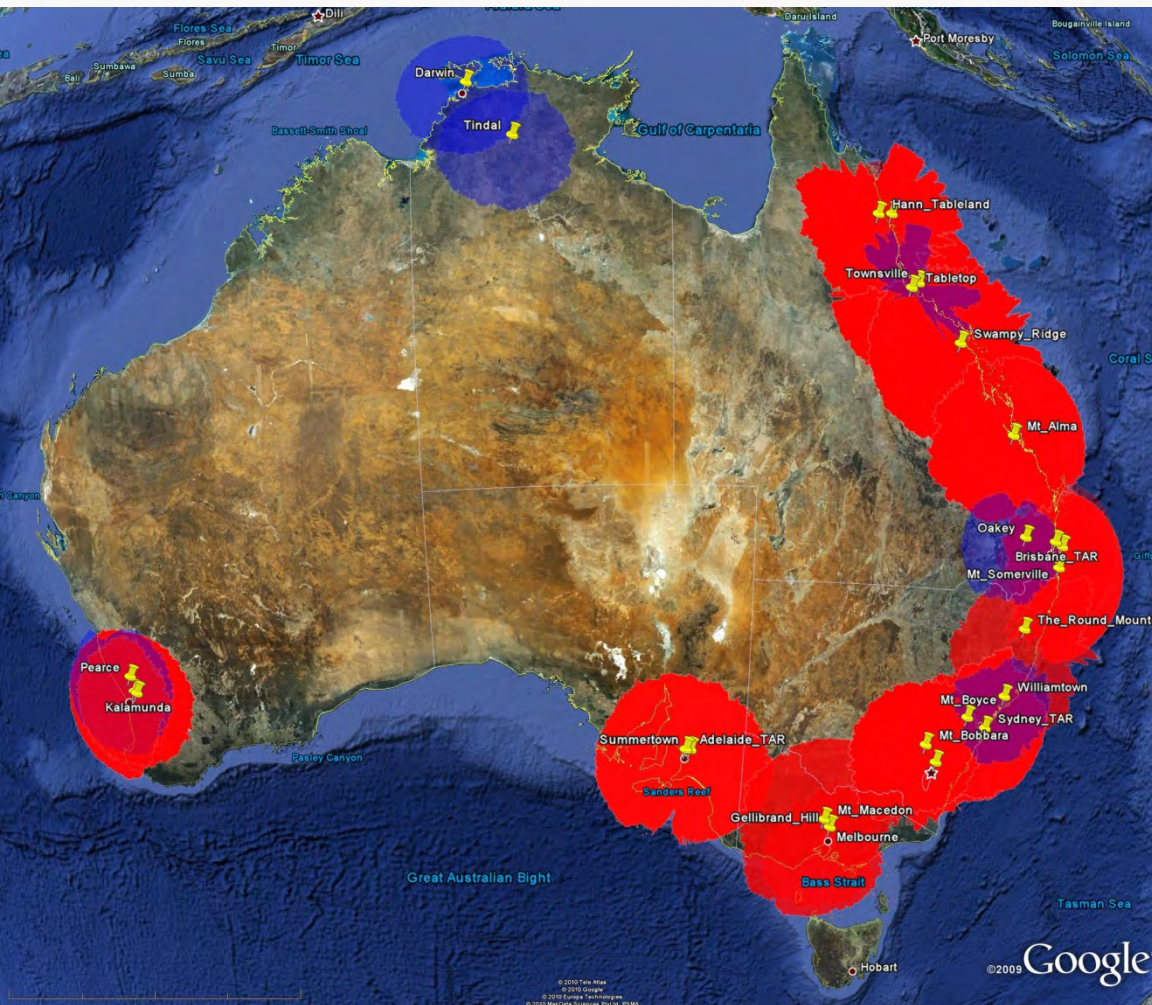


A decade of ADS-B



Greg Dunstone
Surveillance Program Lead,
Airservices Australia

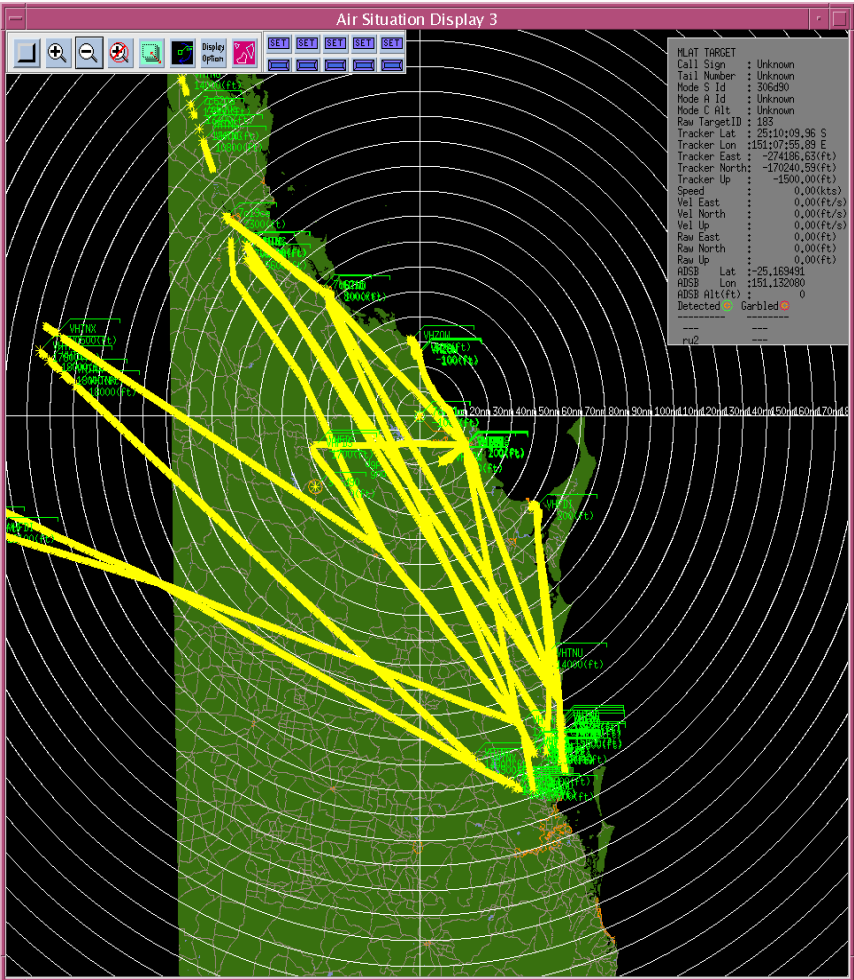
Environment in 2004



Radar coverage at FL100 in 2004

- A continent the size of Europe or USA with only 20 radars
- Procedural control
- Growing traffic

Bundaberg ADS-B Operational trial



- Board Approval 2001 ~ \$5M
- Operationally commissioned
 - ➔ One ground station
 - ➔ ATC system upgrade for ADS-B
- 9 aircraft
- Learn operational lessons
- Safety case & 5 nautical mile separation standard approved

ADS-B display

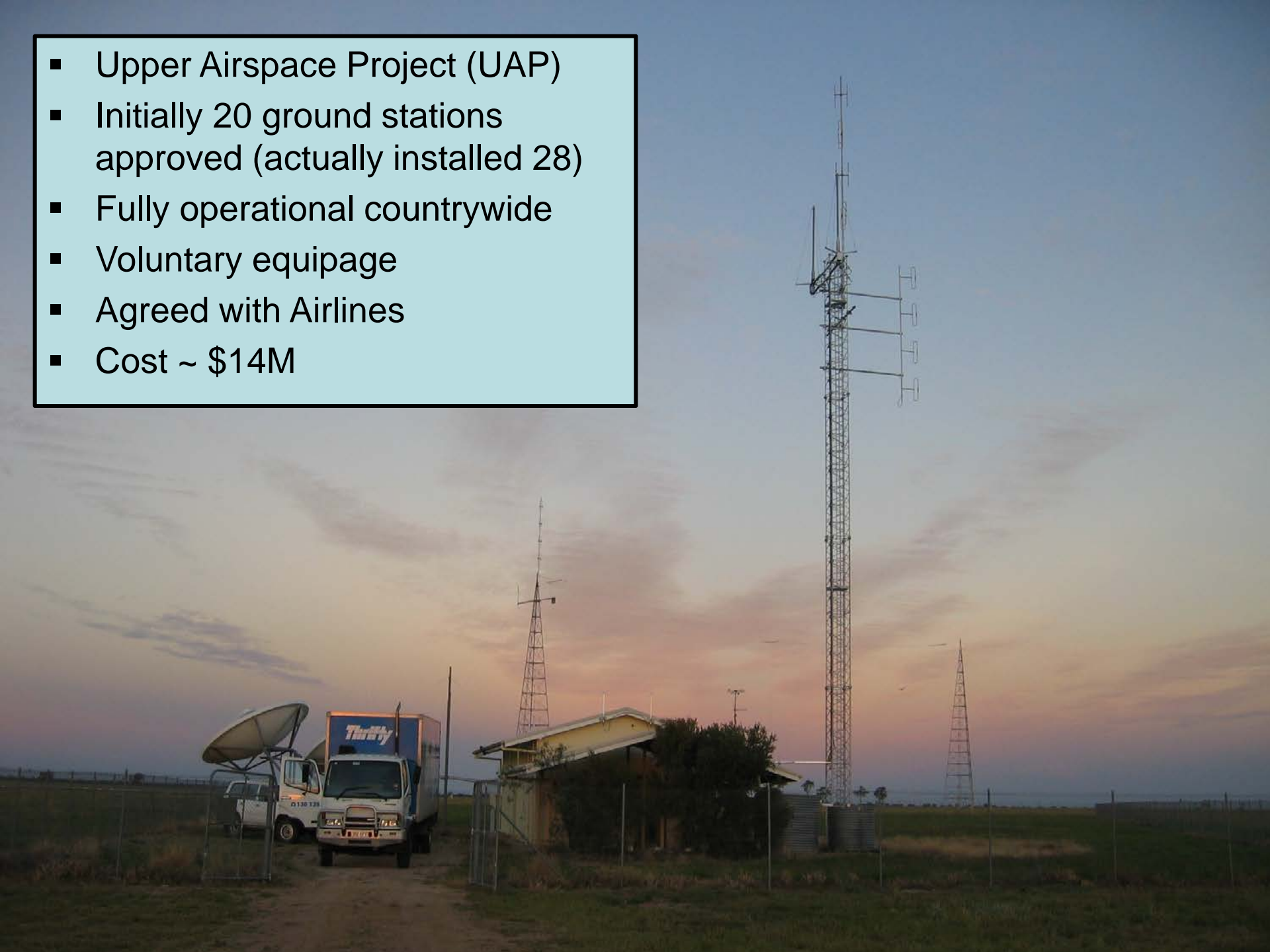
- Radar Track with ADS-B data available



- ADS-B only track



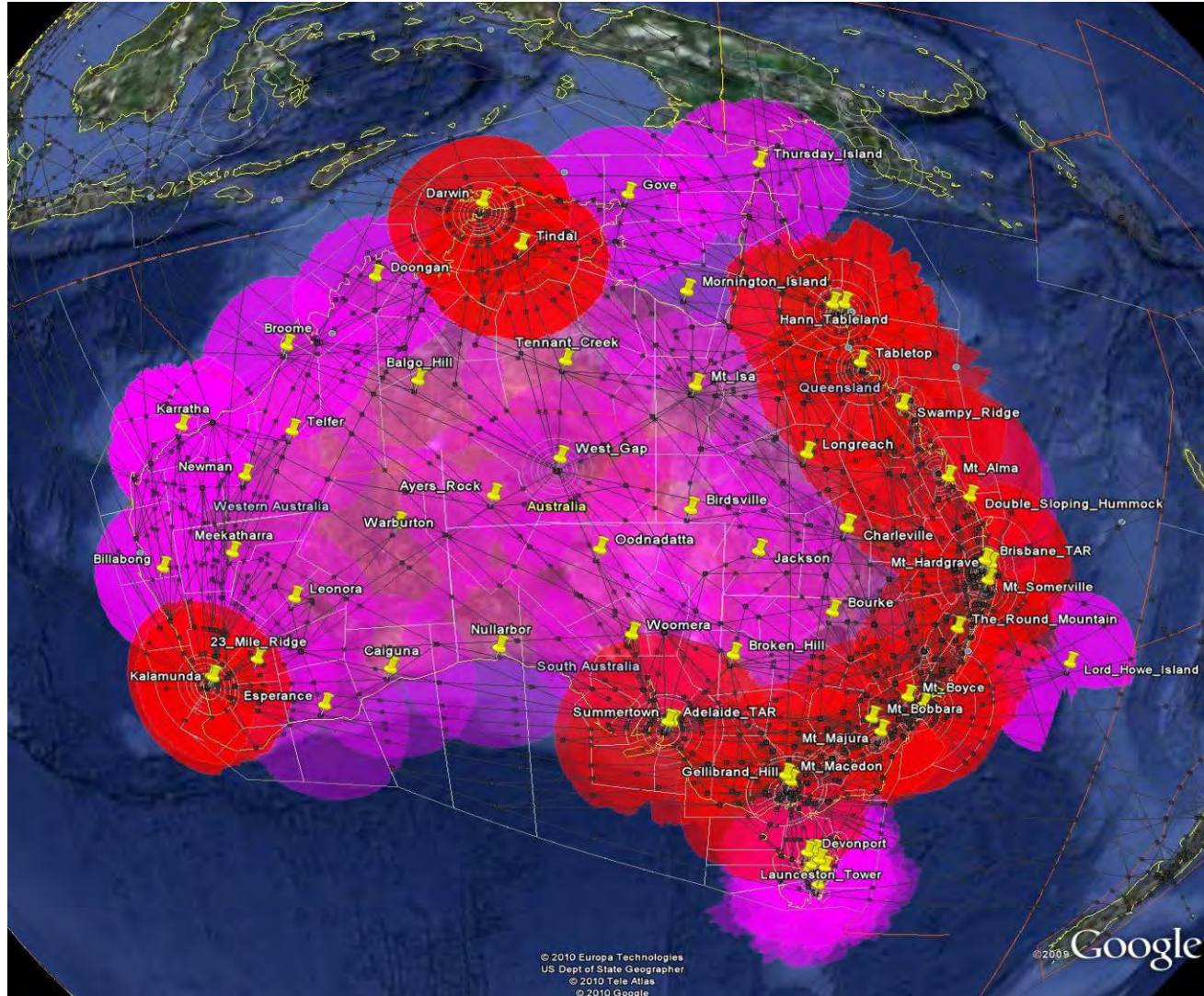
- Upper Airspace Project (UAP)
- Initially 20 ground stations approved (actually installed 28)
- Fully operational countrywide
- Voluntary equipage
- Agreed with Airlines
- Cost ~ \$14M





Some ADS-B installations are in remote areas

ADS-B coverage – FL 285



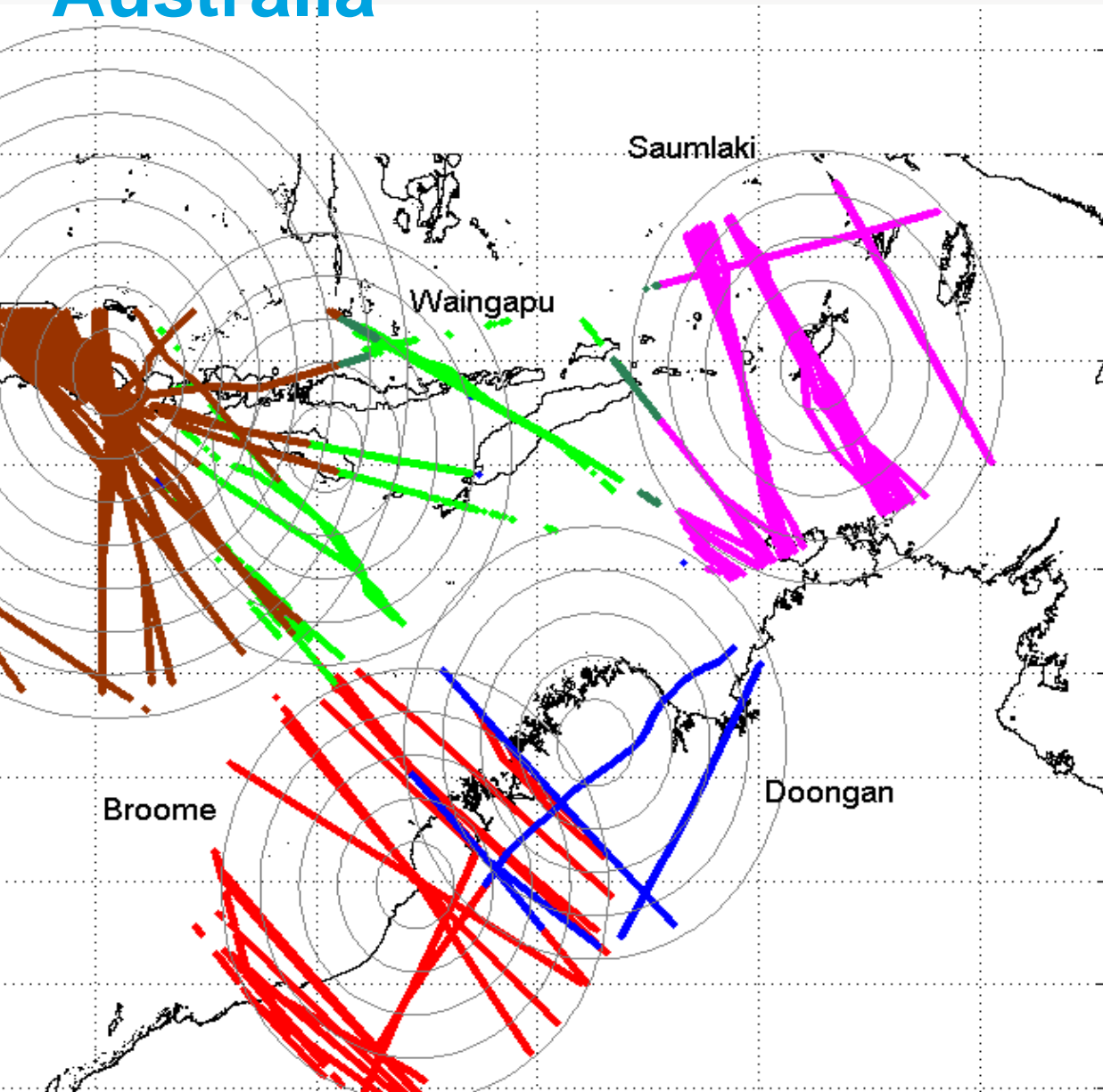
ADS-B Upper

Completed Feb09

**5 Nm separation
approved
continent wide**

-  **RADAR**
-  **ADS-B**

Operations between Indonesia & Australia



OPERATIONAL in Brisbane
on 1 February 2010

Dramatic improvement in
ATC situational
awareness

Safety net operation at FIR
Boundary

Why did Australia adopt ADS-B?

- Massively extends “radar” surveillance-based services Australia-wide at low cost
 - safety and efficiency benefits
- Improved safety
 - ✓ Automated safety net alerts for ATC
 - ✓ Increased situational awareness for ATC
 - ✓ Improved Search & Rescue options
 - ✓ Less transactional work eg. position reporting / freq usage
- Strategic
 - ✓ Open the way for ADS-B IN applications

Controller & Airline reactions ?

- ATC:
 - ✓ More aircraft please
 - ✓ More ground stations please

- Changed the nature of ATC across continent.
 - ✓ Procedural ATC to surveillance based ATC

- Airlines :
 - ✓ Generally Positive feedback
 - ✓ Bizjet issues with some OEMs
 - ✓ Some predictable “grumbles” regarding cost from smaller operators
 - ❖ Why didn’t we wait for USA ?
 - Answers
 - Australia doesn’t have extensive radar coverage
 - Loss of a decade of operational use & safety- efficiency benefit

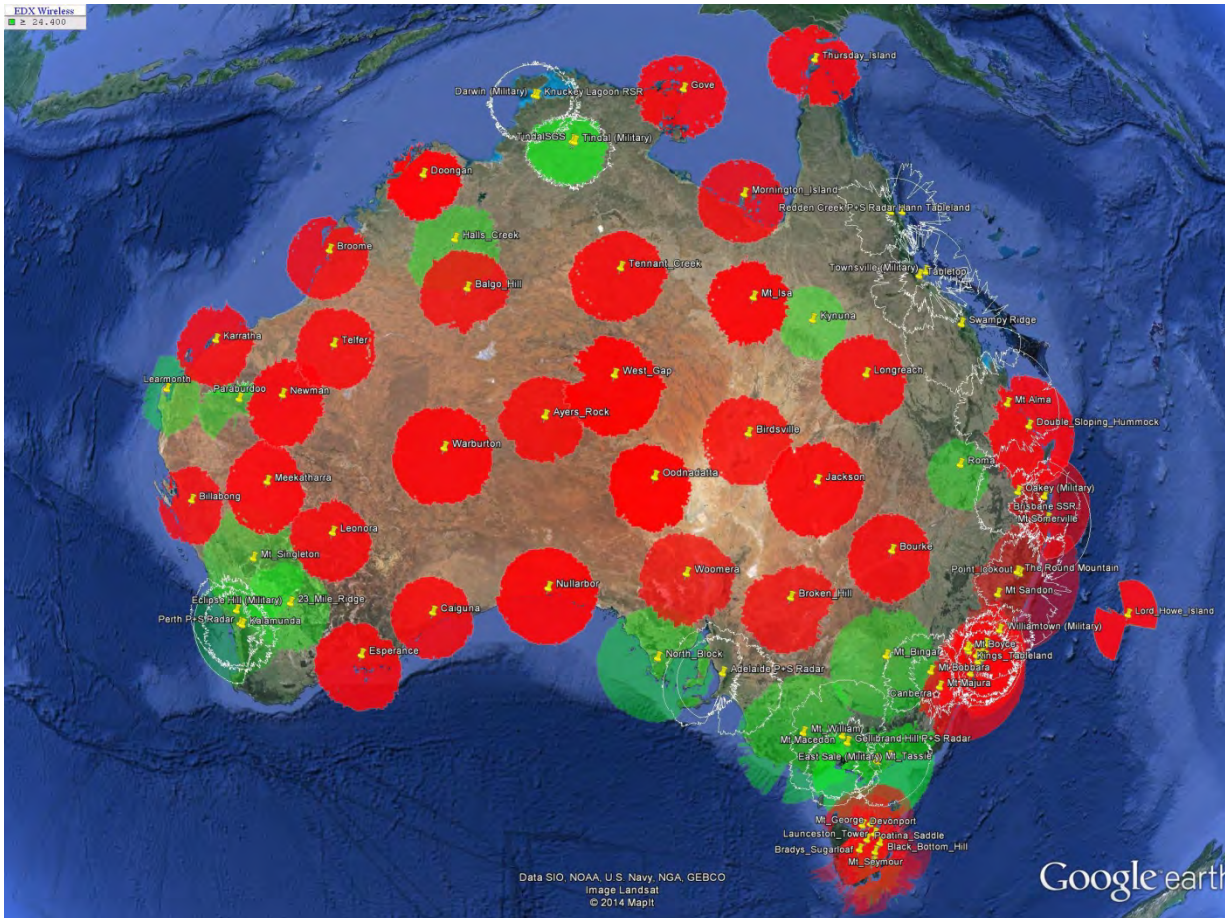
ADS-B coverage – 5,000'

- ACME Project installing 13 more sites this year
- Improvement to ADS-B comms links
- Coverage is altitude dependent

□ RADAR

■ ADS-B

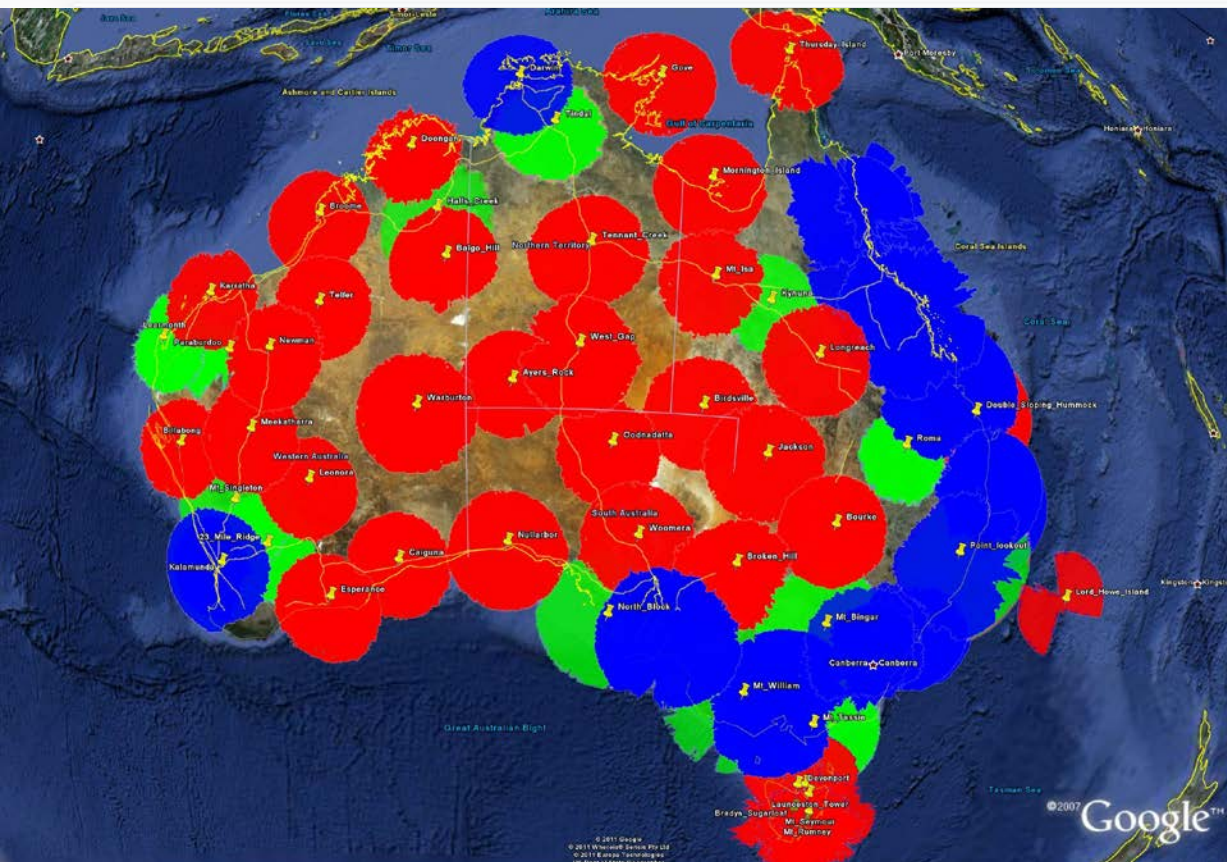
■ ACME ADS-B end 2015



(ACME: ADS-B Coverage and Communications Enhancement)

5000 foot **COVERAGE**

ADS-B coverage – 10,000'



Already installed

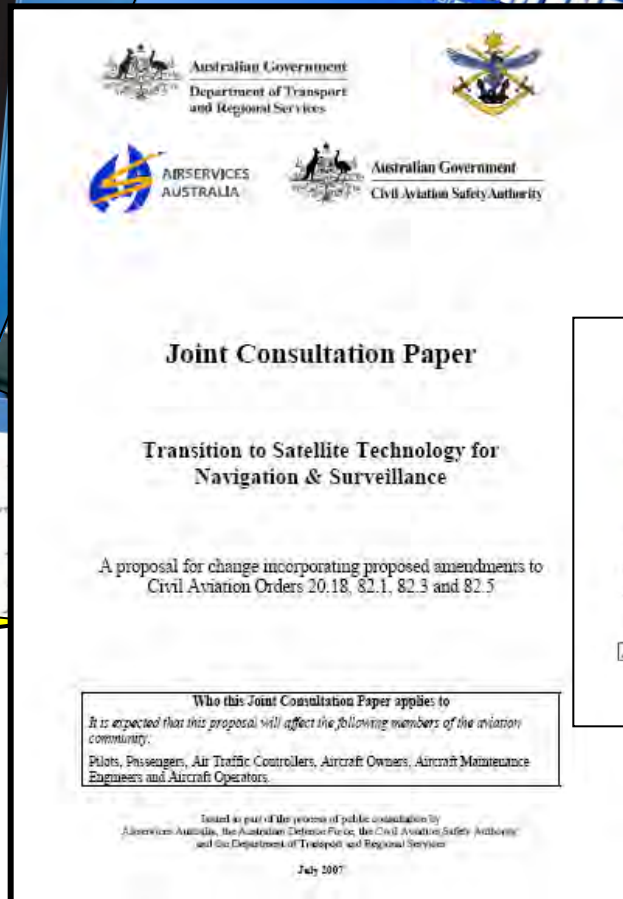
- ➔ Point lookout
- ➔ Mt Tassie
- ➔ Learmonth
- ➔ Mt Singleton
- ➔ Mt William

 **RADAR**

 **ADS-B**

 **ACME ADS-B - 2015**

Getting Industry, Government & other stakeholders to agree



Joint Consultation Paper

Transition to Satellite Technology for Navigation & Surveillance

A proposal for change incorporating proposed amendments to Civil Aviation Orders 20.18, 82.1, 82.3 and 82.5

Who this Joint Consultation Paper applies to
It is expected that this proposal will affect the following members of the aviation community:
 Pilots, Passengers, Air Traffic Controllers, Aircraft Owners, Aircraft Maintenance Engineers and Aircraft Operators.

Issued as part of the process of public consultation by
 Airservices Australia, the Australian Defense Force, the Civil Aviation Safety Authority
 and the Department of Transport and Regional Services

July 2007



Discussion Paper

Proposed Strategy and Regulatory Plan in support of the Australian Government's Aviation White Paper

CASA's Plan for Communication, Navigation and Surveillance Equipment in this decade

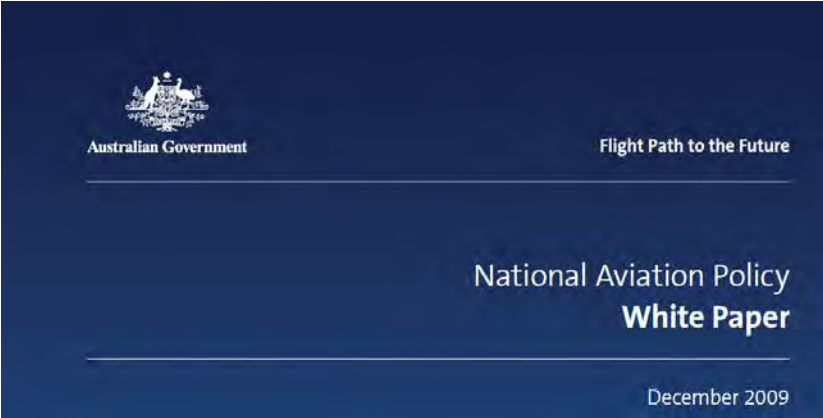
This COP will be of interest to:
 All members of the Australian aviation industry, particularly general aviation and operators.

ISSUED AS PART OF THE PROCESS OF PUBLIC CONSULTATION BY
 AIRSERVICES AUSTRALIA, THE AUSTRALIAN DEFENSE FORCE, THE CIVIL AVIATION SAFETY AUTHORITY
 AND THE DEPARTMENT OF TRANSPORT AND REGIONAL SERVICES

December 2006

- Government
- Industry sectors (GA to A380)
- Installers
- Regulator
- Vendors
- Aircraft OEMs

Government White Paper 2009 supports transition to ADS-B



“ Australia is supporting the wider application and use of satellite surveillance technology, such as Automatic Dependent Surveillance-Broadcast (ADS-B) and satellite navigation technology such as the Global Navigation Surveillance System (GNSS)”



Industry stakeholders
Qantas, Virgin, Airservices
ABAA, AOPA, ASCC, RAAA, AAA

COMPROMISE SOLUTION & TIMING FOR NAV & SURVEILLANCE



**ADS-B SURVEILLANCE TRANSITION
SATELLITE NAV TRANSITION : DECOMMISSION
NON BACKUP NAVAIDS**



2001-2005 > 50 Consultation meetings
Formal Industry Group formed ASTRA
Parliament house briefings

- In 2010 the Industry stakeholders (ASTRA) developed an Industry vision for Surveillance in Australia (ASTRA 2020 Vision)
 - A compromise position about what we agreed rather than what we disagreed
- ASTRA then asked CASA for the 2016/17 Mandates to support the vision.
- ASTRA includes :
 - RAAA (Regional)
 - AOPA (GA)
 - ABAA (Bizjets)
 - ASAC (Sport)
 - Airservices Australia
 - AAA (Airports)
 - Major airlines

ADS-B rules in place



Effective date	Mandate	Status
6 June 2007	<ul style="list-style-type: none"> Non compliant ADS-B must be disabled before flight [no bad data] 	Regulation in place (see CAO 20:18) (All airspace categories)
12 Dec 2013	<ul style="list-style-type: none"> Operation at/above FL290 requires ADS-B 	
6 Feb 2014	<ul style="list-style-type: none"> All IFR aircraft first registered after 6 Feb 2014 must have ADS-B out VFR aircraft first registrations must have ADS-B capable transponder (in class A,B,C,E or above 10,000 feet) 	
4 Feb 2016	<ul style="list-style-type: none"> All IFR must have ADS-B out within 500 Nm Perth to north & east <p>10 months to go</p>	Regulation in place (see CAO 20:18) (Applies to aircraft operating in Class A,B,C, E)
8 Dec 2016	<ul style="list-style-type: none"> ADS-B position source must be SA aware for aircraft manufactured after date 	Regulation in place (see CAO 20:18) (All airspace categories)
2 Feb 2017	<ul style="list-style-type: none"> All IFR must have ADS-B out in Australia <p>22 months to go</p>	



Front page of Airservices Australia web site

connecting australian aviation

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- Careers
- Flight briefing
- Publications
- Media
- Projects
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- Environment
- Aircraft noise
- Online store
- Contact us



- Aircraft tracking
- Latest news
- [ADS-B mandates 2014-2017](#)
- How air traffic control works
- Pilot and airside safety

- > NAIPS Internet Service
- > WebTrak
- > Newsroom
- > Network Status Update
- > National Operations Centre

Airservices is a government owned organisation providing safe, secure, efficient and environmentally responsible services to the aviation industry. We manage air traffic operations for over **90 million passengers** on more than four million flights every year.

We provide the aviation industry with aeronautical data, telecommunications, navigation services and [aviation rescue fire fighting services](#).

We employ more than **4000 staff**, with approximately 1000 air traffic controllers, working from [two major centres](#) in Melbourne and Brisbane and [29 towers](#) at international and regional airports.



ARE YOU FITTED?

ADS-B



Mandatory fitment deadlines for ADS-B technology in Australian airspace are fast approaching.

Where do you fit?	On or after	Requirement
All flights at/above FL290	12 December 2013	Must be ADS-B capable
Addition to Australian register	6 February 2014	Must be ADS-B capable GNSS navigation required
Replacement transponder	6 February 2014	Must be ADS-B transponder
Operating 500NM from Perth	4 February 2016	Must be ADS-B capable
IFR aircraft (aerial work/private operations)	4 February 2016	GNSS navigation required
Operate to BNE, SYD, PER or MEL	4 February 2016	Mode S transponder required
All IFR aircraft	2 February 2017	Must be ADS-B capable

www.airservicesaustralia.com/projects/ads-b/other-mandates-2014-2017

airservices
connecting australian aviation

GET FITTED 4 FEB 2016

ADS-B

FLYING IFR?

Important mandates from CASA are approaching fast.

is urging all IFR aircraft operators, including some helicopter operators, enough time to be fitted with new satellite-based technologies including Navigation Satellite System (GNSS) and Automatic Dependant Surveillance (ADS-B) ahead of CASA's 4 February 2016 fitment mandate.

Information on ADS-B and GNSS mandates is available at www.casa.gov.au/projects/ads-b/other-mandates-2014-2017



A NEW ERA IN AVIATION

ADS-B



Using ADS-B has assured that we are able to transfer patients to the destination hospital faster than before.

Michael Bleus, Chief Pilot, Royal Flying Doctor Services



Airservices congratulates the Royal Flying Doctor Service Western Operations on fitting ADS-B technology to its fleet of Pilatus PC-12s and on their commitment to aviation safety.

By 2017 all Australian registered IFR aircraft flying in Australia's airspace will be required to operate using ADS-B.

www.airservicesaustralia.com/projects/ads-b



AEA & Vendor support

FEATURE Avionics



WHAT ARE WE WAITING FOR?

Australian Pilot chats to Bruce Baxter, Aircraft Electronics Association's Regulatory Consultant, about his organisation's role in equipping IFR aircraft with ADS-B.

Bruce, tell us a bit about the AEA. How is it structured, and who are its members both around the world and here in Australia?

Founded in 1957, the Aircraft Electronics Association (AEA) represents more than 1,300 aviation businesses, including repair stations that specialise in maintenance, repair and

The mandate for ADS-B fitment for aircraft flying at or above FL290 will be upon us by the end of the year. Are most aircraft that fly at these altitudes already equipped with ADS-B? Not at all, of course the airlines are progressing quite well, but there is a lot of concern about the business jet sector. Some leased aircraft are constrained by the lease documents, which frequently state that only original equipment manufacturer (OEM) equipment can be fitted. OEM equipment for this class of aircraft can be extremely expensive and operators are reluctant to spend money on an aircraft that they may return to the lessor in the future.

What will happen if an aircraft that is not equipped with ADS-B attempts to fly at FL290 or higher after the fitment date?

This is a double banger question: firstly let's look at it from CASA's point of view. CASA have regulated that all aircraft flying at or above FL290 must be fitted with ADS-B out – so therefore, we do not expect that exemptions will be forthcoming from CASA. Additionally, Airservices Australia has indicated that anyone filing a flight plan for flight at or above FL290 without ADS-B will not be permitted by Airservices to operate at those flight levels.

These responses are not my interpretation of things to come; these are the current positions of CASA and Airservices.



Koalas are fuzzy.
The new ADS-B rules are not.

Everybody who wants to fly IFR in Australia will need ADS-B "Out" capability no later than 2017. And in some airspace, you'll need it even sooner. So, why wait until crunch time? See your Garmin dealer now to select the ADS-B upgrade that's right for your aircraft and budget. Our GTX 330 ES and GTX 33 ES transponders, when paired with a compliant position source like our GTN 750/650 series navigators, can provide the complete solution for compliance with CASA's Australian equipage requirements.



To learn more, visit our ADS-B Academy online at garmin.com/ads-b

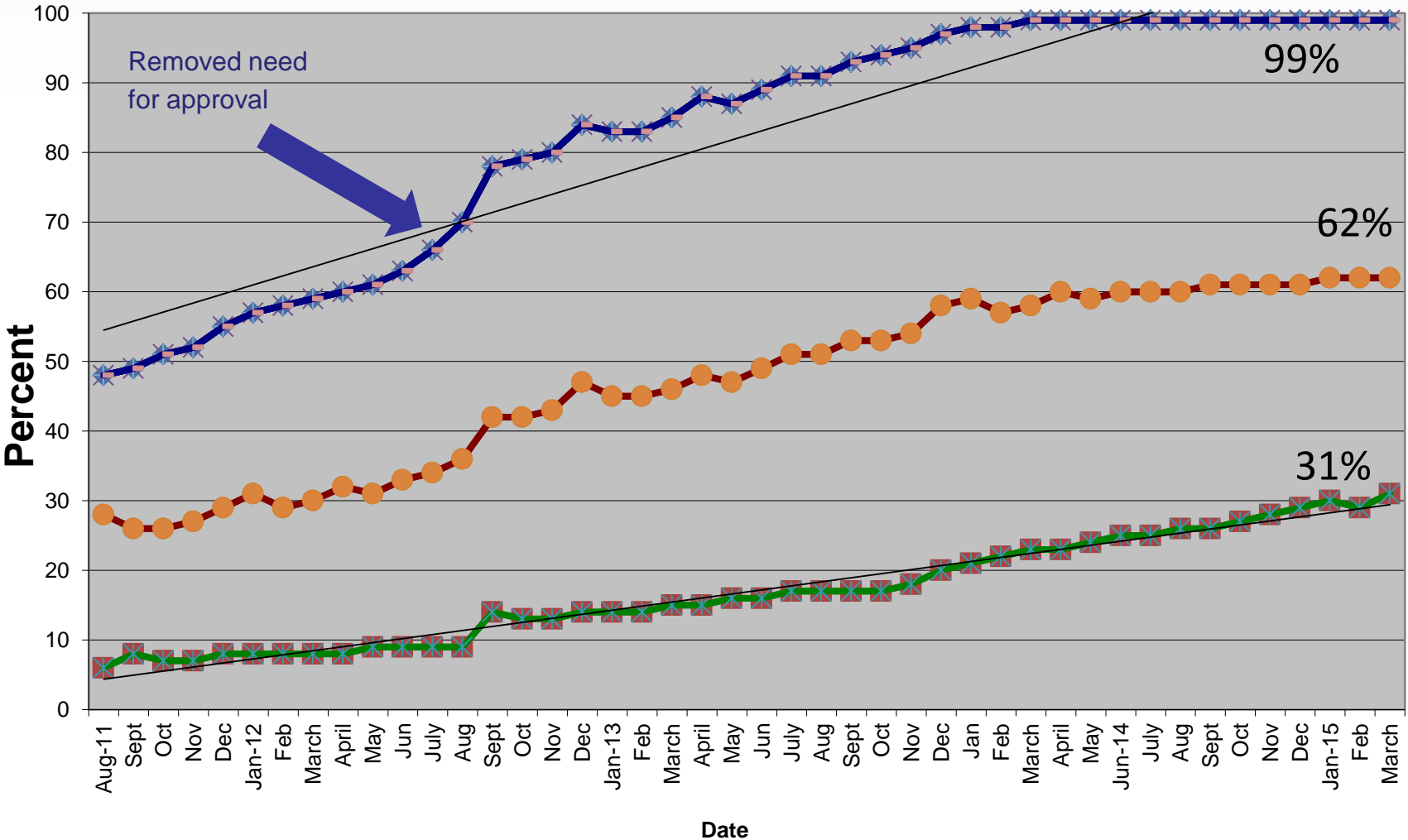
NASDAQ: GRMN
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ADS-B Solutions

Current status : Civilian IFR flights

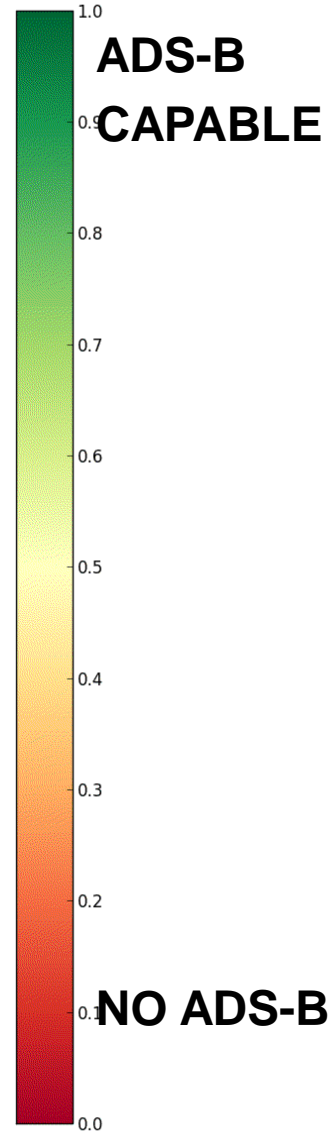
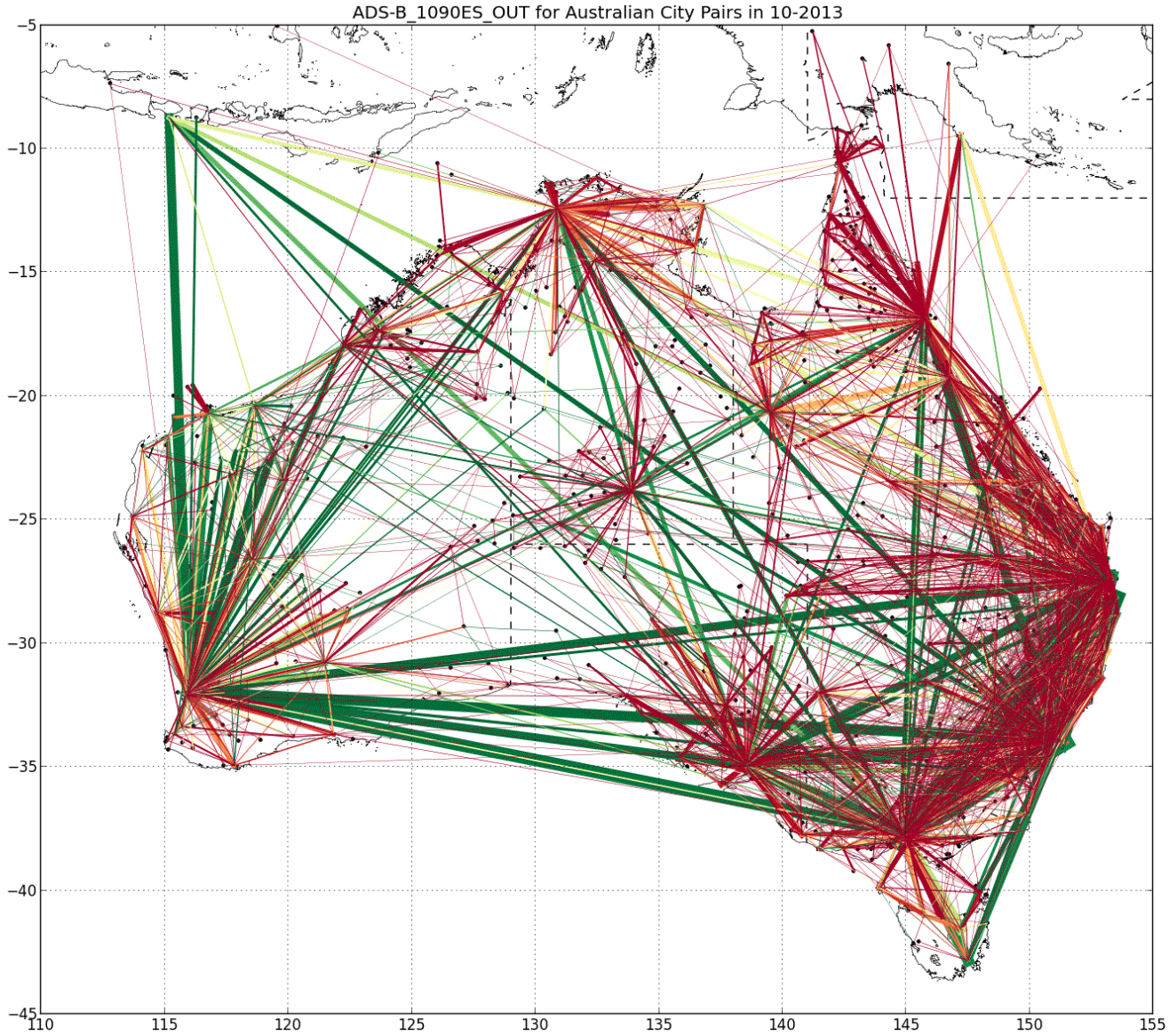


% Civilian Flights (Domestic & Foreign) with ADSB



October 2013 ----- January 2015

All IFR Flight planned flights – all levels



ADS-B IFR Equipage – Australian rego



	% Airframes	% Flights
Airlines – jets	98.5%	99.5%
Bizjets	77%	78%
IFR 500 miles Perth	75%	84%
IFR (all of Australia)	37%	63%
IFR helicopters	15%	17%
VFR (not required to equip but chose to do so)	149 airframes	

Only includes Airframes flight planned IFR since 1 Aug 14
Does not include Foreign Internationals or Military

- The task is NOT just installing ground stations
 - ➔ Legislation, regulation
 - ➔ Technical procedures/training
 - ➔ Operational procedures/training
 - ➔ Safety, regulator

- Appropriate to assume avionics is good
 - ➔ Removed “white list” and pre-approval
 - ➔ Assume avionics are good due regulation

- Stakeholder relationships are critical
 - ➔ Lots of “hearts & minds”
 - ➔ Public relations engagement is required (website, publications, meetings, airshows, annual conferences etc)

- Persistence – worthwhile tasks are difficult



Next Steps

- ADS-B into TCUs (3 nautical mile separation)
- ADS-B into more remote towers (display of airborne aircraft)
- Decommission 4 radars in 2017 (in lieu ADS-B)
- Encourage lower cost ADS-B out
 - ➔ Make VFR aircraft “visible”
 - ➔ Lower cost GPS solutions (eg TSO199)
- New ATC system – better ADS-B integration
 - ➔ Dynamic blacklist, Route & volume equipage requirements, Fusion with radar
- Improve coverage & performance
 - ➔ More ground stations / Offshore platforms / maybe Space Based ADS-B / ADS-B repeater / Data sharing PNG
- Examine other applications
 - ➔ ADS-B IN (ATSAW/AIRB , ITP)
 - ➔ Precision Runway Monitor (PRM)
 - ➔ Low cost Surface surveillance (Tower display of ADS-B only)
 - ➔ Replace TAS WAM

Australia is ADS-B Operational

- Safety & efficiency benefits available now (fully operational)
- Lower costs for Airservices & hence our customers
 - International airlines – well equipped (>98% flights)
 - One airline has advised that it is saving significant fuel per flight leg to Australia
 - Domestic major operators at/above FL290 – well equipped (>99% flights)
 - Airservices Australia customers are supportive
 - IATA, AOPA, RAAA, ABAA
- ADS-B has been proven in Australia over the last decade
 - 5 Nautical mile separation approved in 2004
 - Mandated above FL285 today (domestic & foreign aircraft)
 - Mandated all levels for IFR in Feb 2017
 - New aircraft & new transponders must have ADS-B capability
 - including VFR that operate in controlled airspace
 - SA aware GPS position source from 8 Dec 2016

Questions?



ADS-B Regulation Development in Australia



DISCUSSION PAPER (DP) - informal consultation

2004

- DP0410AS Carriage & Use of ADS-B



Notice of Proposed Rulemaking (NPRM)

2007

- formal consultation, once the policy and associated advisory/procedural material have been established/developed

-Includes justification

- Joint Consultation Paper on Transition to Satellite Technology for Navigation and Surveillance



Notice of Final Rulemaking (NFRM)

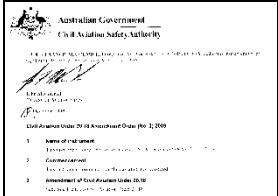
2009

incorporating a *Summary of Responses (SOR)* —

It contains a consolidation of the comments received, CASA's comments, and a disposition of the comments.

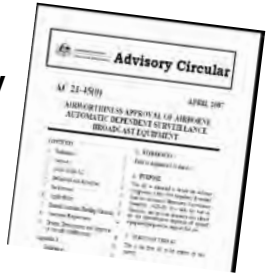
- Includes actual rule

- NFRM JCP – March 2009



Instrument CAO: 20:18

Advisory Circular



ADS-B Timeline

