



SURICG/5

Australian Update

Sep 2020

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RADAR



Radar Update

- AMSTAR : Completed (P+S) – with Mode S / DAPs
- ERRP : Completed (SSR only) – with Mode S / DAPs
- DAP Selected Altitude used
- Flight ID not used yet
- Removed in 2017
 - Paraburdoo (North west)
 - Mt Boyce (Sydney)
 - Safety work done
- Next to decommission- Kalamunda
- After Kalamunda there will NO Airservices Mode A/C radars left
- Defence replacement program
 - 2021 -> 2022
 - 9 radars in total
 - Mode A/C -> Mode S



Kalamunda radar - planned to be replaced by ADS-B

Transponder Rules in place



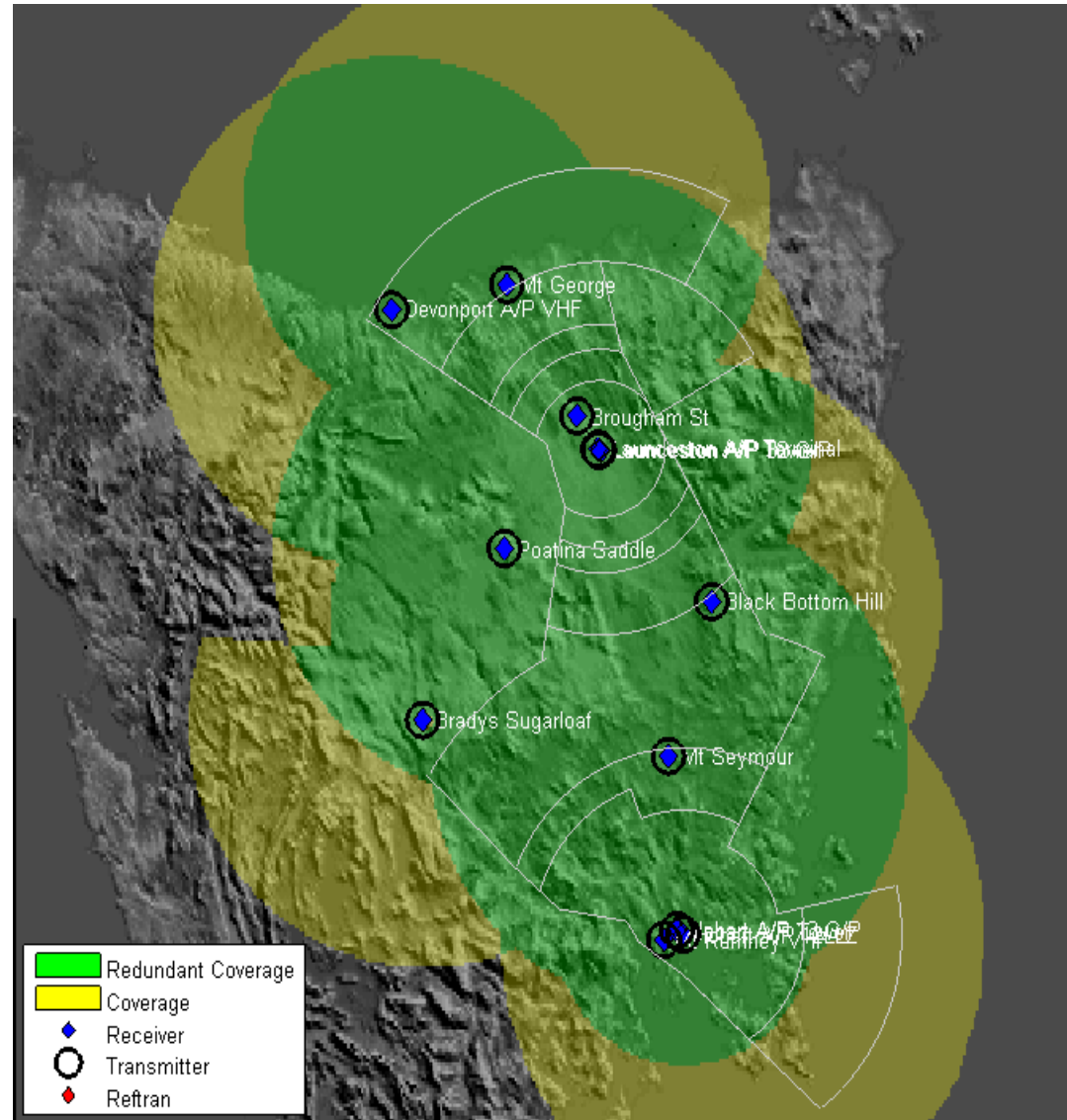
Mandate	Status
<ul style="list-style-type: none">▪ All new manufactured aircraft with Mode S transponder must have Mode S Flight ID▪ All Mode S “DAPS” must be in accord with ICAO SARPS [no bad data]▪ New manufactured aircraft must have Top/bottom antenna if >5700Kg or TAS>250 Kts	<p>Applies to all aircraft operating in Class A,B,C, E or Above 10K in G</p> <p>Exceptions in Class E & G if the aircraft does not have an engine; or sufficient engine-driven electrical power generation capacity to power a Mode S transponder.</p>
<ul style="list-style-type: none">▪ All new manufactured aircraft or transponder installation replaced must have Mode S with Flight ID & ADS-B capability	
<ul style="list-style-type: none">▪ All operations at Sydney, Brisbane, Melbourne & Perth airports must have mode S with Flight ID	Applies to all aircraft

Transponders for aircraft in Class A,B,C,E or above 10K must be Mode S with ADS-B capability - The phase out of Mode A/C has begun

WAM

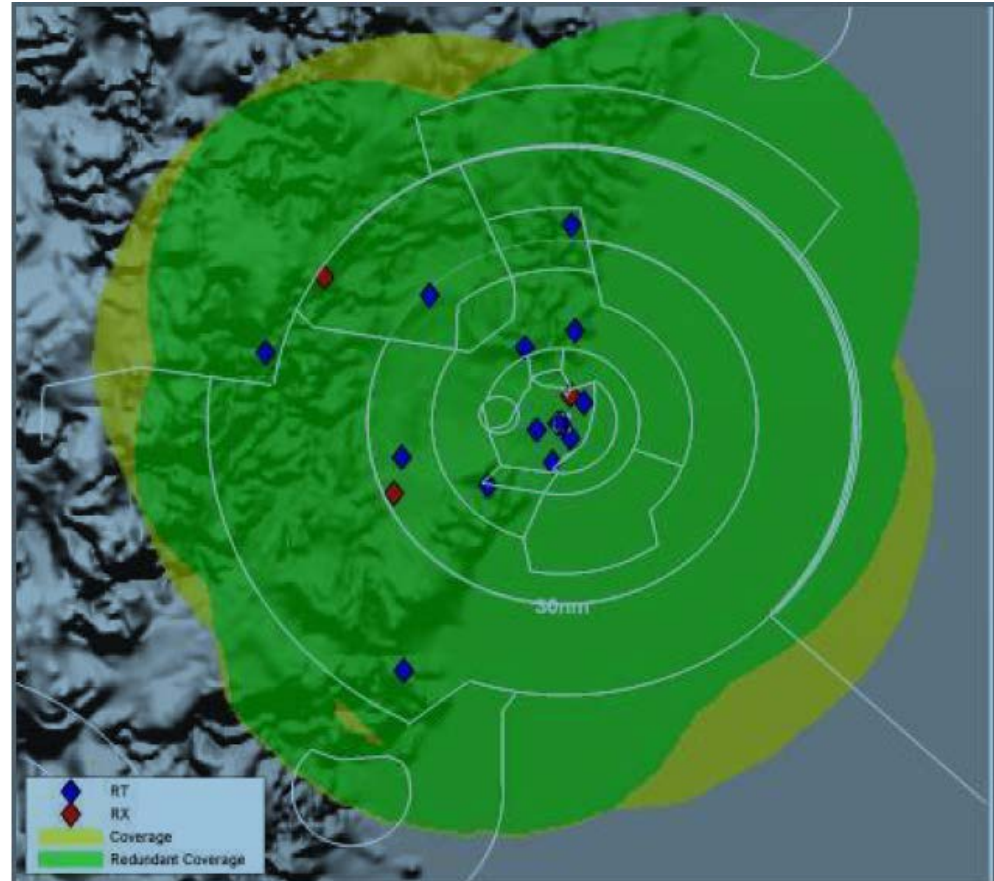
Wide Area Multilateration

- 2 systems since 2010/2011
- Tasmania (TASWAM) comprising 14 RUs – Enroute Service which replaced a “Temporary” radar.
- Coverage is both “redundant” and “non-redundant” as indicated.
- Provides Cat 34/48 output (MLAT position converted to “radar like”).
- Cat 20 not used.
- Cat 21 used for ADS-B – 14 independent ADS-B receivers.



Wide Area Multilateration

- Sydney (SYDWAM) comprising 16 RUs – which replaced an E-scan radar.
- Primary mission is the Precision Runway Monitoring Service for the YSSY parallel runways.
- Cat 20 used for PRM service (1 sec update rate).
- Also provides Cat 34/48 output (MLAT position converted to “radar like”). Limited to 40nm range for TMA 3nm separation.
- Cat 21 used for ADS-B.



SURFACE & TOWERS

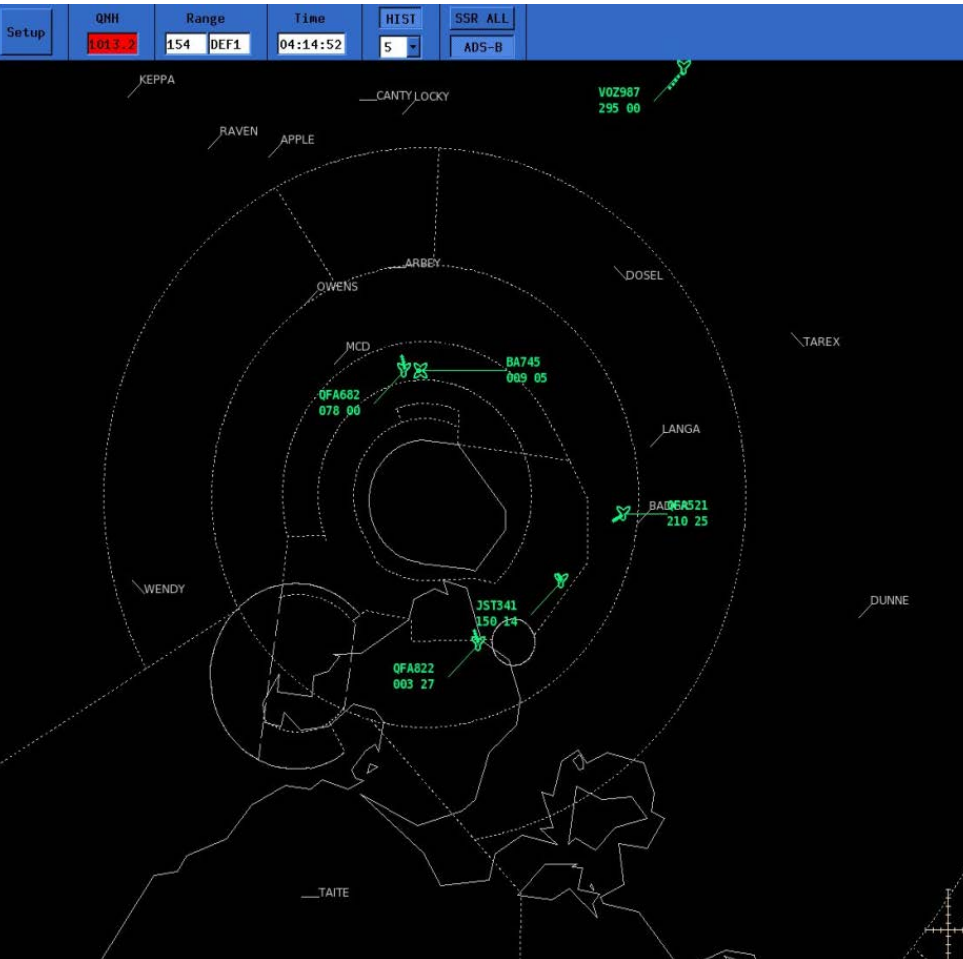
A-SMGCS (Surface surveillance)

- Brisbane, Sydney, Perth, and Melbourne have A-SMGCS
- Brisbane recently expanded for new runway including 2nd SMR
- Integrated “INTAS” – fusion tracking radar, multilat & ADS-B in modern strip-less towers at Brisbane, Perth, and Melbourne
- Adelaide, Rockhampton, Cairns, and Gold Coast have INTAS without surface surveillance, but with radar feed
- Broome has INTAS without surface surveillance but with ADS-B surveillance (airborne SA)



Adelaide tower

ADS-B only Airborne Situational awareness in towers



- ADS-B in TSAD (Tower display)

Operational

- Launceston
 - Hobart
 - Alice Springs
 - Karratha
 - Coffs Harbour
 - Albury
 - Tamworth
 - Hamilton Is
- Many towers have a radar display for situational awareness

Class D (Towers)

■ Current rules in Class D

- SSR not mandatory
- Some have radar coverage above altitude “x”
- Some have good coverage to circuit
- Some have no radar surveillance
- Clearance required
- IFR must have ADS-B
 - Some limited exemptions
- Essentially procedural.



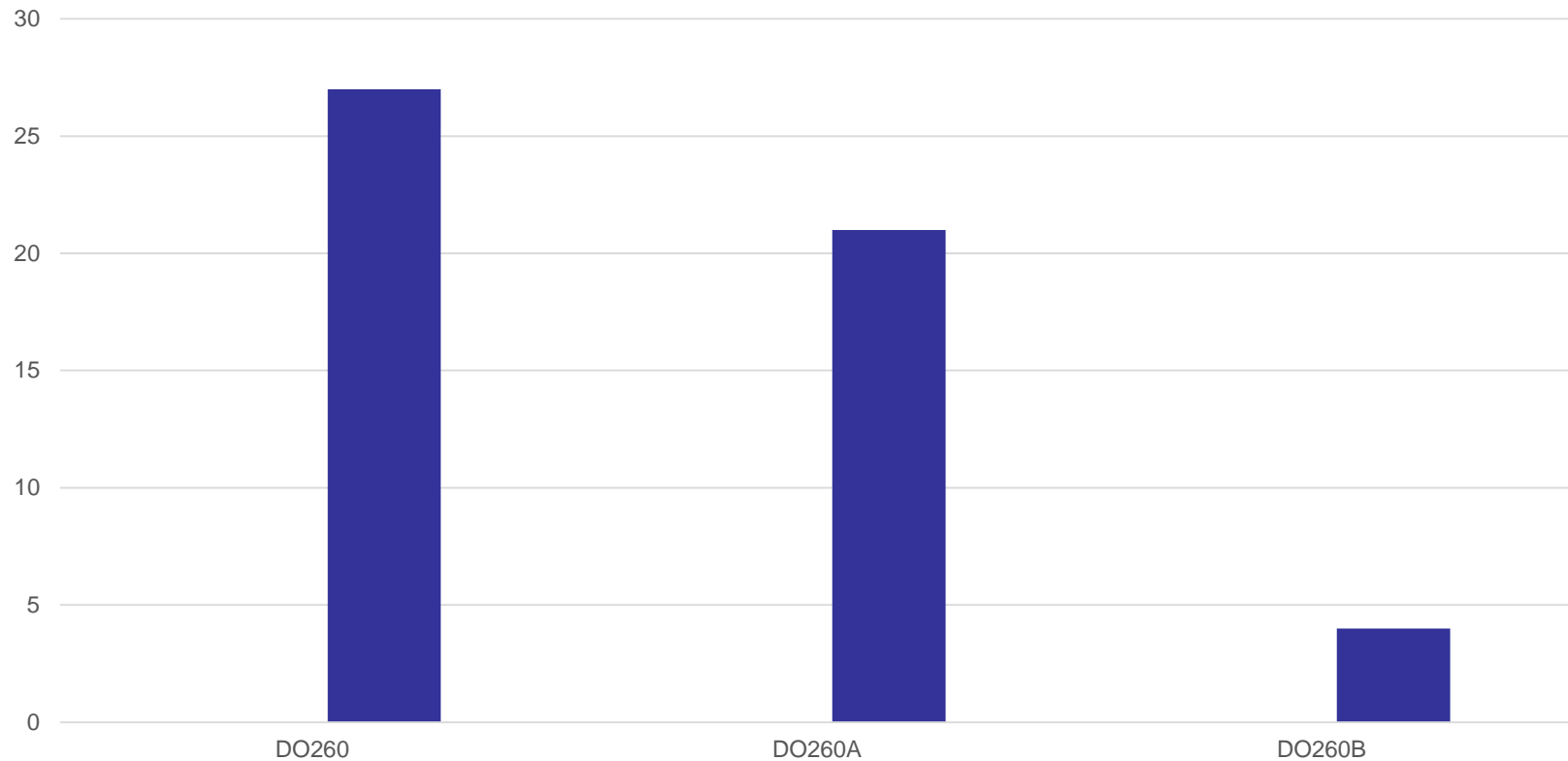
ADS-B only Airport Surface situational awareness



- ADS-B in TSAD (Tower display)
 - Smaller, but still major airports
 - e.g. Adelaide, Canberra, Cairns, Gold Coast
 - A-SMGCS not warranted
 - Planned trial at Canberra
 - Considering implications & mitigations of ADS-B without integrity data
 - Trial progressing through planning and safety work.

Surface ADS-B. Aircraft >10% FOM/PA 0

Percent aircraft on surface - transmit >10% FOM/PA=0
DO260 NUCp = 6, DO260A/B NIC = 0



Issues (ADS-B only surface)

- Use of ADS-B (only) on surface
 - DO-260 and DO-260A – unbounded HPL above 0.1nm
 - Use of site monitor to validate GNSS position solution?

- Issue of Specs for surface vehicles
 - Integrity or not ?
 - Limited products with proper HPL calculation

- Applications
 - Improved situational awareness
 - Support movement increases during Low Vis Ops
 - Safety logic and alerting??

ADS-B

Current Operational use



Use	Requirements
<ul style="list-style-type: none"> Enroute ATC 5 Nm 	<ul style="list-style-type: none"> Approval : FOM/PA ≥ 3 (HPL< 2Nm) Use : FOM/PA ≥ 4 (NUC≥ 4, NIC≥ 5 SIL≥ 2) # <ul style="list-style-type: none"> HPL: DO260 1.0 Nm / DO260A/B 1.0 Nm & NAC≥ 5 (< 0.5 Nm)
<ul style="list-style-type: none"> Terminal ATC 3 Nm 	<ul style="list-style-type: none"> Approval & Use: FOM/PA ≥ 4 (NUC≥ 4, NIC≥ 5 SIL≥ 2) # <ul style="list-style-type: none"> HPL: DO260 1.0 Nm / DO260A/B 1.0 Nm & NAC≥ 6 (< 0.3 Nm)
<ul style="list-style-type: none"> Terminal ATC 2.5 Nm only when radar also available 	<ul style="list-style-type: none"> Approval & Use: (NUC≥ 5, NIC≥ 6 SIL≥ 2) # <ul style="list-style-type: none"> HPL: DO260 0.5 Nm / DO260A/B 0.5 Nm & NAC≥ 7 (< 0.1 Nm)
<ul style="list-style-type: none"> Tower ATC Approach 2.5 Nm 	<ul style="list-style-type: none"> Approval & Use: FOM/PA ≥ 5 (NUC≥ 5, NIC≥ 6 SIL≥ 2) # <ul style="list-style-type: none"> HPL: DO260 0.5 Nm / DO260A/B 0.5 Nm & NAC≥ 7 (< 0.1 Nm)
<ul style="list-style-type: none"> Support enroute procedural ATC, Safety nets, FIR boundary safety, situational awareness. 	<ul style="list-style-type: none"> Approval : FOM/PA ≥ 3 (HPL< 2Nm) SIL ≥ 1 Current Use : FOM/PA ≥ 4 (NUC≥ 4, NIC≥ 5 SIL≥ 2) # <ul style="list-style-type: none"> HPL: DO260 1.0 Nm / DO260A/B 1.0 Nm & NAC≥ 5 (< 0.5 Nm) Duplication not required (Shorter MTBF)
<ul style="list-style-type: none"> Situational awareness Class D towers 	<ul style="list-style-type: none"> Use : FOM/PA ≥ 4 (NUC≥ 4, NIC≥ 5 SIL≥ 2) # <ul style="list-style-type: none"> HPL: DO260 1.0 Nm / DO260A/B 2.0 Nm & NAC≥ 5 (< 0.5 Nm) Duplication not required (Shorter MTBF)

SDA not used or tested

- For DO260A/B, we discard if NAC is incompatible with NIC (if NAC > 0.5 Nm, or NAC $> R_c$)

ADS-B for 3 NM separation Perth and Melbourne TCU



Radar



ADS-B



ADS-B to
Radar
(Cat 48)
conversion

Multiradar
Tracker
ATC
System



3NM Separation
2.5NM Separation

NUC filter , black list etc

Post-mandate stats



ADS-B Statistics for IFR Operations¹ as at 05/06/2017

Flight Plan data from:	01/11/2016	until	01/05/2017	Days since mandate:		401	
Category	% of Aircraft	% of Flights	# of Total Airframes	# to be Fitted	# of Flights ('000s) ²	% of Flights ³	Predictions ⁴
Above FL290 - Major Airlines	100%	100%	381	0	235	46%	
Above FL290 - Bizjets	97% →	96% →	154	4	14	3%	
Above FL290 - Turboprops	98% →	100%	90	2	21	4%	
All Levels - IFR Helicopters ⁵	84% →	87% →	180	29	14	3%	
All Levels - All IFR ^{6,7}	88.0% ↑	98.4% →	2,685	321	507	100%	
Above FL100 - All IFR	95.5% ↑	99.7% →	1,231	57	432	85%	
Below FL100 - All IFR	81.8% ↑	91.4% →	1,454	265	75	15%	
Above FL100 and Below FL290 - All IFR	92.3% ↑	99.7% ↑	570	44	151	30%	
All Levels - Training Organisations	85% ↑	98% →	227	35	8	2%	
All Levels - 500NM North and East of Perth	98% →	100%	567	14	59	12%	
All Levels - Western Australia	95% →	99% →	835	39	82	16%	
All Levels - Tasmania	98% →	100%	506	10	25	5%	
All Levels - Paraburdoo	97% →	99% →	373	12	27	5%	
All Levels - All IFR - Top 40 Operators ⁸	88% →	91% →	389	81	76	15%	
ADS-B Equipped Airframes - Never Filed an IFR Flight			520				

¹ IFR aircraft' are identified as those that have ever filed an IFR flight plan - they may operate as VFR for a portion of their flights.

² The number of flights will vary month-to-month based on how many IFR flight plans are filed.

³ Categories are not all mutually exclusive - e.g. number of flights overlap between 'All IFR' and 'Above FL290 - Bizjets' but not between 'Above FL100 - All IFR' and 'Below FL100 - All IFR'.

⁴ A prediction of the percentage of equipped flights if **only** the 'top operators' fit and **no one else** - refer to category notes for the definition of 'top operators'.

⁵ Prediction assumes **only** the 10 IFR helicopter operators with the largest number of non-equipped flights equip all their aircraft **and no one else**.

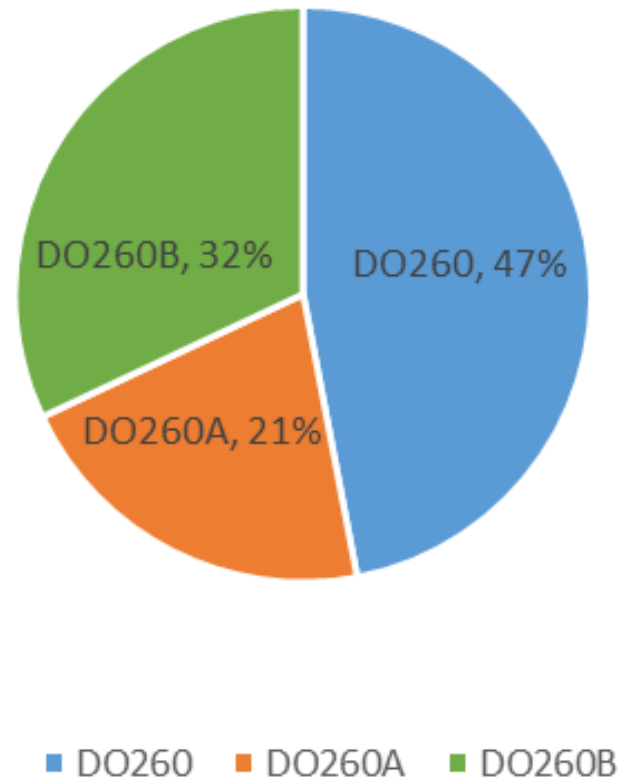
⁶ Some operators will not equip and will instead continue their flight operations under the VFR.

⁷ Prediction assumes **only** the 40 IFR operators with the largest number of non-equipped flights equip all their aircraft **and no one else**.

⁸ 'Top 40 Operators' are those operators with the largest number of non-equipped flights.

ADS-B Versions

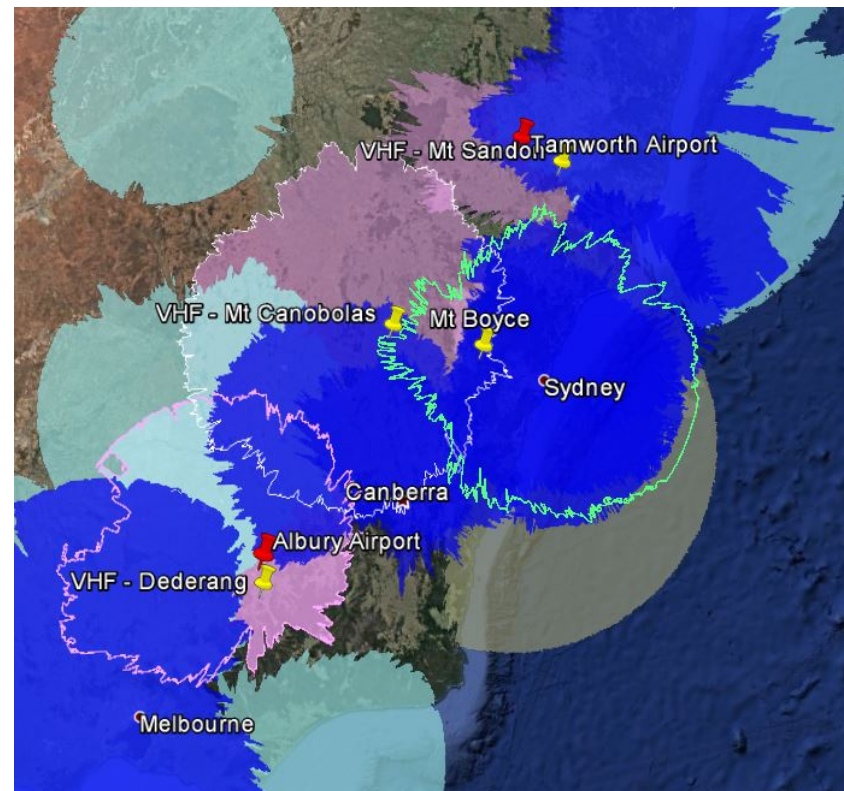
Australian registered (Flights)



ADS-B Future Program

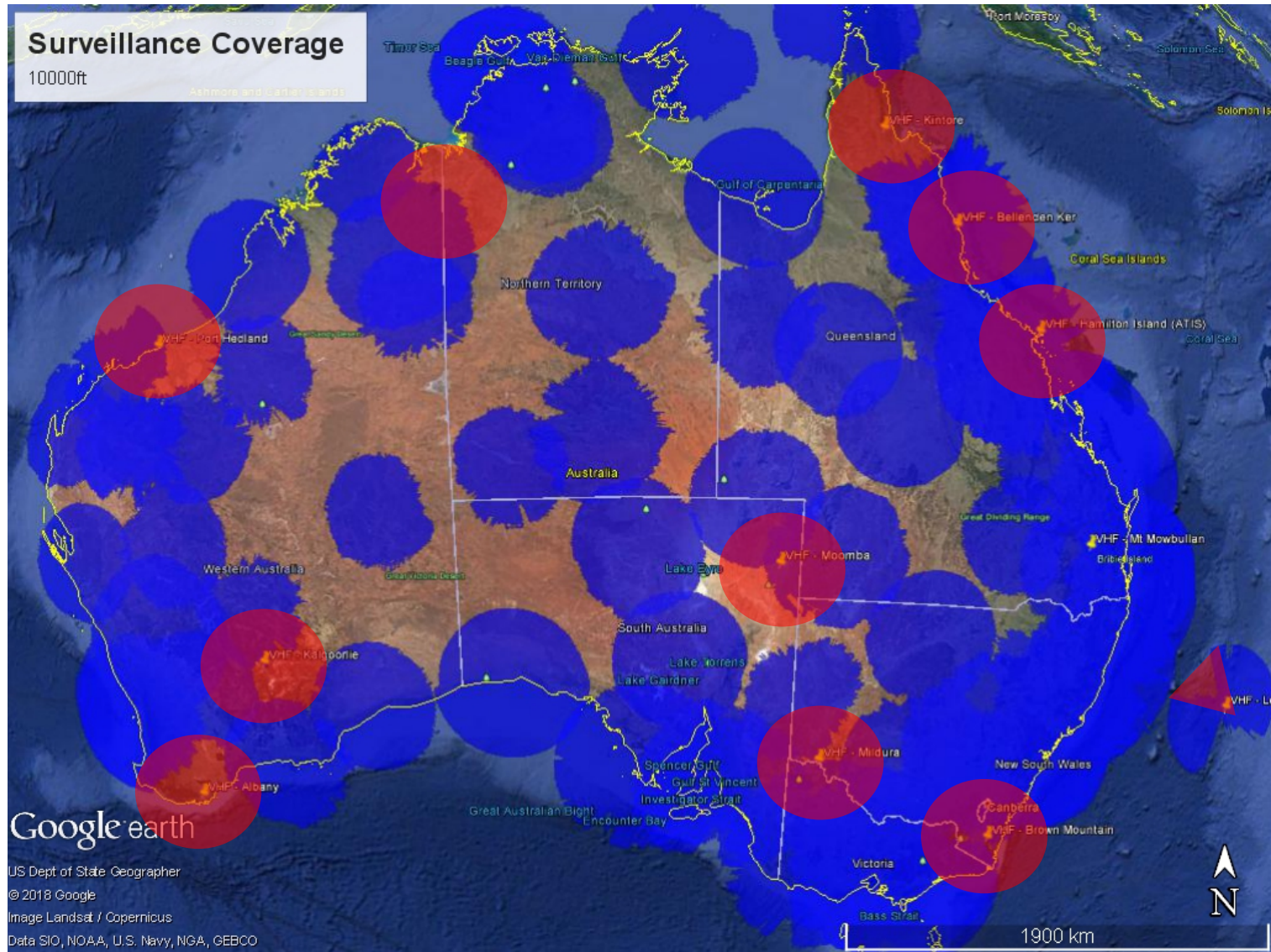
Increase ADS-B Geographical extent (On Hold)

- “Ten more”
 - Approach to market for further coverage enhancement – 2nd generation GS...
- 2nd Generation ADS-B ground stations
 - 10 + replace all existing stations (gradually)
 - Existing functional requirement plus:
 - Asterix version update to report NIC/NAC/SIL NUC etc.
 - DO-260C?
 - Selection of antennas
 - Multi-site validation?
 - Enterprise Network Modernisation – managed service?



ADS-B Ground stations

1. Kintore (QLD)
2. Lord Howe Island repeater (NSW)
3. Port Hedland (WA)
4. Hamilton Island (QLD)
5. Kalgoorlie (WA)
6. Albany (WA)
7. Moomba (SA)
8. Mildura (VIC)
9. Kununurra (WA)
10. Brown Mountain (NSW)
11. Bellenden Kerr (QLD)



Increase application to new tasks

- 1) Trial and consider ADS-B (only) for airport surface surveillance where multilateration is too expensive (cost/benefit argument)
 - Canberra (Trial)
 - Cairns, Adelaide, Gold Coast
- 2) Trial ADS-B for PRM application – (replace WAM in Sydney at end of life (2026) or earlier to lower costs) Commissioned 9/2011
- 3) Use ADS-B to replace TAS WAM at end of life (replace WAM at end of life – 2025 or earlier if warranted) Commissioned 3/2010
- 4) Use instead of enroute radars in 2030+ at end of life of ERRP
 - Plan to decommission all enroute radars



Increase fitment (VFR)



- Civil Aviation Order 20.18 updated June 2020 > *allow VFR aircraft voluntarily to use a broader range of air-to-air surveillance technology (in the form of ADS-B) than was previously available. The aim is to reduce the costs of installing air-to-air surveillance technology in VFR aircraft with a view to enhancing the basic VFR safety principle of “see and avoid”. (EC Devices - UK CAP 1391, TABS Device – TSO-C0199)*
 - Also see AC 91-23v1.0 - ADS-B for enhancing situational awareness (July 2020)
- Encourage ADS-B fitment by delivering ADS-B based services
- Promote air-air use (ADS-B IN)

Space Based ADS-B

Space Based ADS-B - Progress



- **Benefits include:**
 - operational errors being captured and ATC being automatically alerted and corrected by ATC sooner, resulting in increased safety.
 - Improved situational awareness by ATC particularly at FIR boundaries (safety)
 - Reduced workload (removal of position reports) for ATC & pilots

- Continuing to consider Cost/Benefits
 - Pros/Cons against traditional ground surveillance
 - Ever changing Airspace and traffic demands
 - Maturing technology
 - Potential transition to managed services

Questions?

- **Your questions?**

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