



International Civil Aviation Organization

**ELEVENTH MEETING OF THE SOUTHEAST  
ASIA AND BAY OF BENGAL SUB-REGIONAL  
ADS-B IMPLEMENTATION WORKING GROUP  
(SEA/BOB ADS-B WG/11)**



New Delhi, India 17 – 19 November 2015

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**Agenda Item 4: Report on ground system and avionics performance monitoring and improvement in compliance**

**UPDATE ON ATC SURVEILLANCE ACTIVITIES IN AUSTRALIA**

(Presented by Australia)

**SUMMARY**

This paper provides information on air traffic control surveillance activities in Australia. The paper is an update of the reports previously provided.

**1. Introduction**

This paper provides information on air traffic management surveillance activities in Australia. The paper is an update of the reports provided previously.

**2. Surveillance Projects – Status Update**

Airservices is in the middle of a large capital program to deliver new surveillance infrastructure. The status of these projects has been reported in various details over the past few years. The current status of these projects is:

*Radar Replacement*

- All terminal area radars have been replaced with new primary and co-mounted Mode S (AMSTAR project). This includes the commissioning of additional (previously transportable) Mode S radar in Sydney (Cecil Park) to provide additional Primary and Secondary coverage for Sydney Terminal Area;
- The ERRP project is deploying new Mode S radars to replace Nine of Eleven existing en-route Mode A/C radars (SSR only). Five Mode S radars have now been commissioned. Four more (Macedon, Tabletop, Hann Tableland, Swampy Ridge) are yet to be commissioned and two (Macedon & Hann) require transportable radars to be used during the transition;
- It is planned to decommission three radars in 2017 and replace these sites with ADS-B only following the ADS-B mandate (Feb 2017);

- Data transport from the radar sites to the ATC centres will migrate from dedicated serial lines to an IP based network design over the next 3 to 5 years, with this already underway for some of the new radars; and
- In addition to the above works being undertaken by Airservices (Civil ATC), the Royal Australian Airforce will be upgrading their ATC radars to new Mode S radars. This upgrade is expected to be deployed through to 2020, with these radars being integrated into the current Airservices ATM system, as well as the proposed joint civil-military ATM system.

#### *WAM*

- WAM in Tasmania (TASWAM) has been operational since early 2010. Work is proposed to replace aging processors and to relocate some receivers due to airport construction activity;
- WAM in Sydney (SYDWAM) is operational in the terminal area supporting a 3NM separation standard and for Parallel Runway Monitor (PRM) application;
- Currently there are no plans to deploy further WAM systems; the previously planned upgrade of the WAM system in Tasmania to include Higher Power Interrogators to extend coverage has been cancelled after a further cost-benefit analysis. The main factors involved were the upcoming 2017 IFR ADS-B mandate and the number of aircraft that are already ADS-B equipped; and
- The planned software upgrade to support DO-260B has now been completed in Sydney and Tasmania WAM. ADS-B DO-260B is now supported by both WAM systems.

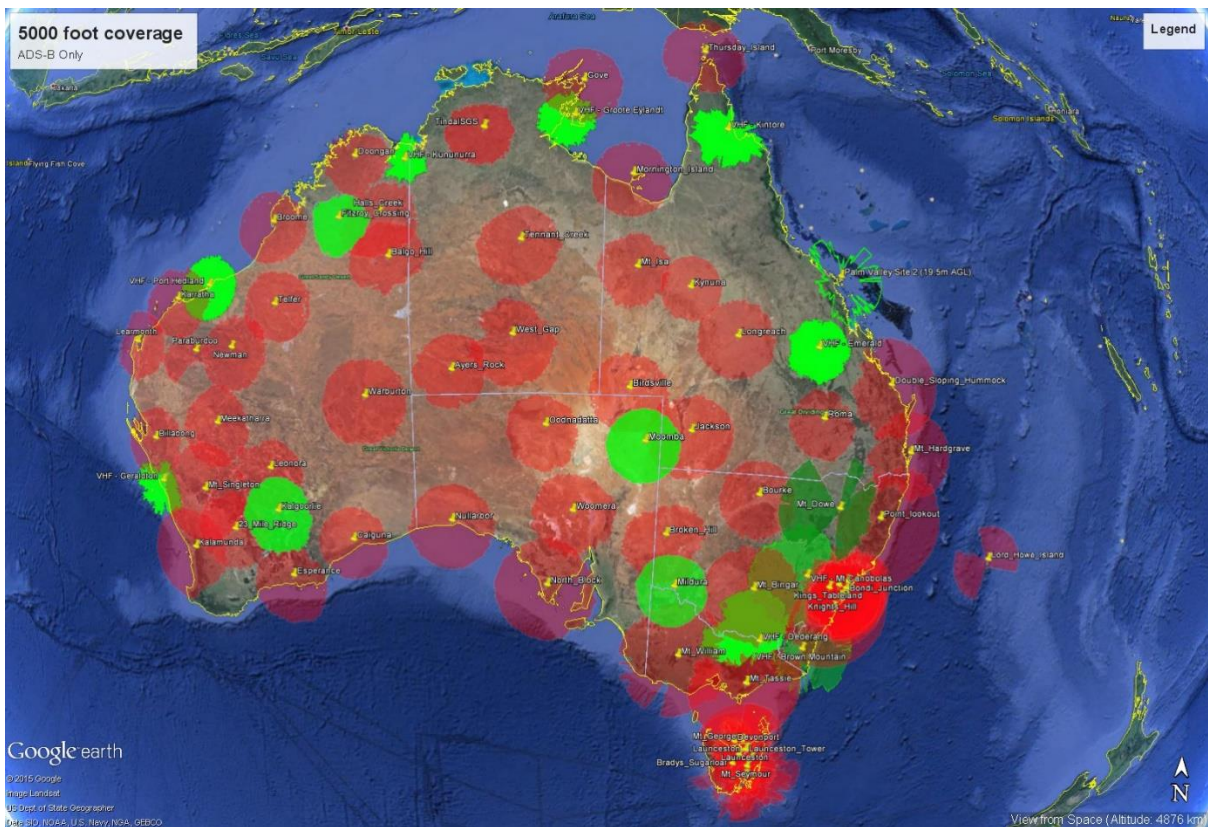
#### *ASMGCS*

- Operational in Melbourne since December 2009, Sydney since May 2010, Brisbane since January 2014 and Perth since April 2015. Work is proposed to extend this system due to construction of a parallel runway; and
- In Melbourne, the ground display is integrated into the tower automation system and operates as a “fused display” with the associated terminal area radar. This new architecture will also be rolled out in Brisbane and Perth as towers are upgraded.

#### *ADS-B*

- The ACME project, deploying additional ADS-B ground stations has almost been completed. A total of 43 ADS-B sites are currently operational, plus ADS-B is received from two operational WAM systems. This results ADS-B data being used operationally from over 70 domestic sites. Two additional sites are expected to be commissioned in the next weeks; and
- ADS-B ground stations support DO-260B.

- A new project is now being contemplated to deploy a further 15 ADS-B ground stations in Regional Australia. The project is in the business case development phase. It will include ADS-B ground stations to support regional control towers and enroute airspace at regional airports. The project will also commence the purchasing of new ADS-B ground stations able to support Asterix Category 21 Version 2.x (as well as Version 0.23);
- The expected additional coverage is shown in the plots below (green shading);



5000ft coverage

- A separate project is currently developing the concept for deploying ADS-B ground stations to offshore gas platforms in the Timor Sea north west of Australia to extend coverage beyond the mainland;
- A project to upgrade the Terminal Control Unit, Automation System to display and process ADS-B at Melbourne and Perth is in the design phase. ADS-B data will be converted to a radar Cat48 radar data stream. It is acknowledged that this methodology is sub-optimal but it has been chosen as a viable lower cost alternative during the interim period before the arrival of our new ATC automation system. This will provide an additional layer of surveillance in the terminal areas to supplement existing radar. Under this project, Airservices will use ADS-B data in the terminal area using a minimum 3 nm separation standard in 2016;
- The safety work to allow 3 nautical mile separation standards using ADS-B is now complete and will be published in the next edition of the Manual of Air Traffic Services (MATS);

- An ADS-B repeater prototype has been acquired and testing is complete. This is a stand-alone unit that re-transmits ADS-B messages on 1090 MHz to nearby ground stations to provide additional coverage around obstacles like terrain without the need for an additional ground station. It is expected this could be used at Lord Howe Island or offshore; and
- ADS-B data is now being displayed for situational awareness in 4 regional towers. This has been combined with the existing radar display to provide extended coverage for ADS-B equipped aircraft outside radar coverage. This will be extended to other towers as additional ADS-B ground stations are deployed;

#### *ADS-B data sharing*

- Australia and Indonesia continue to benefit from the sharing of ADS-B data. The parties updated the ADS-B Collaboration agreement in Jun 2014 such that if either nation has or installs a ground station that provides coverage within 150 NM of the shared FIR boundary, then the data will be offered to the other party. This increases the number of sites affected;
  - Australia would like to deploy ADS-B to a site on Christmas Island and share this data with Indonesia. However the business case is currently delayed because :
    - The data cannot be directly used by the existing ATC system due to playing area limitations. Our new ATC system in 2020 will solve this.
    - The cost of deployment in this remote location
    - The relative priority of the project in competition for resources with the large capital program currently underway.
- Discussions on ADS-B collaboration between Australia and PNG, and between Indonesia and PNG, have commenced in preparation for the commissioning of PNG's new ATM system and ADS-B ground stations.

#### *Other Projects*

- The Defence Radar Filter (DRF) Project has deployed computer-based processors and redundant communications that provide a centralised path for IP based radar data between Airservices and Defence. Defence operated radars that are used for Civilian ATC are progressively being transitioned to this new system;
- Australia is considering a proposal to trial the deployment of an ADS-B only display in a control tower which has no surface movement surveillance. The objective would be to examine the viability of an ADS-B only surface movement situational awareness display; and
- Australia is exploring the opportunities that might be available via space-based ADS-B. Airservices has signed a memorandum of agreement with Aerion and will participate in the evaluation of the space based ADS-B technology. No firm commitments have been given at this time.

**3. Activation of ADS-B mandates and ADS-B Equipage Rates**

Australia has successfully transitioned to mandatory ADS-B use at and above FL290 and the forward fit of ADS-B for new aircraft registrations in Australia.

The number of issues relating to ADS-B operations and the new mandates has steadily decreased as fitment of ADS-B has increased. CASA have provided exemptions for some aircraft for operations within the East Coast radar airspace and also in Oceanic airspace. These exemptions expire in December 2015.

The current fitment rates at/above FL290 are shown below :

ADS-B Flights Planned Above FL285	Nov 2015
Major Airlines	99.5%
Biz Jets	80%
Turboprops > FL285	92%

The current status for ALL IFR aircraft at all flights levels is :

ADS-B IFR Flights Planned	Feb 2015
Operations within 500 NM Perth (Feb 2016 Mandate)	90%
All Australia (Feb 2017 Mandate)	67%
All Australia IFR helicopter operations	30%
Flight training organisations	36%

**4. Transponder Regulations and Future Mandates**

The following table provides a reference to all current and future requirements that are in current regulations relating to the carriage and use of surveillance transponders including Mode S and ADS-B. No further changes are being planned at this stage.

Effective Date	Surveillance	Mandate	Status
9 Feb 2012 ✓	Mode S	Forward Fit – Mode S capable aircraft must support Flight ID Applies to – <ul style="list-style-type: none"> <li>new aircraft on register from 9 Feb 2012</li> </ul> If DAPS are transmitted they must be in accordance with Annex 10	Regulation (CAO 20.18) <b>IN EFFECT NOW</b>

<p><b>12 Dec 2013</b> ✓</p>	<p>ADS-B</p>	<p>All aircraft operating at FL290 and above must be fitted with ADS-B OUT</p> <p><i>Exemptions are granted for operations within the east coast radar coverage areas and Oceanic airspace until November 2015. Exemptions have not been granted by CASA for operations across the continent outside of radar coverage.</i></p>	<p>Regulation (CAO 20.18) (CAO 82.1/3/5)</p> <p><b>IN EFFECT NOW</b></p>
<p><b>6 Feb 2014</b> ✓</p>	<p>Mode S</p>	<p>Forward Fit – Aircraft with transponder requirement (operations in Class A,B,C,E and G above 10,000ft) must be fitted with Mode S transponder with ADS-B capability (not necessarily the GNSS position source)</p> <p>Applies to –</p> <ul style="list-style-type: none"> <li>• new aircraft on register from 6 Feb 2014 and</li> <li>• new transponder installations in existing aircraft requiring a transponder after 6 Feb 2014</li> </ul>	<p>Regulation (CAO 20.18)</p> <p><b>IN EFFECT NOW</b></p>
	<p>ADS-B</p>	<p>Forward Fit - IFR aircraft must be fitted with ADS-B OUT</p> <p>Applies to –</p> <ul style="list-style-type: none"> <li>• new aircraft on register from 6 Feb 2014</li> </ul>	
<p><b>4 Feb 2016</b></p>	<p>Mode S</p>	<p>All aircraft operating at Melbourne, Sydney, Perth &amp; Brisbane aerodromes must be fitted with Mode S transponder with ADS-B capability (to support ASMGCS)</p>	<p>Regulation (CAO 20.18)</p>
	<p>ADS-B</p>	<p>All IFR aircraft operating within 500 Nm East/North of Perth must be fitted with ADS-B OUT <b>~10 weeks to GO</b></p>	<p>Regulation (CAO 20.18)</p>
<p><b>2 Feb 2017</b></p>	<p>ADS-B</p>	<p>All IFR aircraft must be fitted with ADS-B OUT (now applies to domestic and foreign registered aircraft)</p>	<p>Regulation (CAO 20.18) (CAO 82.1/3/5)</p>

CASA has extended the 2017 IFR ADS-B mandate to apply to foreign aircraft as well as domestic operators. Civil Aviation Orders (CAO 82.1, CAO 82.3 and CAO 82.5) are relevant.

The next significant date will be the introduction of a mandate for the carriage and use of ADS-B for all aircraft operating within 500NM East/North of Perth to enhance ATC services in Western Australia and for all aircraft operating at A-SMGCS airports to have Mode S. This applies in Australian airspace (domestic and foreign aircraft) from **4<sup>th</sup> February 2016**.

Mode S equipage at the major airports where a Mode S transponder will be required from 4<sup>th</sup> February 2016 has recently been examined. The percentage of flights that are already Mode S equipped is high however there remain a number of smaller operators that have multiple aircraft to upgrade prior to this mandate.

Flight Plans and Mode S radar detections in the period 1/1/2014 to 1/8/2014 were analysed with the following results:

Departure Airport	Brisbane YBBN	Melbourne YMML	Perth YPPH	Sydney YSSY
% of Flight Planned Flights with Mode S declared in Flight Plan (L,S,E,H or P)	91.5%	99.6%	94.0%	97.3%
% of Flight Planned Flights detected as Mode S by radar	90.7%	99.6%	94.3%	98.2%

The analysis above also highlights the significant number of flight plans that do not correctly indicate the Mode S capability of the aircraft.

We will continue to promote and provide assistance to operators in preparation for these mandates.

#### 4. Operational Use of Flight ID from radar

Flight ID from surveillance is provided to the ATC system from ADS-B ground stations and the WAM systems in Sydney and Tasmania. The ATC system performs flight plan coupling using this identification.

While Mode S radars are configured to extract this information from aircraft, it is not yet distributed to the ATC system due to processing issues within the Eurocat system.

During the initial transition which was trialled in Adelaide (February 2014) processing issues with VFR traffic were observed that generated nuisance alarms for controllers so the use of Flight ID in these sectors was put on hold. At this stage these issues have not yet been resolved. The transition to full operational use of Flight ID will be resumed as soon as this issue is resolved.

#### 5. SkySafe Enhancements and use of DAPS

A special taskforce called SkySafe was convened to look at Loss of Separation (LOS) events in Australia and has made a number of recommendations to enhance ATM in Australia.

The following features are now being implemented in the current ATC system:

- Improvements to safety net conflict alerts, including of 5minute look-ahead time conflict alert.
- Selected Altitude Mismatch – use of Mode S DAPS & ADS-B “Selected Altitude” to provide an alert when this is mismatched with Cleared Flight Level (CFL). This is currently expected to become operation late 2015 early 2016.

#### 6. OneSky and Future use of DAPS

The future joint civilian/military Australia wide ATM system, called OneSky, will make use of Mode S DAPS for safety net alerting and for display to the controller. This is expected to be fully operational by 2020.

The system supplier has been announced and work continues towards definition & design. Further details on the usage of Mode S DAPS will be provided as this program progresses.

## **7. Conclusion**

The meeting is invited to note the information presented in this paper providing an update of ATC surveillance activities in Australia.

## **8. Action by the meeting**

The meeting is invited to :

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.

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