International Civil Aviation Organization

Fifth Meeting of the Surveillance Implementation Coordination Group (SURICG/5)

Web-conference, 22 – 24 September 2020

Agenda Item 5: Update on surveillance activities and explore potential cooperation opportunities

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.

2 Surveillance Projects

Since the mid 2000's, Airservices Australia has established a large capital program to deliver new surveillance infrastructure. The status of the surveillance projects has been reported in various Asia-Pacific regional meetings over a number of years, including SURICG/4. The current status of the program is:

Radar Replacement

- All terminal area radars have been replaced with new primary and co-mounted Thales Mode S (AMSTAR project).

- The Enroute Radar Replacement Project (ERRP) deployed new Indra Mode S radars to replace nine of eleven existing en-route Mode A/C radars (SSR only). The last site as part of this project was commissioned in December 2016.

- 2 radars were decommissioned during 2017 with surveillance in these areas replaced by ADS-B. There were:
  - Paraburdoo (North-west Australia) – now ADS-B surveillance only.
  - Mt Boyce (near Sydney) – now surveillance by combination of radar from other nearby sites, and additional ADS-B coverage.

- 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 2 to 4 years, with this already in place for some of the newer radars.

- In addition to the above works being undertaken by Airservices (Civil ATC), the Royal Australian Air Force will be upgrading their ATC radars to new Airbus Defence and Space MSSR 2000I Mode S radars. This upgrade is expected to be deployed through to 2022, with

the first upgrade to be commissioned in early 2021. These radars will be integrated into the current Airservices ATM system, as well as the proposed joint civil-military ATM system. These radars will support both civilian and Defence surveillance requirements.

WAM

- Saab-Sensis WAM in Tasmania (TASWAM) has been operational since early 2010 supporting enroute services. A work program is underway in 2019 to upgrade TASWAM remote communication links and provide network diversity to the tracking processors in Melbourne. Near end-of-life, TASWAM may be converted to an ADS-B receive system only, allowing the removal of several RU's.

- Saab-Sensis WAM in Sydney (SYDWAM) is operational in the terminal area supporting a 3NM separation standard and for Precision Runway Monitor (PRM) for the closely spaced parallel runways. Work is proposed to replace aging processors and to update the remote communication links due to equipment obsolescence.

- WAM will output Asterix CAT 20 data to the new joint civil-military ATM system in lieu of Asterix Cat 34/48.

- Currently there are no plans to deploy further WAM systems.

- ADS-B Version 2 / DO-260B is supported by both WAM systems following an upgrade in 2014.

A-SMGCS

- Operational in Melbourne since December 2009, Sydney since May 2010, Brisbane since January 2014 and Perth since April 2015. Surface surveillance capability (A-SMGCS) is being extended for new runway management programs, including Brisbane's New Parallel Runway, and upcoming new runways in Melbourne and Perth.

- Airservices is investigating various options in technology stacks to meet specific aerodrome service requirements at airports. We are examining whether A-SMGCS can be deployed using MLAT and ADS-B only, removing the requirement for the primary surface movement radar. This requires that all vehicles operate with serviceable transponders/vehicle locaters and procedures in place in the event of transponder unserviceability.

- In Melbourne, Brisbane and Perth, the ground display is integrated into the tower automation system and operates as a "fused display" with the associated terminal area radar, ADS-B and multilateration data. This new architecture will also be rolled out in Sydney as the tower is upgraded.

ADS-B

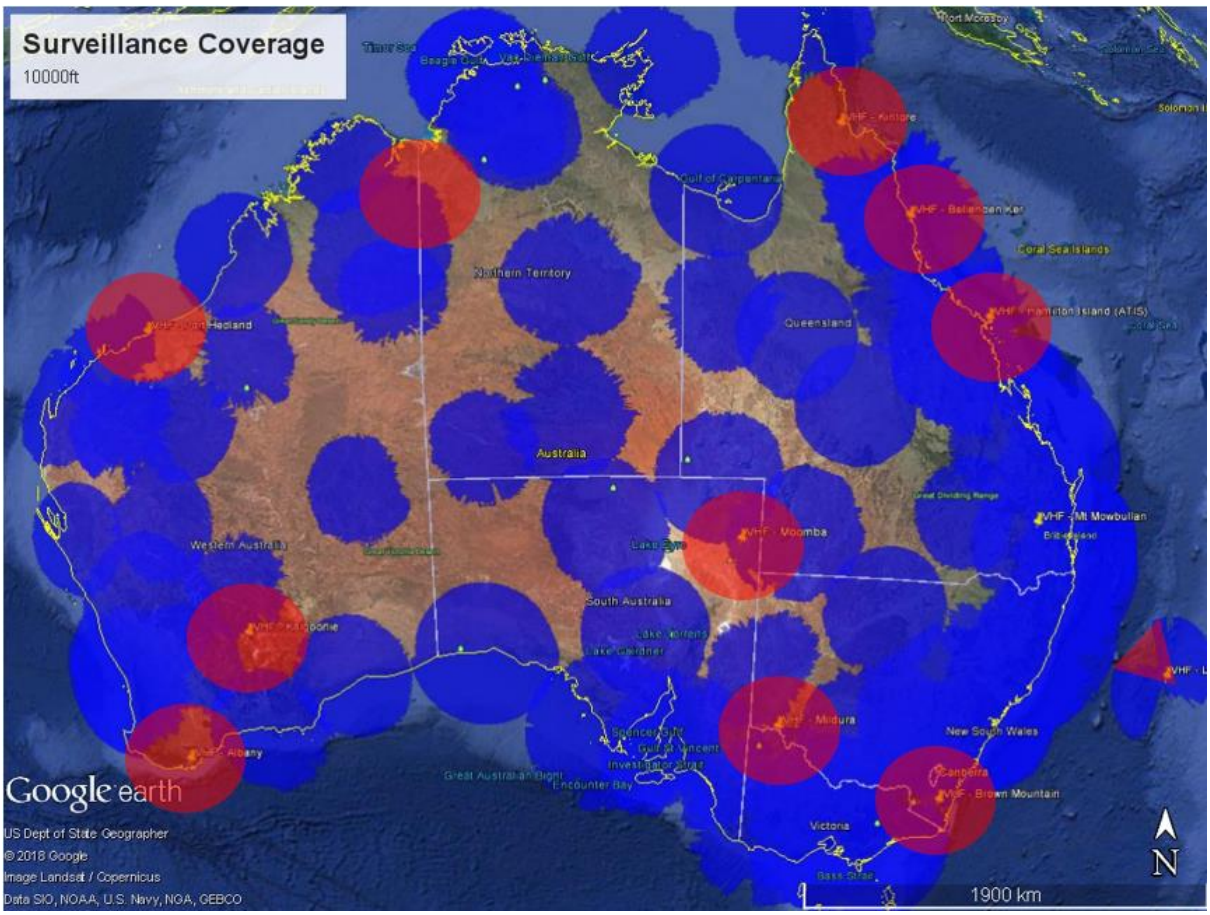
- A total of 50 Thales ADS-B sites are currently operational, plus ADS-B is received from the two operational WAM systems. This results in ADS-B data being used operationally from over 70 domestic receiver sites.

- ADS-B ground stations support DO-260, DO-260A, and DO-260B.

- A business case is proposed to deploy a further 10 ADS-B ground stations in regional Australia and an ADS-B repeater at Lord Howe Island. The project will include ADS-B ground stations to support enroute controlled airspace at additional regional airports. These next generation

ADS-B ground stations will support ASTERIX Category 21 Version 2.x (as well as Version 0.23). The ground stations selected by this project may also be used to replace the existing ADS-B ground station network, which will be approaching "end of life" from around 2021/22. This project is currently on hold following the COVID-19 pandemic and will be subject to review and dependent upon the outcomes of the Enterprise Network Modernization Program discussed below.

- The expected additional coverage (assuming the potential 10 additional ground stations) is shown in the plots below (red shading).



10 000ft coverage

- As part of Airservices' Enterprise Network Modernization Program, an industry Request for Expression of Interest (REOI – PRN 13827) has been released and includes a component which invite proposals for alternative service delivery options to achieve the required capability provided by the current ADS-B network.

- The safety work to allow 3 nautical mile separation standards using ADS-B is now complete and authority to use ADS-B for 3NM separation has been published in the Manual of Air Traffic Services (MATS). NUCp >=4, or NIC>=5 (HPL<1.0NM) and NACp>=6 (HFOM<0.3NM) are required for 3NM separation.

- The safety work to allow 2.5NM separation standards using ADS-B (for aircraft on final approach within 10NM of the runway threshold) has been completed. This separation standard requires a higher threshold of accuracy/integrity than for the 3NM standard; NUCp>=5, or NIC>=6 (HPL<0.5NM) and NACp>=7 (HFOM<0.1NM) are required for 2.5NM separation. ADS-B is used only to supplement radar coverage for 2.5NM separation.

- The Melbourne and Perth Terminal Control Unit Automation Systems use ADS-B data as an additional input to the multi-radar tracking system.

  ADS-B data is converted to a radar Cat 48 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 provides an additional layer of surveillance in the terminal areas to supplement existing radar, or in the case of Perth, will allow for the decommissioning of an existing, obsolescent, Mode A/C radar. Through this project, Airservices now uses ADS-B data in the terminal area using a minimum 2.5 NM separation standard.

- ADS-B data is now being displayed for situational awareness in 8 regional towers – Alice Springs, Coffs Harbour, Broome, Karratha, Hobart, Launceston, Tamworth and Albury. In five of these towers, this has been combined with the existing SSR (or WAM) display to provide extended coverage for ADS-B equipped aircraft outside/below radar coverage. This could be extended to other towers if additional ADS-B ground stations are deployed.

- The Royal Australian Air Force plans to install ADS-B ground stations at 5 sites to provide redundancy for radar coverage and to give them the option to operate their radars in military priority configurations that do not meet civil ATC requirements. It is anticipated the data from these ADS-B stations will be shared with Airservices.

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 June 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. The agreement was reviewed and updated, and signed in August 2018. A total of 10 sites are currently shared between the 2 countries – 6 sites in Indonesia and 4 sites in Australia.

Other Projects

- Australia is progressing a trial the deployment of an ADS-B only display in a control tower which has no A-SMGCS. The objective is to examine the viability of an ADS-B only surface movement situational awareness display. This activity is currently in the early testing phase with supporting safety work also being completed.

- Australia is exploring the opportunities that might be available via space-based ADS-B. Investigations into the economic and safety benefits of this technology are ongoing. An initial Market Survey (ASA REOI 12895) was conducted in 2018.
  - *Airservices Australia is seeking information from the market regarding Non-Terrestrial Based Aviation Surveillance Solution for Australian Flight Information Region (FIR).*

- Australia plans to consider using ADS-B only Precision Runway Monitoring for closely spaced parallel runway operations based only on ADS-B in future.

3 Transponder Regulations and 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 –aircraft manufactured from 9 Feb 2012. If DAPS are transmitted they must be in accordance with Annex 10	Regulation (CAO 20.18) **IN EFFECT NOW**
12 Dec 2013 ✓	ADS-B	All aircraft operating at FL290 and above must be fitted with ADS-B OUT ***Exemptions have not been granted by CASA for operations across the continent outside of radar coverage.***	Regulation (CAO 20.18) (CAO 82.1/3/5) **IN EFFECT NOW**
6 Feb 2014 ✓	Mode S	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) Applies to – • aircraft manufactured from 6 Feb 2014 and • new transponder installations in existing aircraft requiring a transponder after 6 Feb 2014	Regulation (CAO 20.18) **IN EFFECT NOW**
	ADS-B	Forward Fit - IFR aircraft must be fitted with ADS-B OUT Applies to – • aircraft manufactured from 6 Feb 2014	
4 Feb 2016 ✓	Mode S	All aircraft operating at Melbourne, Sydney, Perth & Brisbane aerodromes must be fitted with Mode S transponder with ADS-B capability – but not necessary to have ADS-B Out enabled (to support ASMGCS)	**Regulation** **(CAO 20.18)** **IN EFFECT NOW**
	ADS-B	All IFR aircraft operating within 500 NM East/North of Perth must be fitted with ADS-B OUT	**Regulation** **(CAO 20.18)** **IN EFFECT NOW**
2 Feb 2017	ADS-B	All IFR aircraft must be fitted with ADS-B OUT	**Regulation**

Effective Date	Surveillance	Mandate	Status
		(Applies to domestic and foreign registered aircraft) Limited exemptions available.	**(CAO 20.18)** **(CAO 82.1/3/5)** **IN EFFECT NOW**

The Civil Aviation Safety Authority (CASA) is currently developing updates to Civil Aviation Safety Regulations (CASR) Part 91 – General operating and flight rules – which will consolidate a substantial number of existing Civil Aviation Regulations and Civil Aviation Orders into Part 91 and its supporting Manual of Standards. Of note for the surveillance domain, the provisions of CAO 20.18 (which currently regulates transponder and ADS-B requirements amongst others) will be incorporated into the new Part 91 Manual of Standards.

4 Lower cost ADS-B avionics for VFR

Work has commenced on proposals to support General Aviation (GA) use of ADS-B by using lower cost ADS-B avionics with reduced capability and reduced certification requirements. The main target is ADS-B IN use by GA, for regional RPT operations into Class G aerodromes with a high number of VFR flights, and use by ATC for situational awareness, rather than for separation. A Discussion Paper was issued by CASA in December 2017. Pending the CASR Part 91 review (see above), provisions for lower cost ADS-B in VFR aircraft, including acceptance of FAA TSO-C199 and UK CAA Electronic Conspicuity standards, are being considered for incorporated into CAO 20.18.

5 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 an initial transition to the widespread use of Flight ID, 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 or with the transition to the next generation ATM system.

6 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 implemented in the current ATC system:

- Improvements to safety net conflict alerts, including a 5 minute look-ahead time conflict alert – generally in non-surveillance airspace.
- 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 became operational late 2015. While the Mode S radars and ADS-B ground stations support this function, the WAM Systems require an upgrade to process and distribute this information.

7 OneSKY and Future use of DAPS

The future joint Civilian/Military Australia wide ATM system, called CMATS and delivered within Airservices Australia under the OneSKY program, will provide a "Multi Sensor" surveillance tracking function, incorporating ADS-B, radar and WAM inputs, and will make greater use of Mode S DAPs for safety net alerting and for display to the controller. Planning for the implementation of this new system continues with the selected vendor (Thales).

8 Conclusion

Australia continues to make greater use of ADS-B and Mode S following investment by airspace users and the air navigation service providers.

9 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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