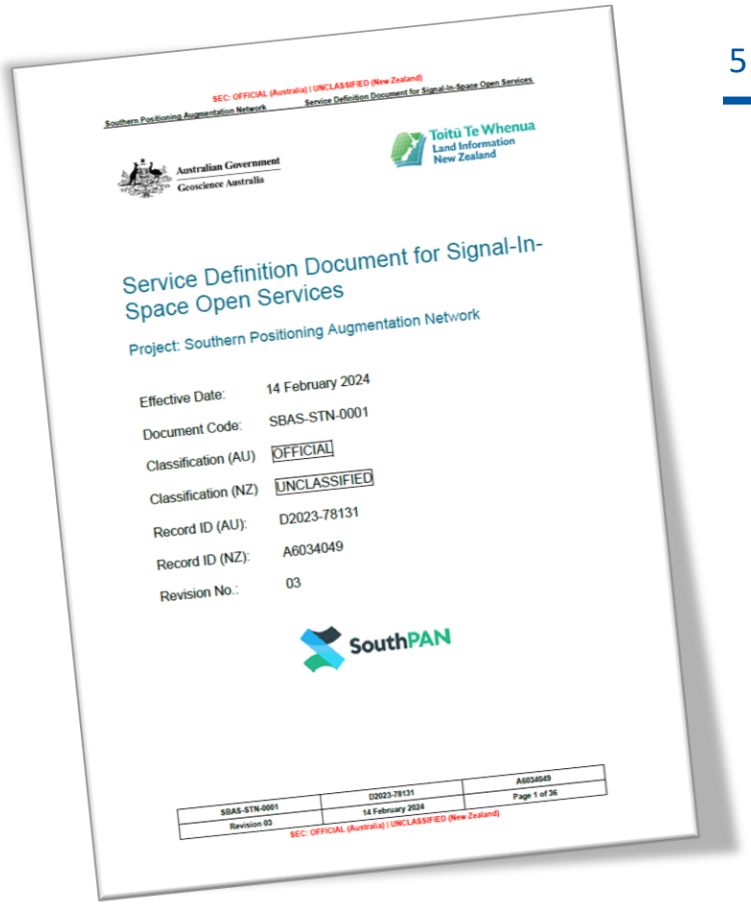
SouthPAN Service Catalogue

- Service Definition Documents are available on GA and LINZ websites:
  - ga.gov.au/southpan
  - linz.govt.nz/southpan
- Open Services are available now; Safety-of-Life will be available in 2028.
- Users may access Open Services using the Signal-In-Space or the Data Access Service.
- GNSS Observations from reference stations will be provided via gnss.ga.gov.au after site installation.



SouthPAN (GA)

SouthPAN (LINZ)

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SouthPAN Services (1)

L1 SBAS Signal-In-Space Open Service

- Single-frequency, single-constellation
- Augments GPS L1-C/A

Performance	Now	2028+
Accuracy (Hori.)	3 m	3 m
Accuracy (Vert.)	4 m	4 m
Availability	99.5%	99.9%

L1 SBAS Signal-In-Space Safety-of-Life Service

- Single-frequency, single-constellation
- Augments GPS L1-C/A
- Will support all phases of flight down to LPV-200

Performance	Now	2028+
Accuracy (Hori.)	-	16 m
Accuracy (Vert.)	-	4 m
Availability	-	99%
Cont. (LPV-250)	-	8×10^{-6}
Cont. (LPV-200)	-	5×10^{-5}

SouthPAN Services (2)

DFMC SBAS Signal-In-Space Open Service

- Dual-frequency, dual-constellation
- Augments GPS L1-C/A & L5 plus Galileo E1 & E5a
- Currently no plans for a DFMC SBAS Safety-of-Life Service

Performance	Now	2028+
Accuracy (Hori.)	1.5 m	1 m
Accuracy (Vert.)	2.5 m	1.5 m
Availability	99.5%	99.9%

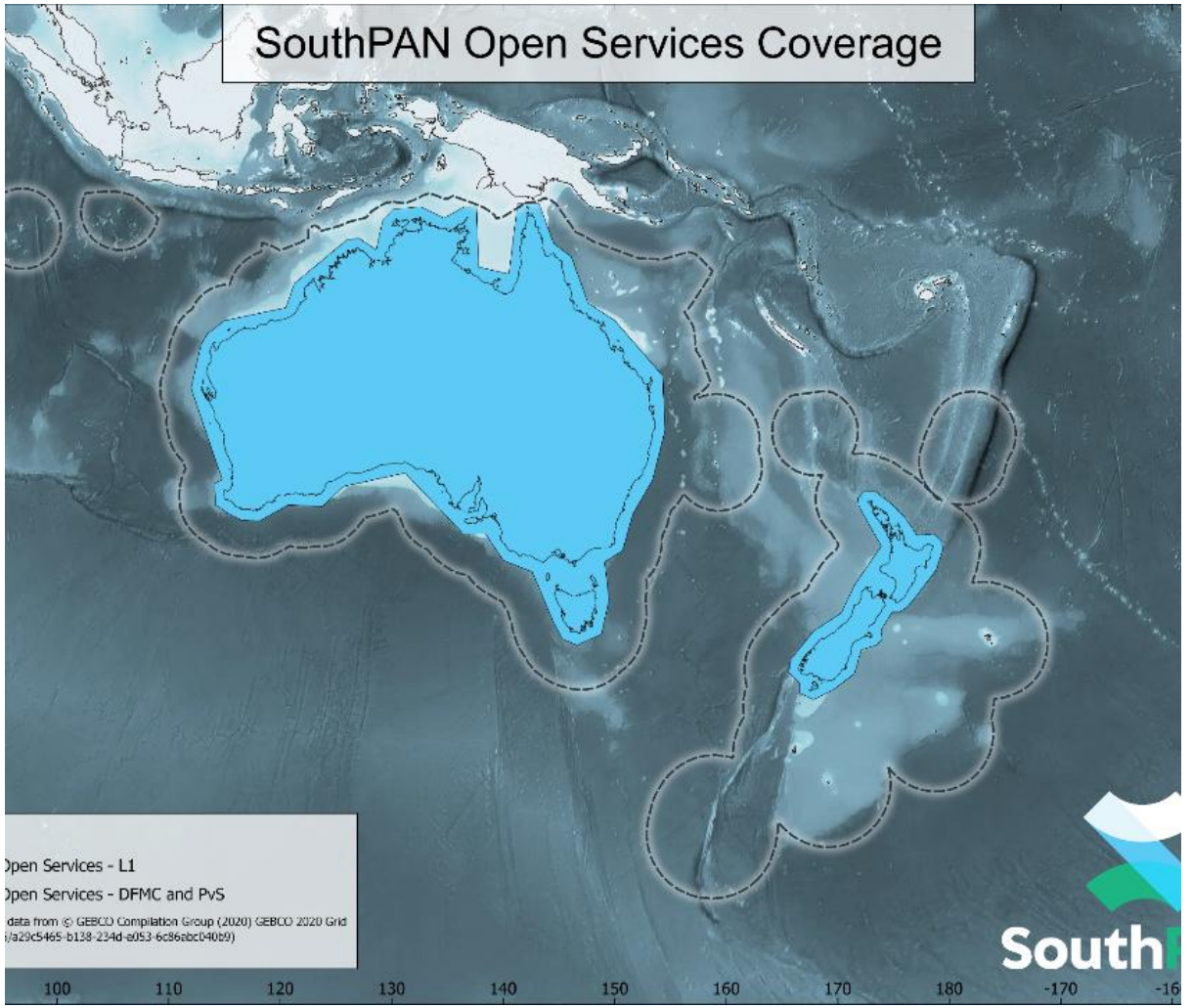
PPP Via SouthPAN Signal-In-Space Open Service

- Dual-frequency, dual-constellation
- Augments GPS L1-C/A & L5 plus Galileo E1 & E5a

Performance	Now	2028+
Accuracy (Hori.)	37.5 cm	15 cm
Accuracy (Vert.)	52.5 cm	22 cm
Availability	99.5%	99.9%
Convergence	80 min	40 min
Nav. signal	L5	L5b

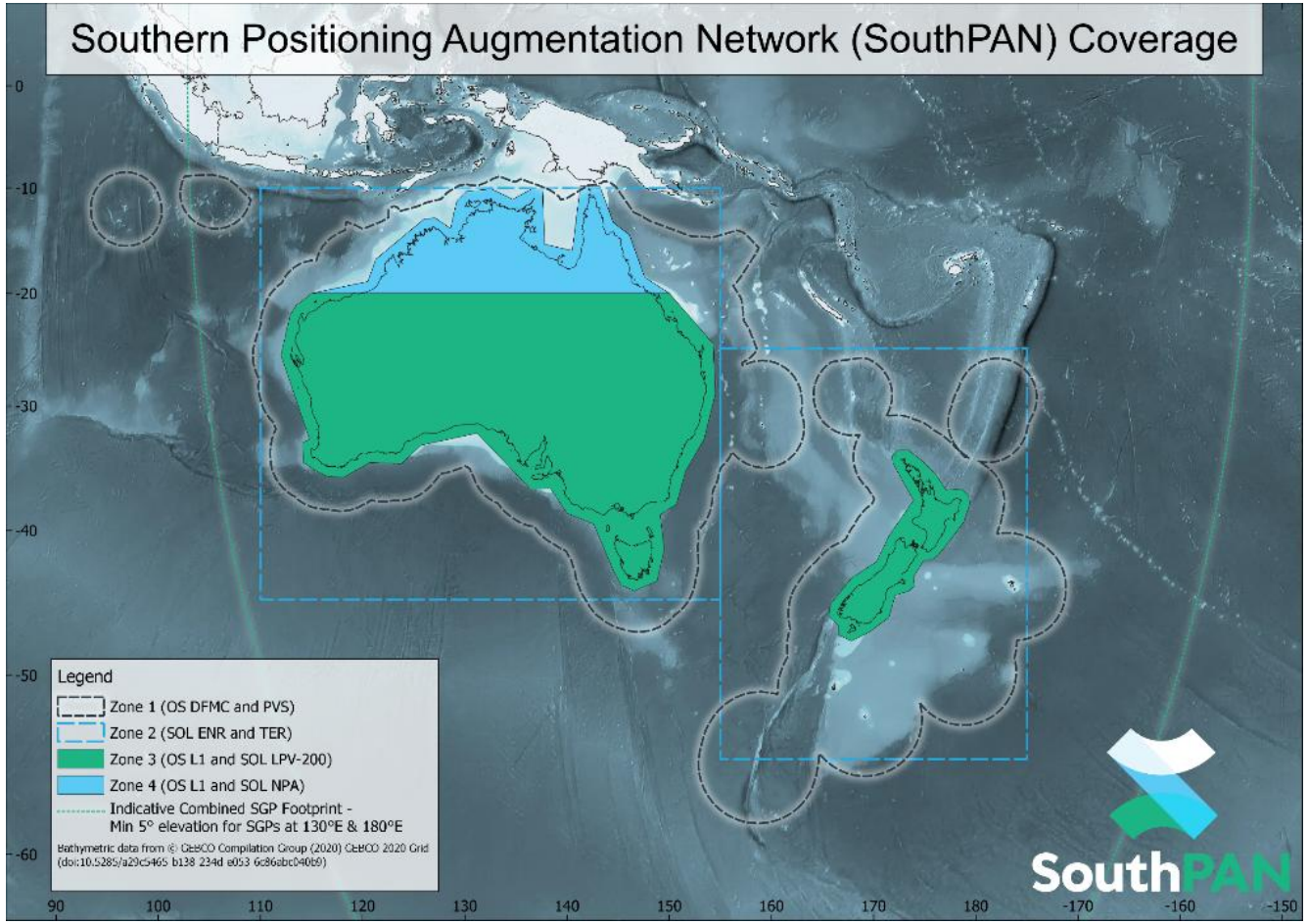
Service Volume (now)

- Open Services L1 SBAS SIS and DAS are available within 50 nautical miles of mainland Australia, Tasmania, and New Zealand's North and South Islands.
- Open Services DFMC SBAS SIS and DAS, and PVS SIS and DAS are available within the combined Exclusive Economic Zones of both countries.



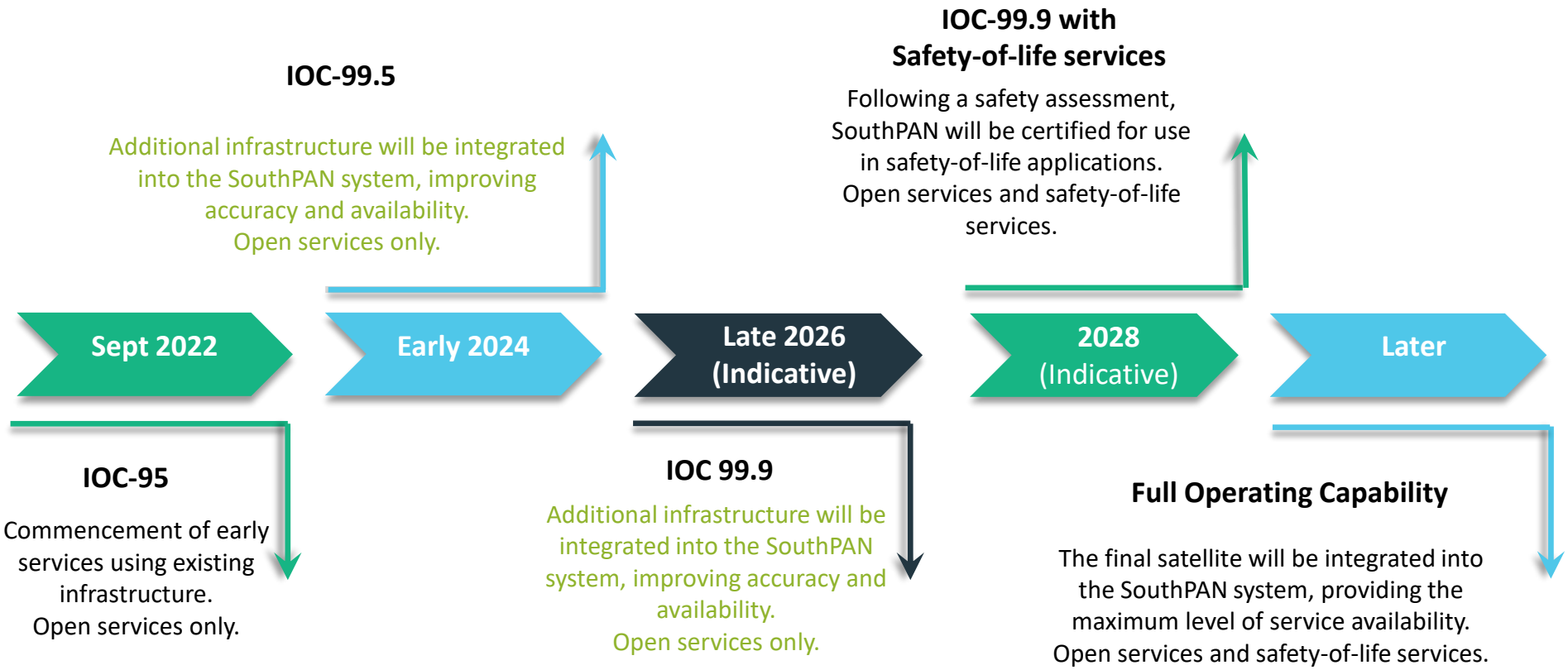
Service Volume (2028)

- Open Service coverage maintained.
- Safety-of-Life Service L1 SBAS SIS is available within 50 Nautical Miles of mainland Australia & Tasmania, as well as New Zealand north and south islands.
- Coverage north of 20° South is limited to LNAV-only due to ionospheric activity.



Schedule and Progress

Development Roadmap



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Progress Update

Project Delivery

- System Preliminary Design Review completed 13 February 2023
- System CDR completed 11 April 2025
- Civil works has commenced at both UPCs and 3 GRS.
- Factory Verification/Acceptance Tests scheduled for end-September.
- Safety computer software applications have commenced development.

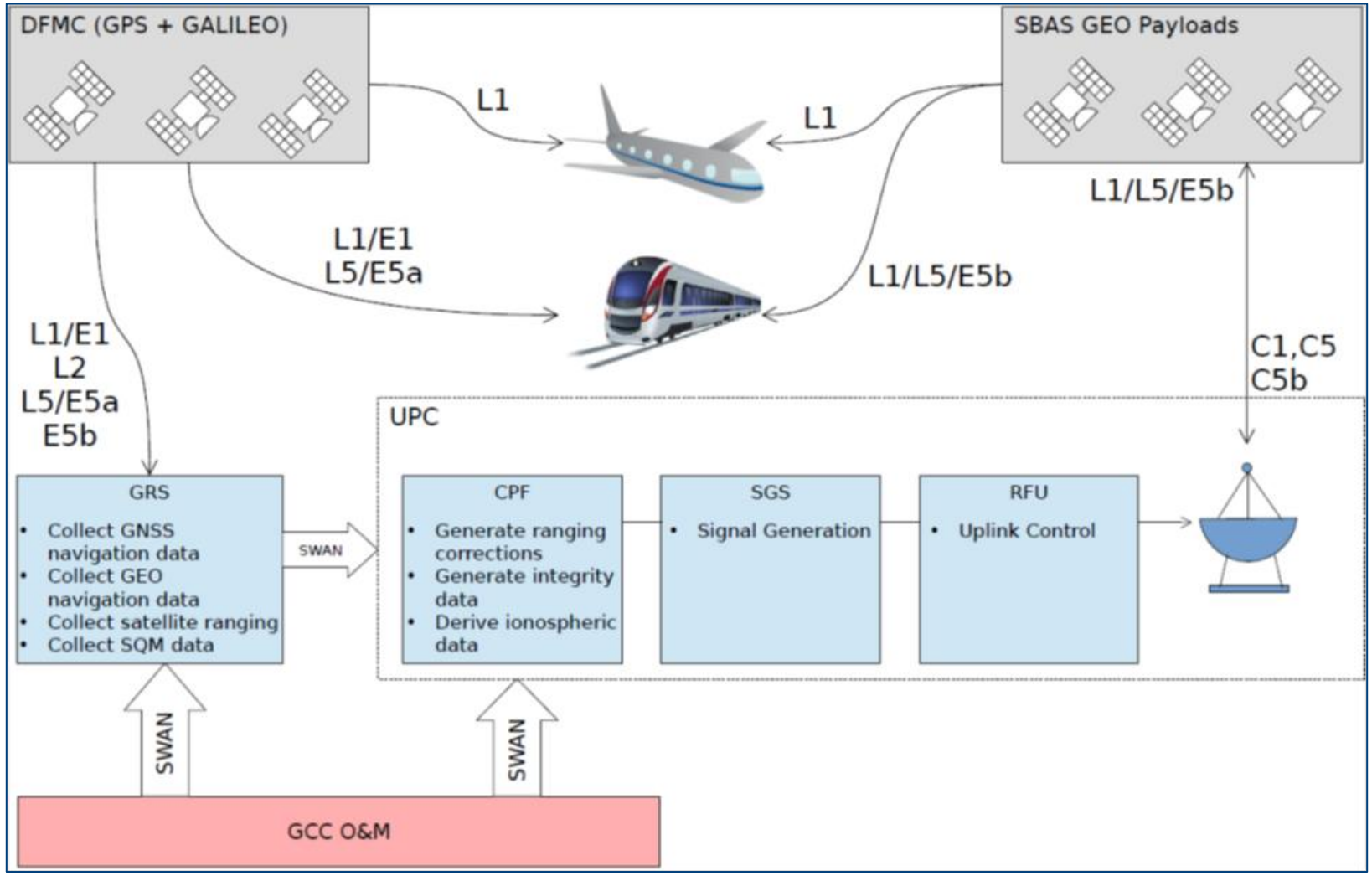
Service Delivery

- Initial Operating Capability (IOC) 95% phase commenced 26 September 2022 and ended 14 March 2024—all service Key Performance Indicators were exceeded.
- SouthPAN Data Access Services commissioned December 2023 (‘SiSNET-like’) to provide L1 SBAS, DFMC SBAS, and PVS SIS over the internet.
- IOC 99.5% cutover completed on 14 March 2024—improved availability, comparable accuracy.

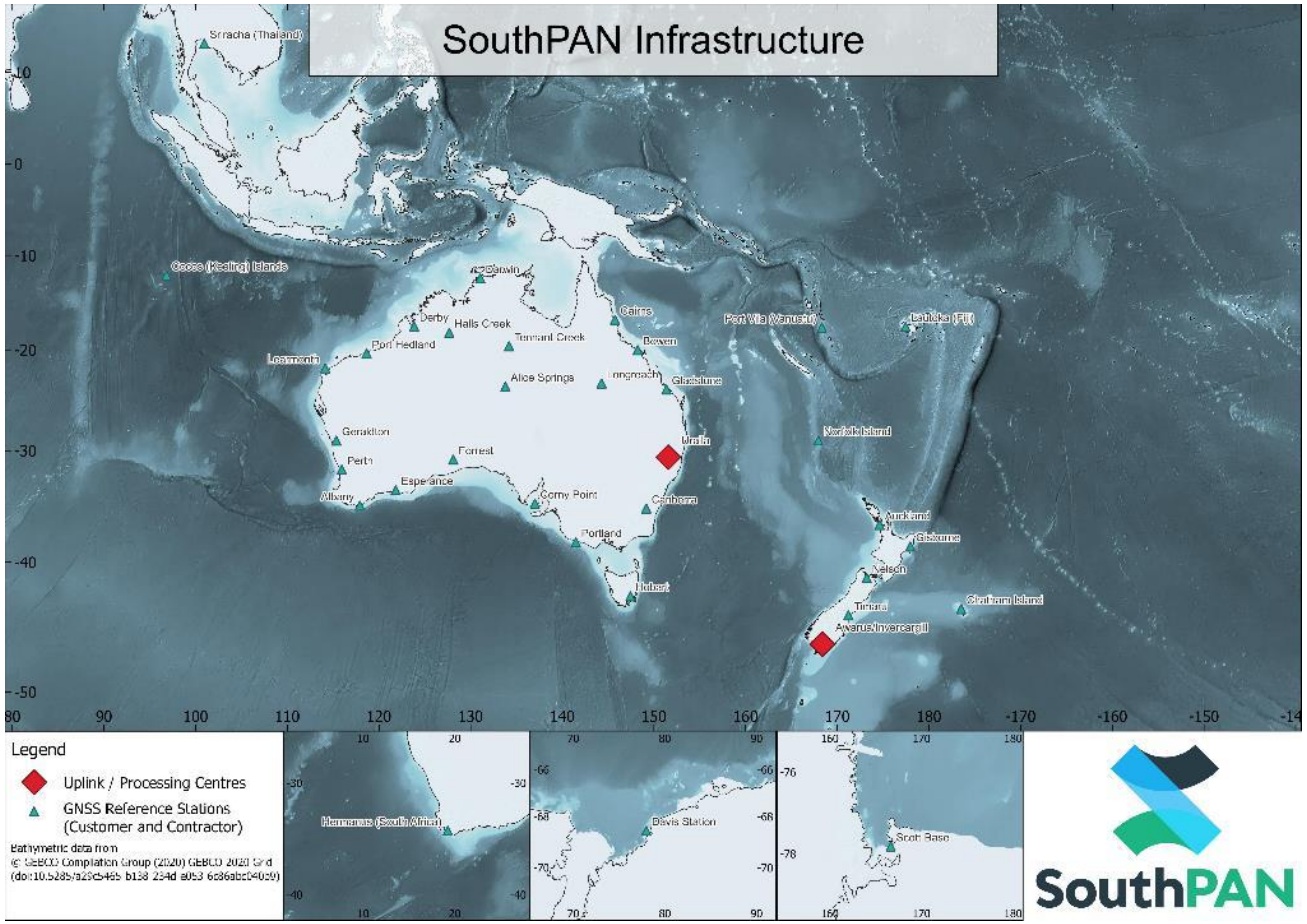
System Configuration

Ground, Space and User Segment

System Architecture



Facility Locations



- Uplink and Processing Centres:
  - Uralla, New South Wales AU
  - Awarua, Southland NZ
- GNSS Reference Stations:
  - 24 in AU
  - 6 in NZ
  - 1 in Antarctica
  - 1 each in South Africa, Thailand, Vanuatu, Fiji

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Ground Segment

- ‘Build 0’ from 26 Sep 2022 to 14 Mar 2024
- ‘Build 1’:
  - Build 1.0 (14-Mar-24): navigation uplink from dedicated 11.1 m C-band, prototype software/hardware, GA/LINZ provides GNSS observations from CORS
  - Build 1.1 (17 Jul 2024): additional nav. uplink
  - Build 1.5 (late 2025): GNSS Observables service commissioned
- ‘Build 2’: from late 2026, system baseline for SOL certification

Space Segment

SGP-00:

- Inmarsat transferred 4F2 into 143.5 East
- Transition of services completed 20 November 2023

SGP-01:

- Contract awarded to Inmarsat Australia on 1 May 2023 for the first new satellite (3 navigation signals L1/L5/L5b)
- Navigation payload PDR completed 25 January 2024

SGP-02:

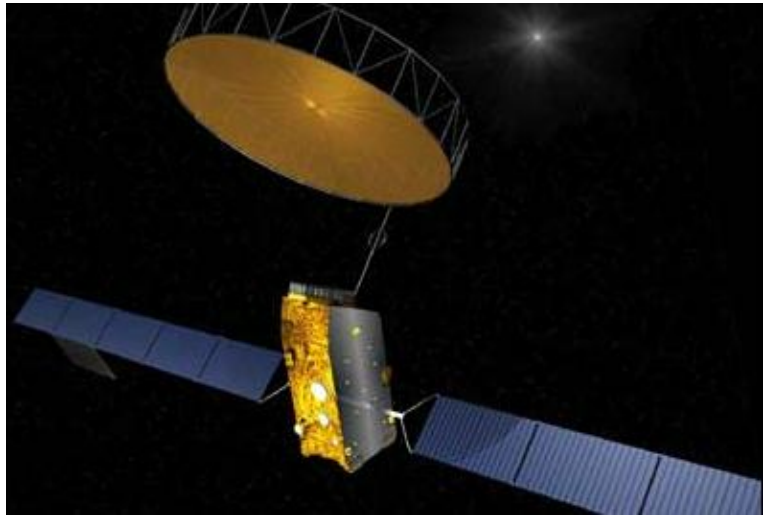
- Contract awarded to Inmarsat Australia on 12 August 2025
- Includes ongoing access to 4F1 and 4F2 to support Open services, Integration & Test, and Safety-of-Life.

PRN code 122 renewed on 11 January 2023

- Currently allocated to Inmarsat 4F2 -> Inmarsat 8F4

PRN code 124 acquired on 13 April 2024

- Currently allocated to Inmarsat 4F1 -> Inmarsat 8F1



SGP-00 (143.5° East)

SGP-01 (178° East)

User Segment

L1 SBAS Signal-in-Space (SIS):

- Useable by any RTCA DO-229E-compliant receiver (non-SOL)

DFMC SBAS SIS:

- Useable by any RTCA DO-401 / EUROCAE ED-259A compliant receiver (non-SOL)

PVS SIS:

- Useable by any receiver that can decode L5 SIS and process message protocol defined in the SouthPAN SIS Open Service Definition Document (SBAS-STN-0001)

SDAS:

- Useable by any software that can interface with Geoscience Australia's caster in accordance with DAS Service Definition Document (SBAS-STN-0002)

List of compatible SouthPAN user equipment is available:

- ga.gov.au/southpan
- linz.govt.nz/southpan

Service Performance

Reporting period: 1 July 2024 to 30 June 2025

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Service Performance (1)

DFMC SBAS Open Service report card

Performance	Average	Worst
Accuracy (Hori.)	0.59 m	1.18 m
Accuracy (Vert.)	1.36 m	2.16 m
SIS Avail.	99.89%	
Service Avail.	99.84%	

PPP Via SouthPAN Open Service report card

Performance	Average	Worst
Accuracy (Hori.)	0.095 m	0.115 m
Accuracy (Vert.)	0.170 m	0.180 m
Convergence	35.60 min	45.38 min
SIS Avail.	99.89%	
Service Avail.	99.86%	

Service Performance (2)

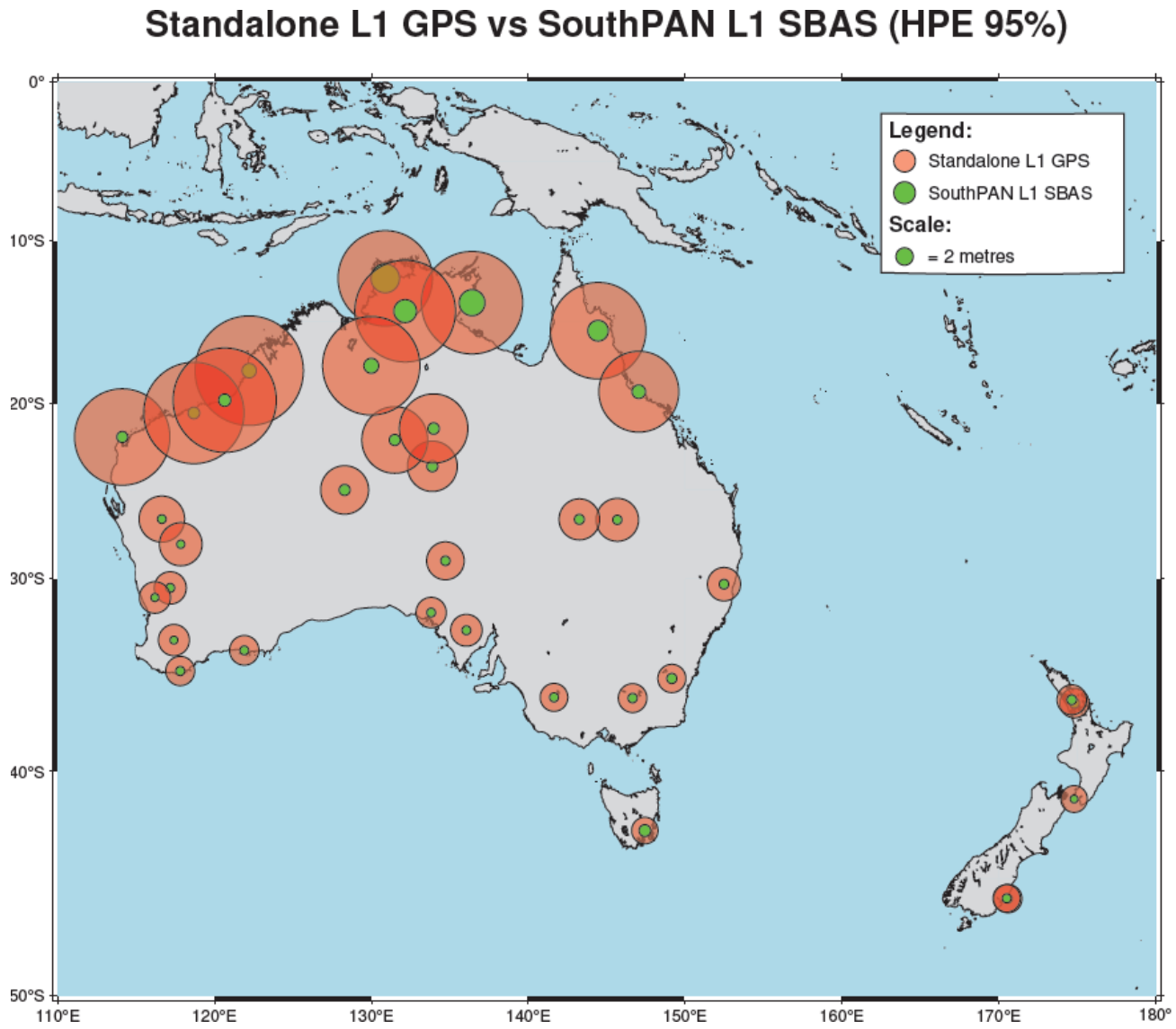
L1 SBAS Open Service report card

Performance	Average	Worst
Accuracy (Hori.)	1.13 m	3.62 m
Accuracy (Vert.)	2.12 m	3.93 m
SIS Avail.	99.94%	
Service Avail.	99.88%	

L1 SBAS Safety-of-Life Service report card

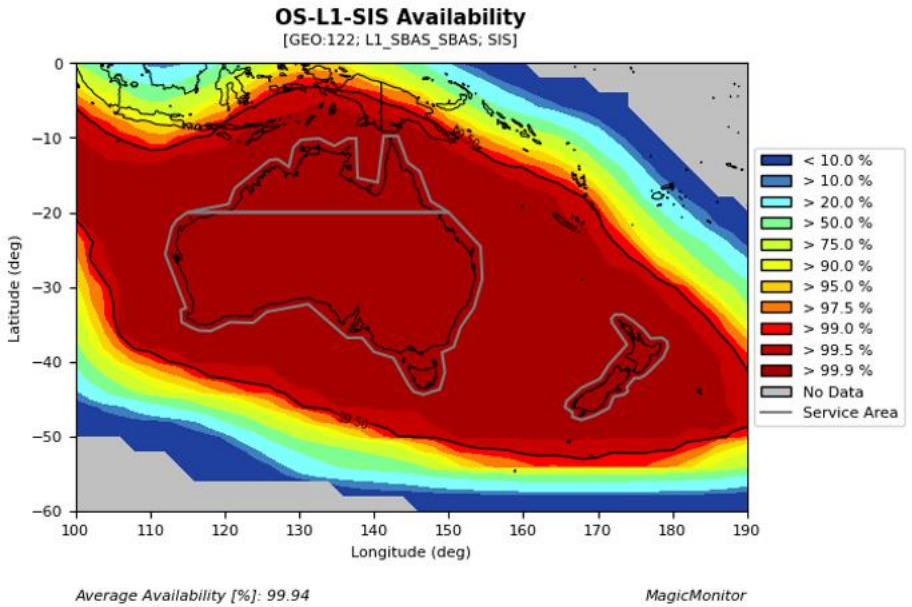
- Nothing to report

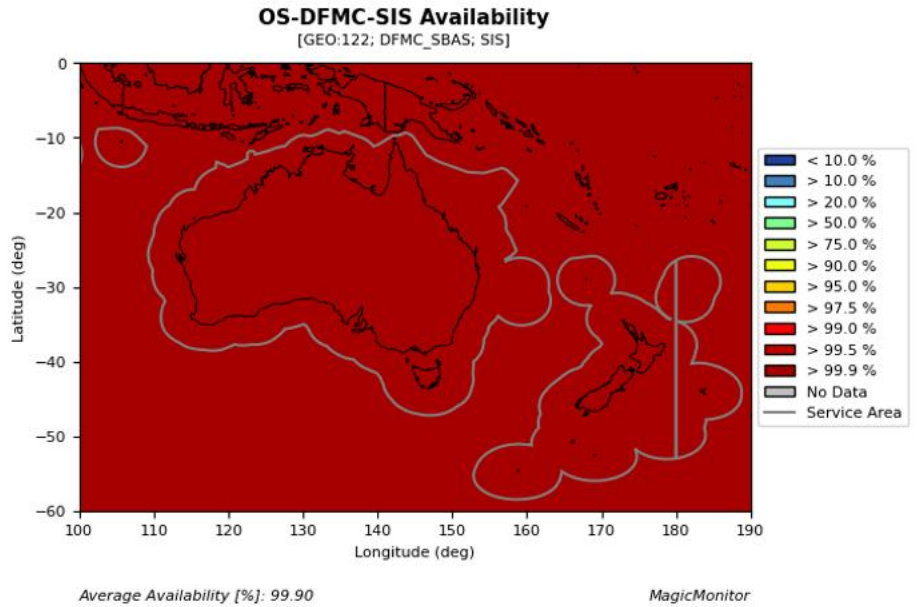
GPS vs SBAS Performance



Service Heatmap

Monthly Snapshot: April 2025





Open Service L1 availability: KPI 13

99.94% *(KPI target met for this month)*

Minimum: >= 0.95; Target: >= 0.995

DFMC-SIS availability: KPI 21

99.90% *(KPI target met for this month)*

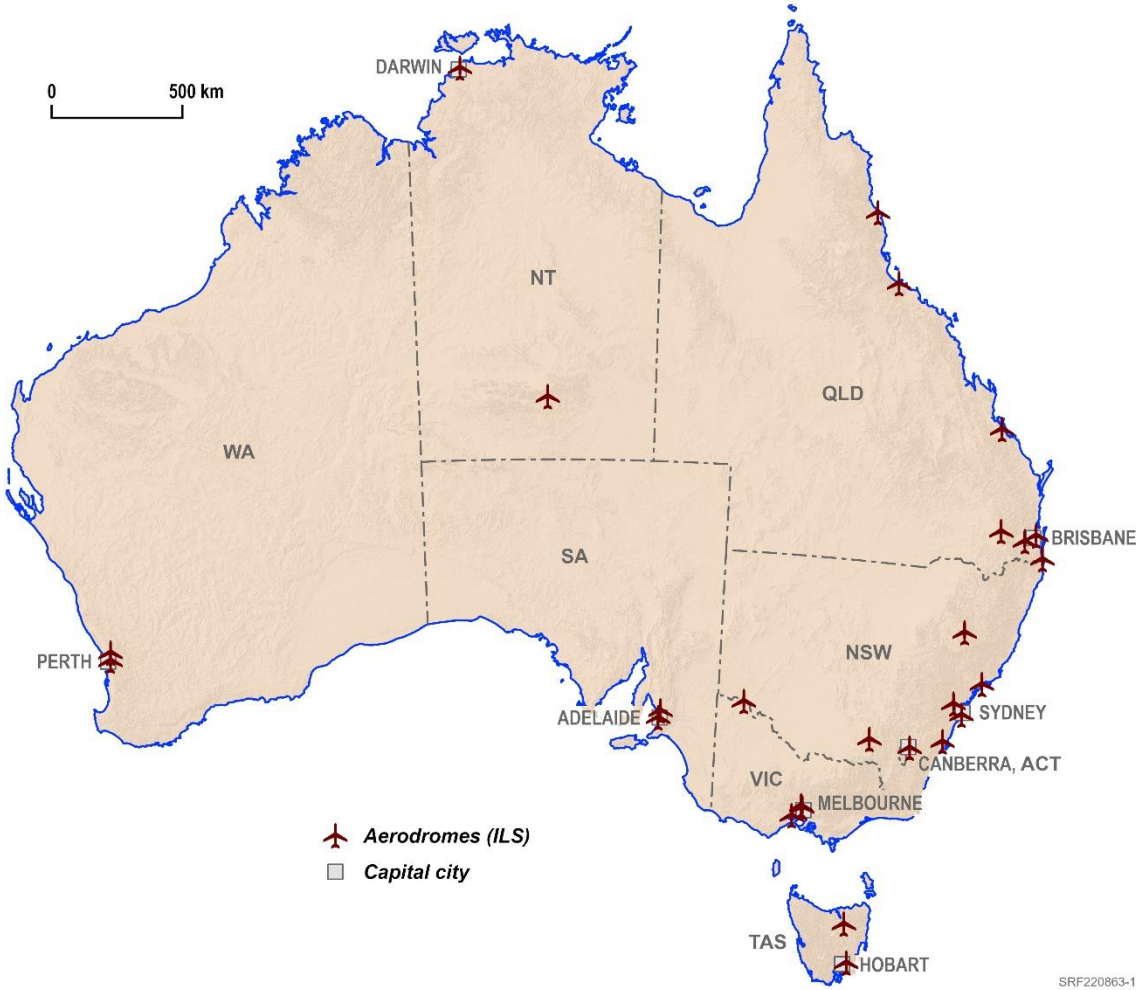
Minimum: >= 0.95; Target: >= 0.995

THE OPEN SERVICE HAS NO INTEGRITY AND THIS IS NOT REPRESENTATIVE OF THE AVIATION SERVICE, particularly in the north

Airspace User Segment

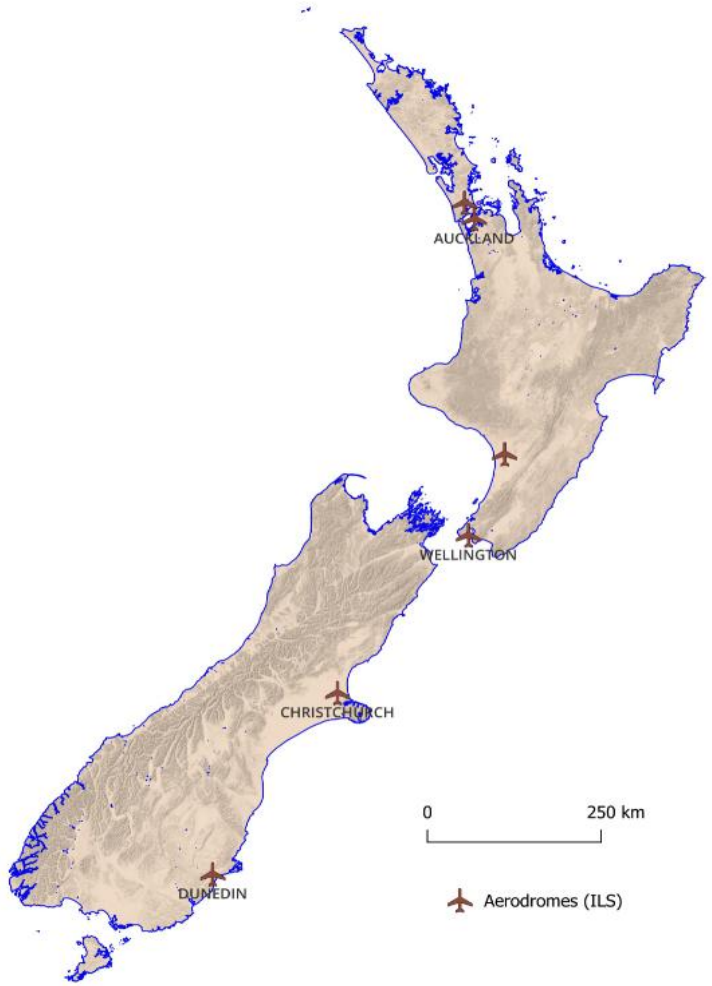
Aerodromes with ILS - Australia

- Currently there are 24 aerodromes with an Instrument Landing System (ILS) in Australia.
- Limited number of precision approaches leads to diversions and reduces safety during widespread weather events.
- Limited services to support remote and regional Australia.



Aerodromes with ILS – New Zealand

- Currently there are 6 aerodromes with an Instrument Landing System (ILS) in New Zealand.
- Limited number of precision approaches leads to diversions and reduces safety during weather events.



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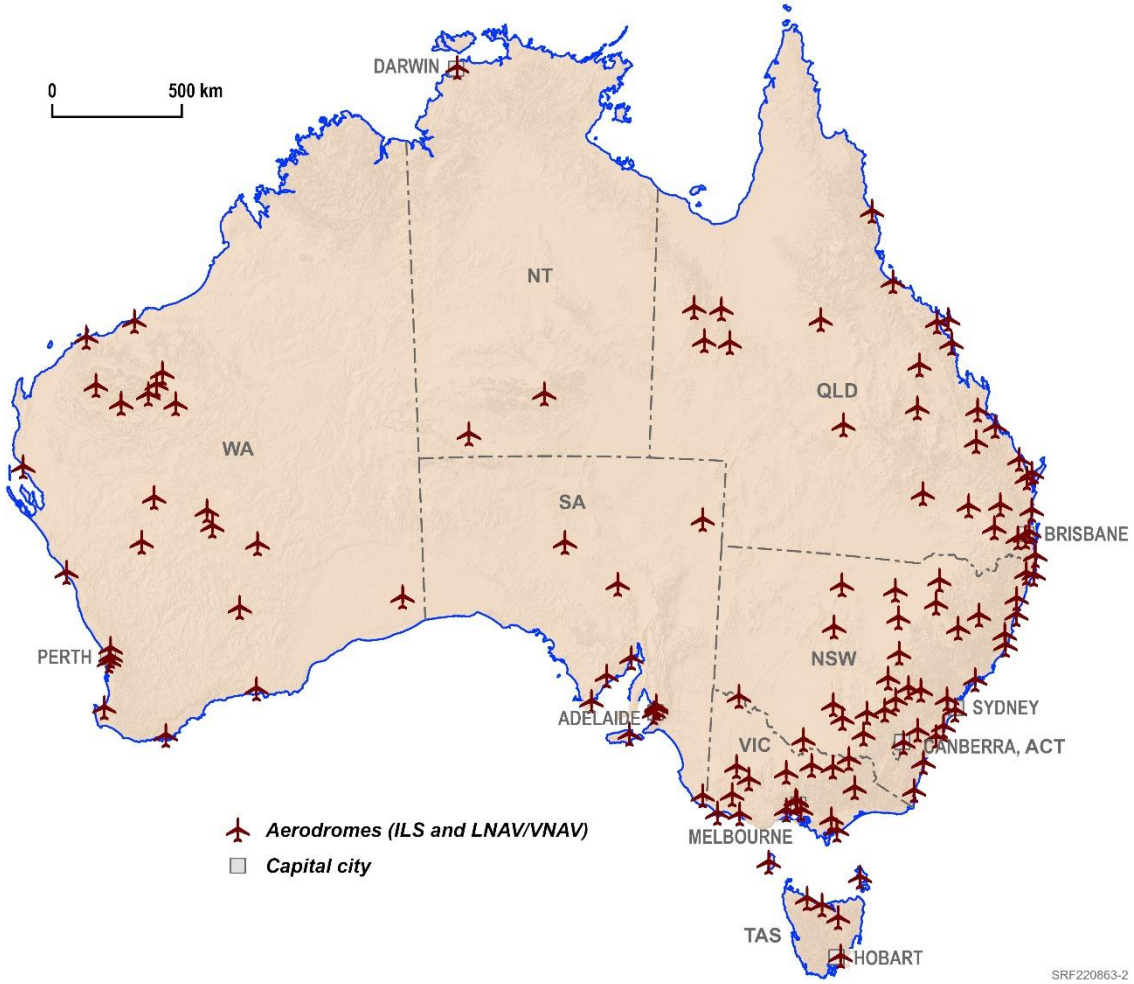
Aerodromes with ILS and Baro-VNAV – Australia



- Baro-VNAV was introduced in Australia in 2015/16 following ICAO resolution A37-11
- Baro-VNAV approaches have been implemented and are in operational use at 144 Australian aerodromes.
- The vast majority of small aircraft (generally, Beechcraft King Air and smaller IFR types) do not have Baro-VNAV equipment, SBAS will be the only means by which these aircraft can acquire vertical guidance capability at aerodromes that do not have ground ILS infrastructure.

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Aerodromes with ILS and Baro-VNAV – New Zealand

- Baro-VNAV approaches have been implemented and are in operational use at 23 New Zealand aerodromes as part of their commitment to Performance Based Navigation.
- Smaller IFR aircraft lack the avionics to allow for Baro-VNAV approaches. SBAS will be the only means by which these aircraft can acquire vertical guidance capability at aerodromes that do not have ground ILS infrastructure.

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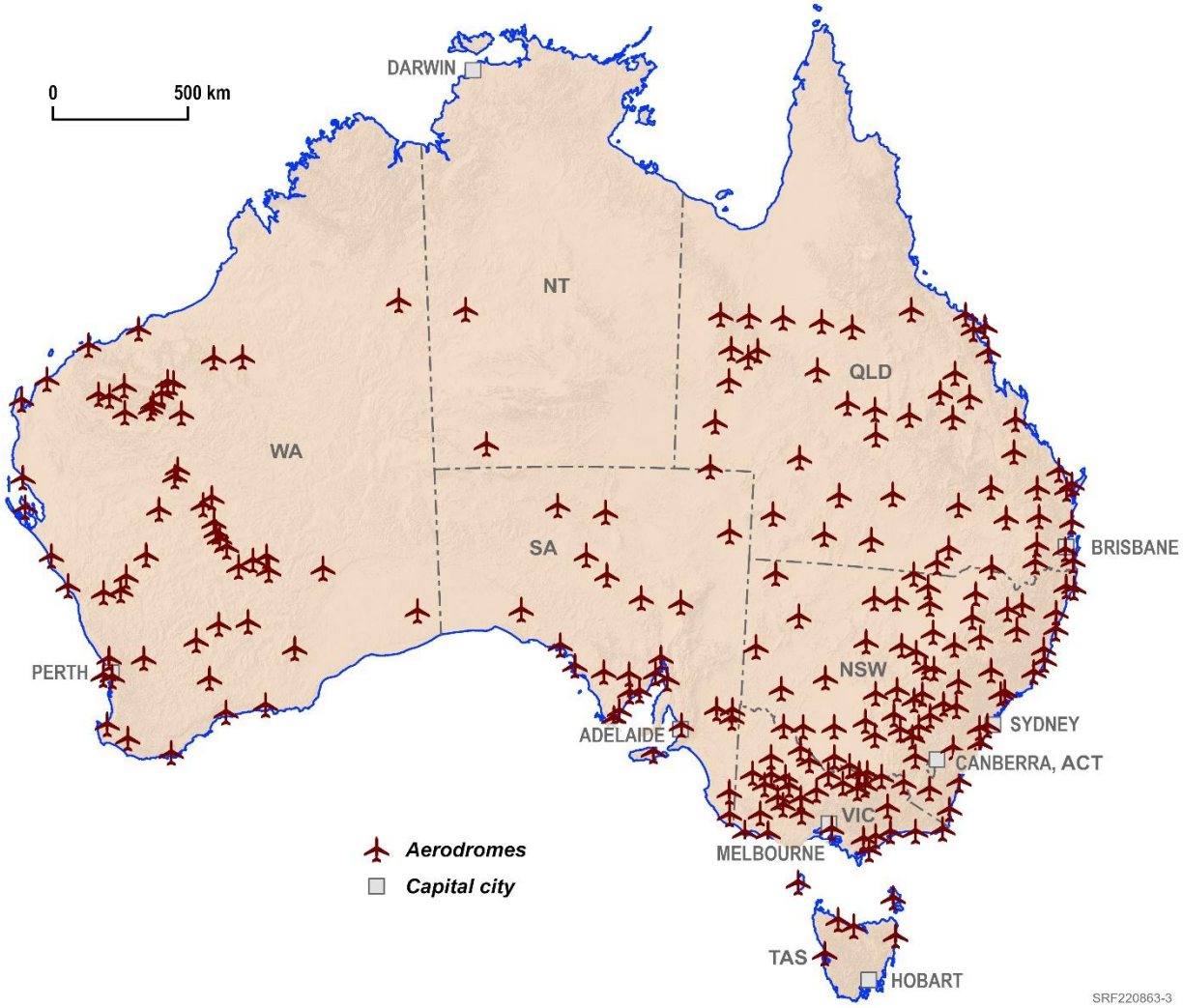
Potential for SBAS APV Procedures



- Potential for SBAS APV's over 200 aerodromes across Australia to have SBAS instrument VNAV/LNAV procedures.
- The Australian Government has committed AU$5 million for the implementation of LPV with SouthPAN at select regional and remote aerodromes.
- Given the size of Australia most traffic to remote and regional locations is fixed wing aircraft, and SBAS will improve the reliability Australia's network.
- A similar investment and approach is being introduced for New Zealand

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Policy Development

- SouthPAN will support **en-route, terminal and APV** operations across both countries
- Current services are **not yet certified for aviation use**
- Align with **ICAO standards** and global SBAS standards
- Enable **precision approaches** and **enhanced safety** in regional and remote airspace
- Foster **trans-Tasman collaboration** in aviation innovation and infrastructure

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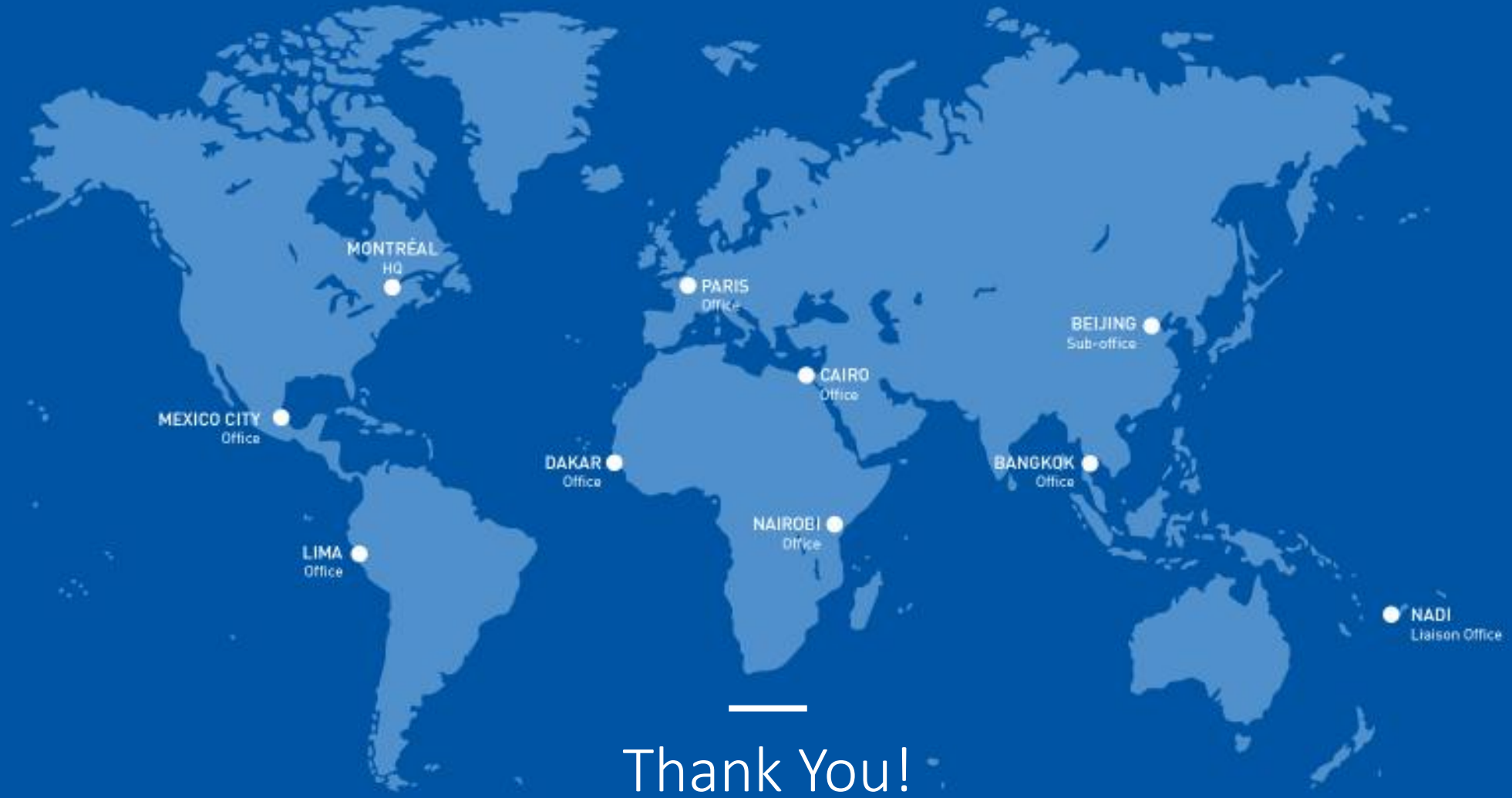

Thank You!

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