

SP/1



ADS-B in Context

APANPIRG ADS-B Study & Implementation Task Force

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Surveillance Program Lead

ADS-B : Its an old idea !



GPS-Squitter



Department of Transportation
Federal Aviation Administration

*ADS-B was flying
in Gulf of Mexico
in 1994*

19 years ago

1996 : MIT gift



International Standards
and Recommended Practices

Annex 10 to the Convention on International Civil Aviation



Note 2.— The Mode S extended squitter system is subject to patent rights from the Massachusetts Institute of Technology (MIT) Lincoln Laboratory. On 22 August 1996, MIT Lincoln Laboratory issued a notice in the Commerce Business Daily (CBD), a United States Government publication, of its intent not to assert its rights as patent owner against any and all persons in the commercial or non-commercial practice of the patent, in order to promote the widest possible use of the Mode S extended squitter technology. Further, by letter to ICAO dated 27 August 1998, MIT Lincoln Laboratory confirmed that the CBD notice has been provided to satisfy ICAO requirements for a statement of patent rights for techniques that are included in SARPs, and that the patent holders offer this technique free of charge for any use.

*On 22 August
1996, MIT Lincoln
Laboratory issued
a notice of its
intent **not** to
assert its rights as
patent owner –
offered to all Free
of Charge*

17 years ago

In 2001 : FAA Capstone program



“Radar-Like” ADS-B Services

- 1st “Radar-Like” ADS-B services - 00:31GMT on 01/01/01

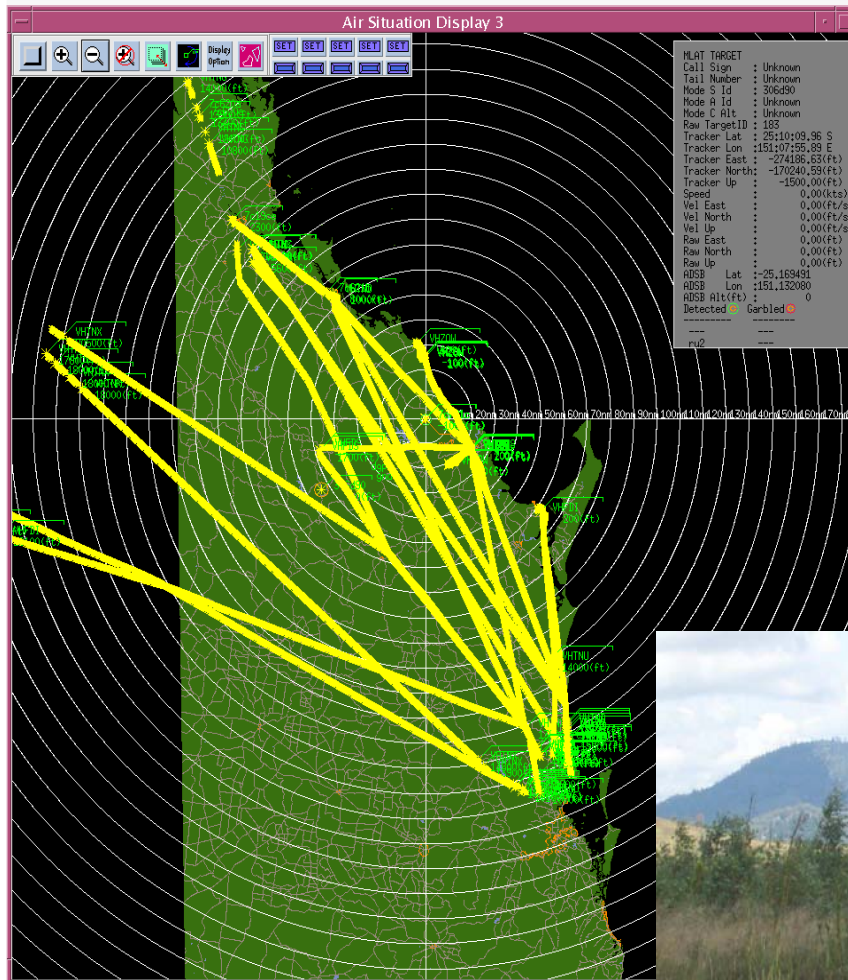


FAA equipped 140 aircraft in Alaska.

Radar like services in 2001

Lesson Learned:
Procedures must carefully “bridge” between legacy systems and the new or emerging.

2001- 4 : Australian operational trial



- Operationally commissioned
- 9 aircraft
- Dh8, Shorts, B200, Jabiru

Objective : Learn operational lessons

Separation standards approved

TESTING : Radar compared to ADS-B

ADS-B ANTENNA



In March 2003 :



ADS-B Study & Implementation Task Force Meeting 1 : Brisbane

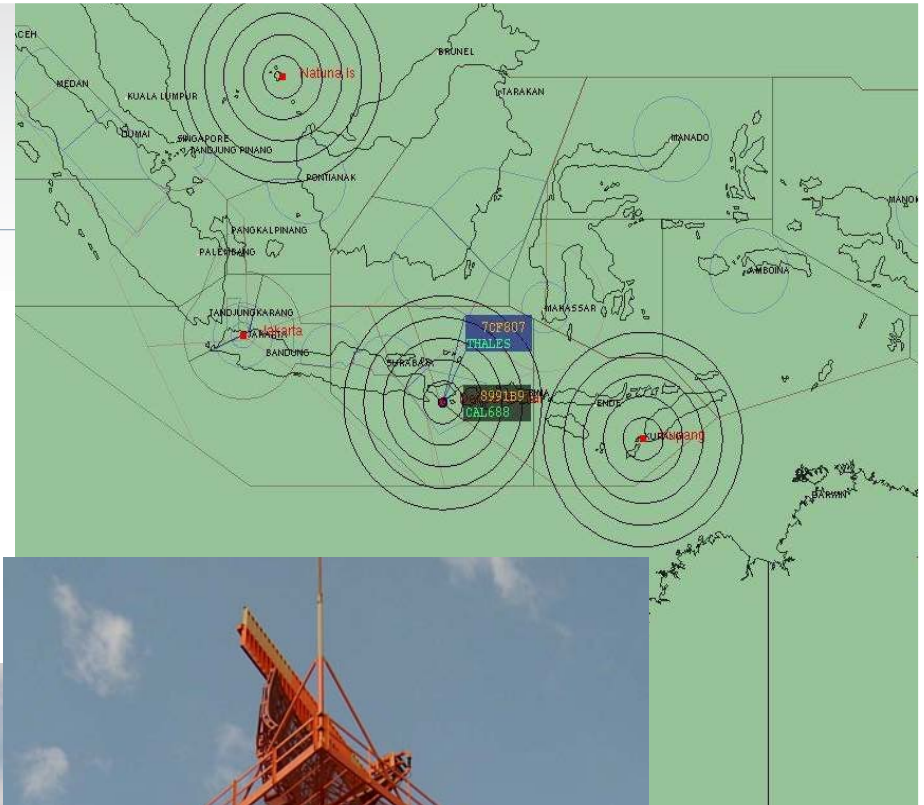


Adopted :

- We need SARPS and Separation standards**
- Asia Pacific will use 1090ES in near term**
- States be encouraged to implement ATC use by 2006**

In 2006 :

ADS-B trial in Indonesia



In 2007 :

ADS-B Task Force Meeting Seoul Korea



IATA is convinced (2007)



Giovanni Bisignani
Montreal, April 2007

To represent, lead and serve the airline industry



DOCUMENT CONTROL
IAP New Doc
Version 0.83 for approval

Automatic Dependent Surveillance Broadcast (ADS-B) QUT

Automatic Dependent Surveillance Broadcast (ADSB) QUT, based on Mode-S Enhanced Squitter (1090ES), is the preferred surveillance technology to replace radar for the air transport industry.

SITUATION

Airlines continue to equip their aircraft with ADS-B (QUT) capability. A return on this investment can only be achieved by implementation of enhanced surveillance solutions resulting in more efficient routing, increased airspace capacity and lower cost ATM infrastructure.

1 Automatic Dependent Surveillance-Broadcast (ADS-B) QUT is a function on an aircraft's surface vehicle that periodically broadcasts its state vector (horizontal and vertical position, horizontal and vertical velocity) and other information. Under ADS-B QUT, a vehicle periodically broadcasts its own position without knowing what other vehicles or entities might be receiving it. ADS-B QUT is automatic in the sense that no pilot or controller action is required for the information to be transmitted. It is dependent surveillance in the sense that the surveillance information depends on the reception and broadcast capability of the source vehicle. ADS-B QUT is used by ATC for surveillance in a manner similar to the use of conventional radar.

A complementary technology is called ADS-B IN, whereby ADS-B information is received, processed and displayed in the cockpit to provide an enhanced "see and avoid" capability that is superior to TCAS. ADS-B IN also enables a number of advanced applications that can enhance safety, capacity and efficiency. Aircraft can be equipped with ADS-B QUT without having ADS-B IN capability.

IATA POSITION

Where justified by operational and business cases, air traffic control using ground radar surveillance should migrate towards ADS-B (QUT).

New surveillance implementations should consider ADS-B QUT in preference to radar.

In airspace where ADS-B QUT is declared operational, associated radar installations should be decommissioned as soon as operationally feasible and the resulting maintenance and operational savings passed on to airspace users.

KEY CONSIDERATIONS

Precedent has been established for the acceptance of DO-260 avionics for near term application of ADS-B QUT with five nautical mile radar-like separation, provided NAVIGATION UNCERTAINTY CATEGORY (NUC) is computed using HORIZONTAL PROTECTION LIMIT (HPL).

However, DO-260A Change 2 is expected to be the baseline for longer term rulemaking in the U.S.A. and Europe.

Eurocontrol will permit the use of DO-260 avionics in its Pioneer Program. However, CASCADE² program management confirms that cumulative rulemaking scheduled to begin during 2007 is expected to use DO-260A Change 2 as its baseline.

¹ Co-operative ATIS through Surveillance and Communications Applications Deployed in ECAC - European Civil Aviation Conference.

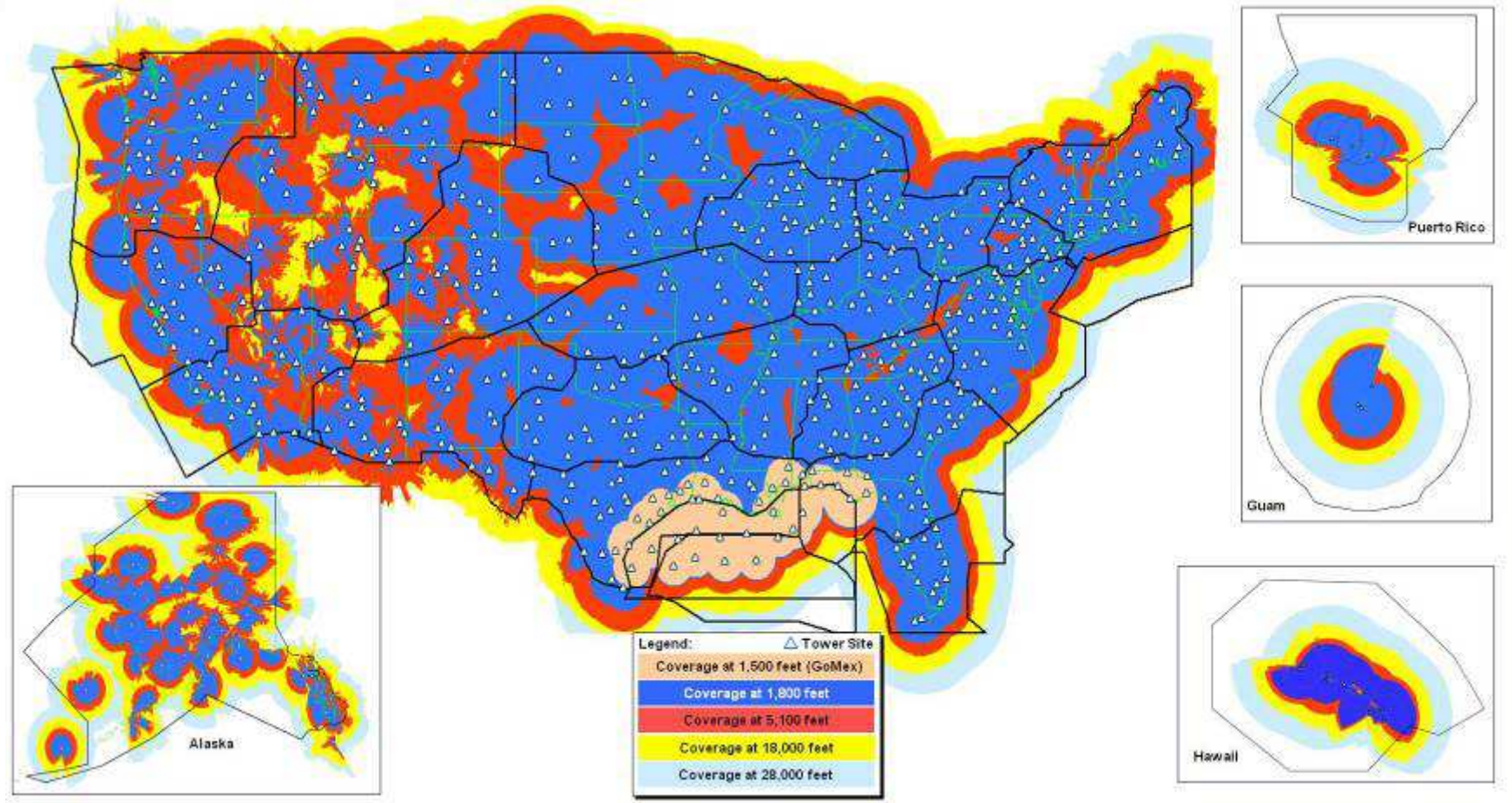


ADS is the agreed technology for the ATM roadmap

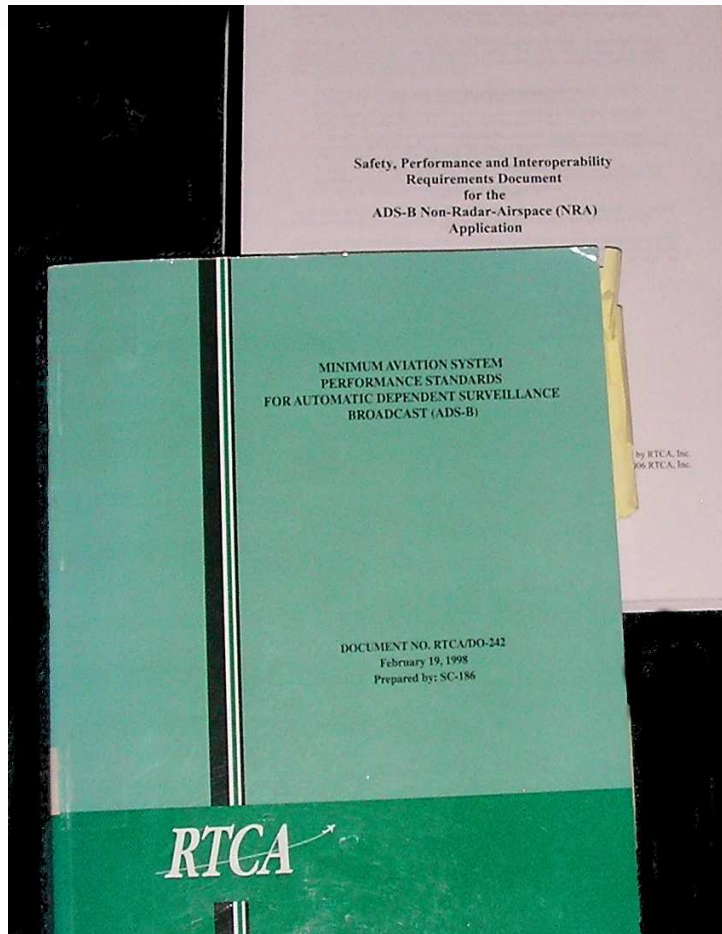
➤ US, Europe and others already looking at

2007 FAA ITT Contract

Ground Infrastructure: 794 Ground Station Solution Provides National Coverage



2004-2009 RFG work on RTCA-EUROCAE GREEN BOOKS

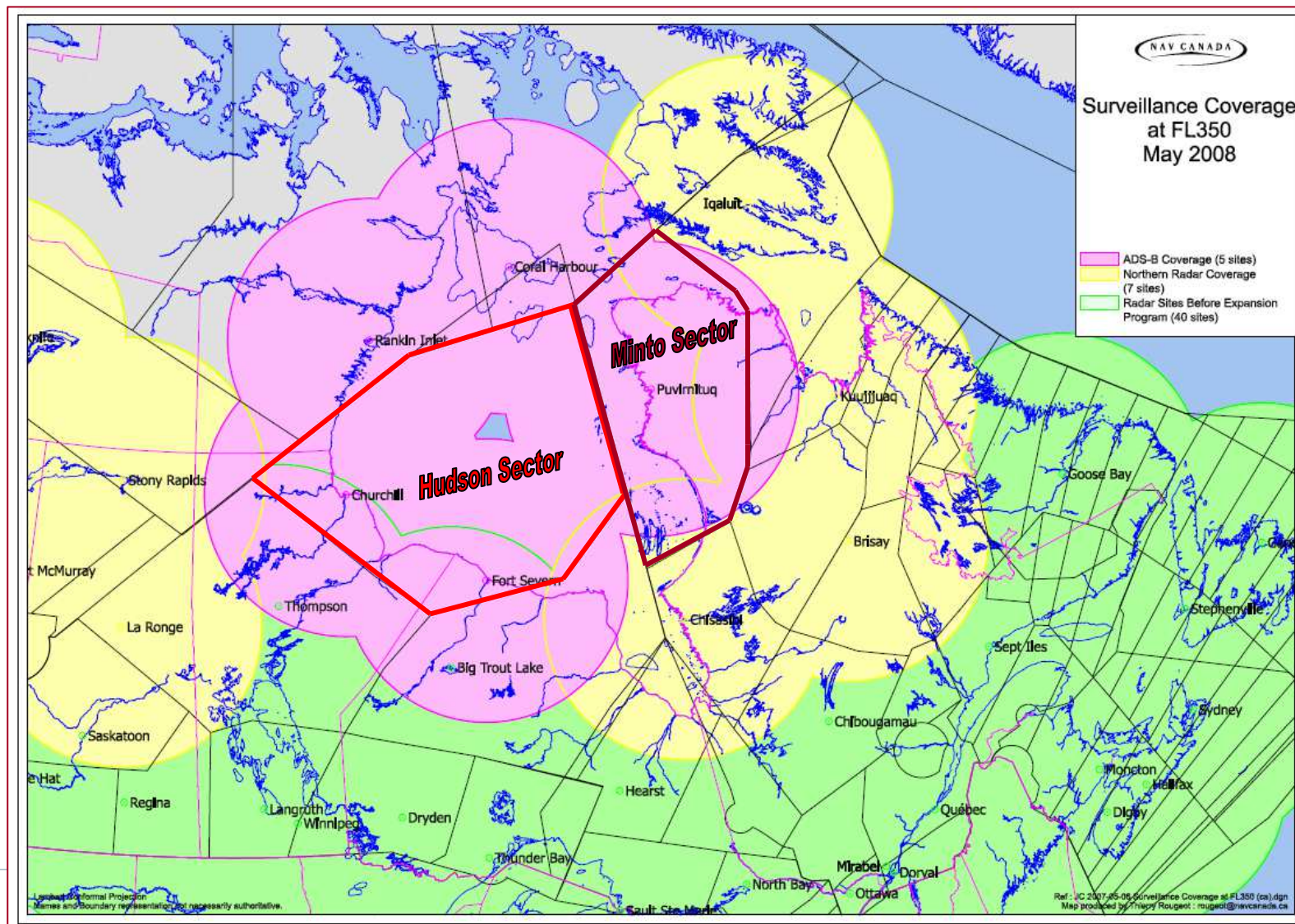


Standards for Global interoperability

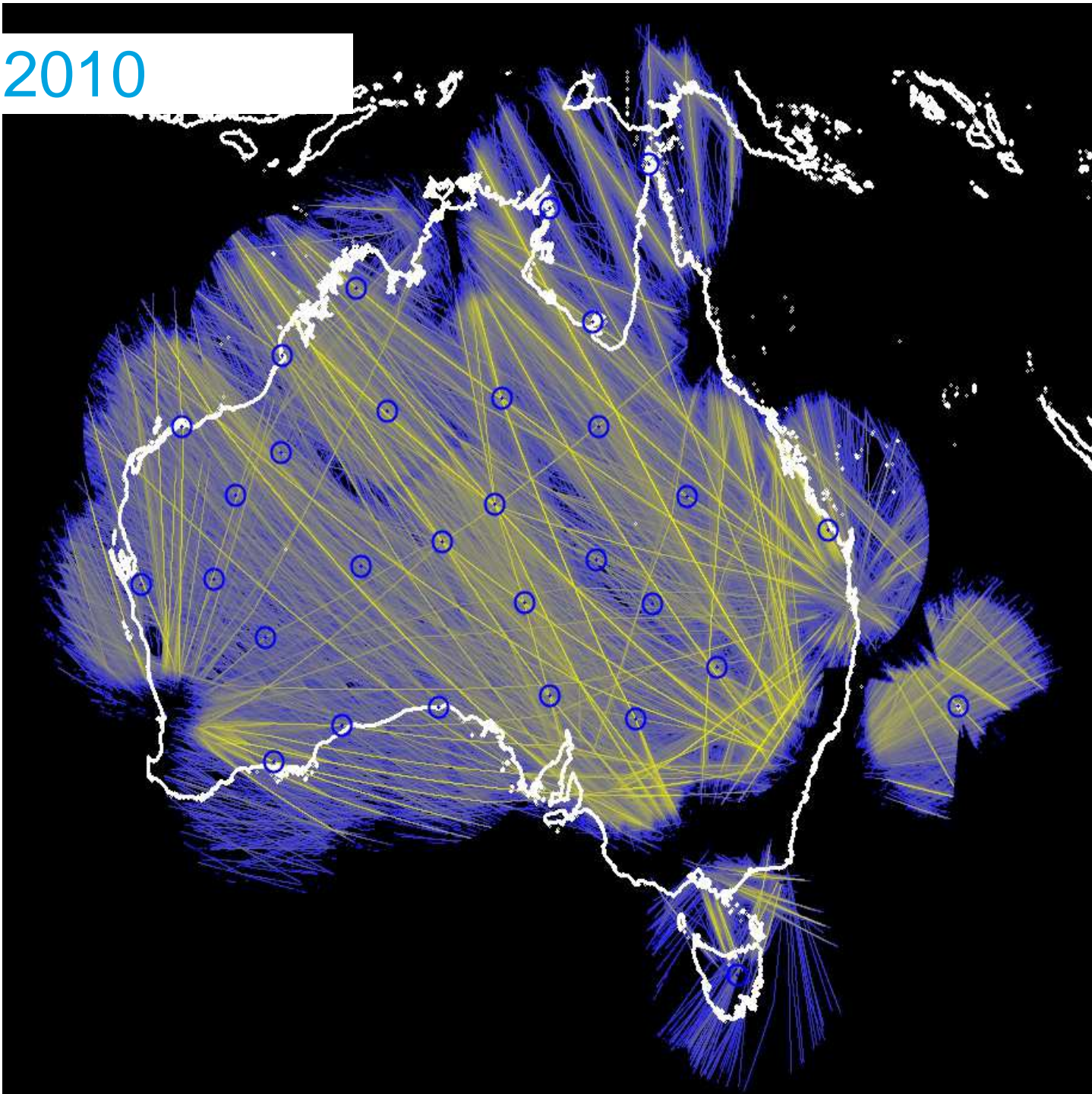
Led to AMC20-24 certification

Eg: RTCA DO303
“ADS-B in
Non-Radar Airspace – NRA”

In 2008 – Hudson Bay



2010



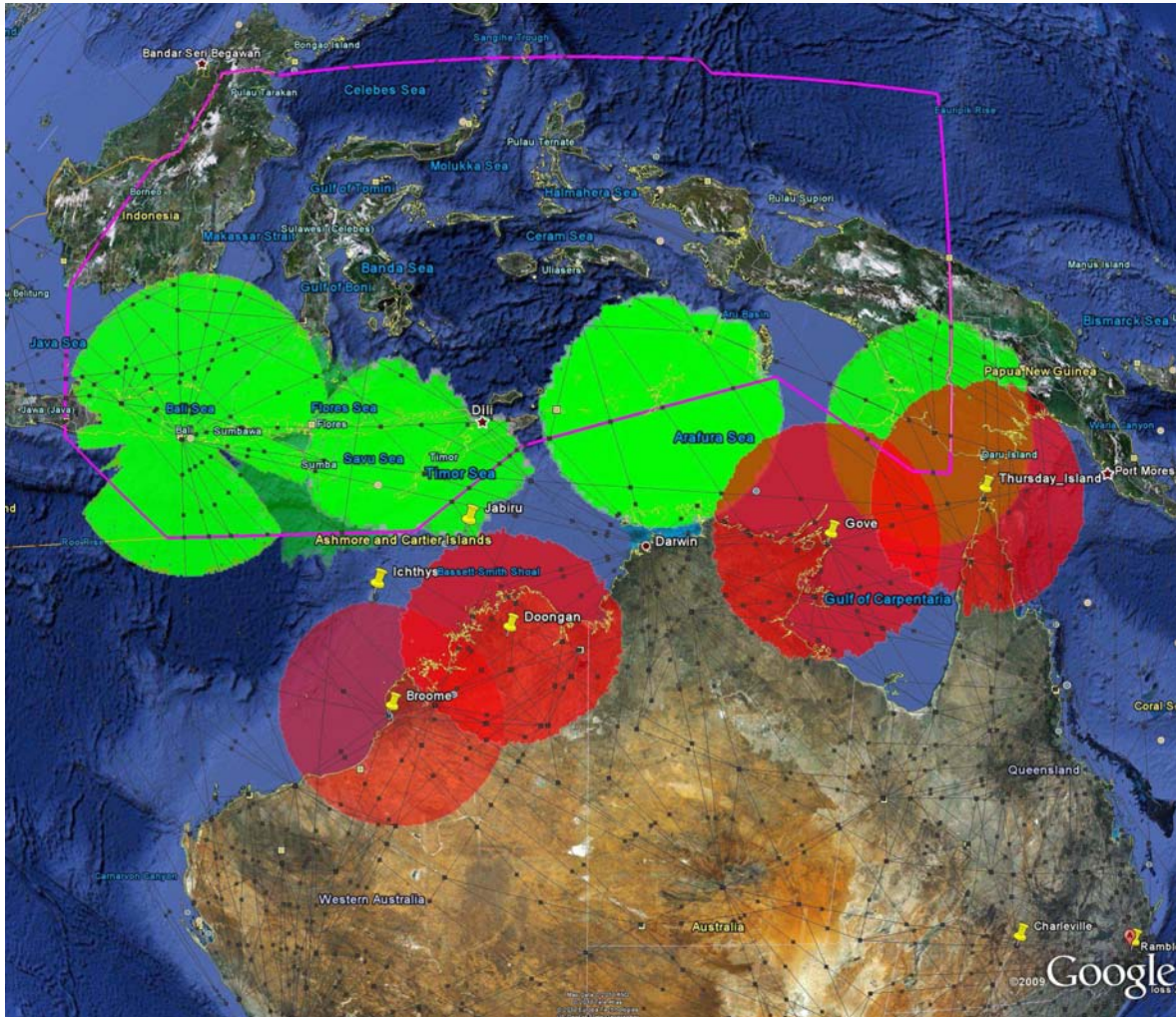
**Continent
wide system
operational in
Australia**

**ICAO Circular
326**

**Changes to
Doc 4444**

In 2010

ADS-B data sharing operational

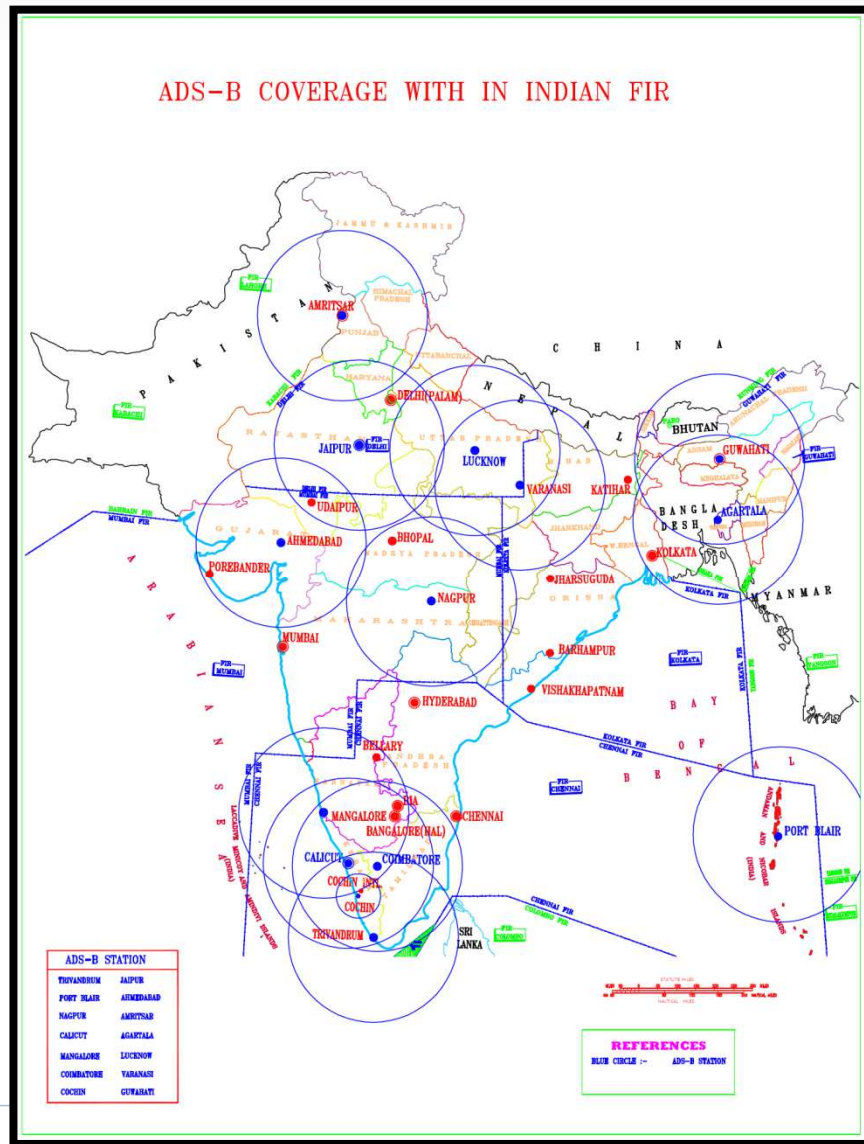


Indonesian data is “on screen” in Brisbane ATC centre

Impact on safety of FIR boundary

- Increased safety
 - Error detection
 - Safety nets
 - Increased situational awareness

2012 : India installs ADS-B



Exciting ADS-B program in India

Domestic & Oceanic airspace

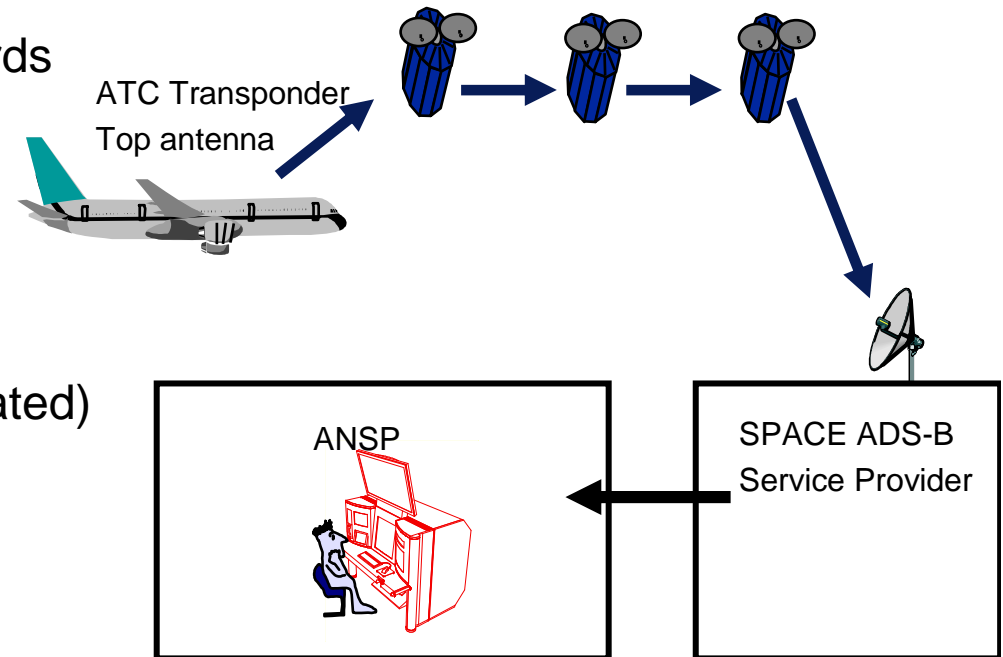
With Data Sharing

2015 : Launch of ADS-B receivers



To improve Oceanic ATC without new avionics

- Significant benefits in North Atlantic
- Aiming at reduced separation standards
- Radar like separation NOT expected

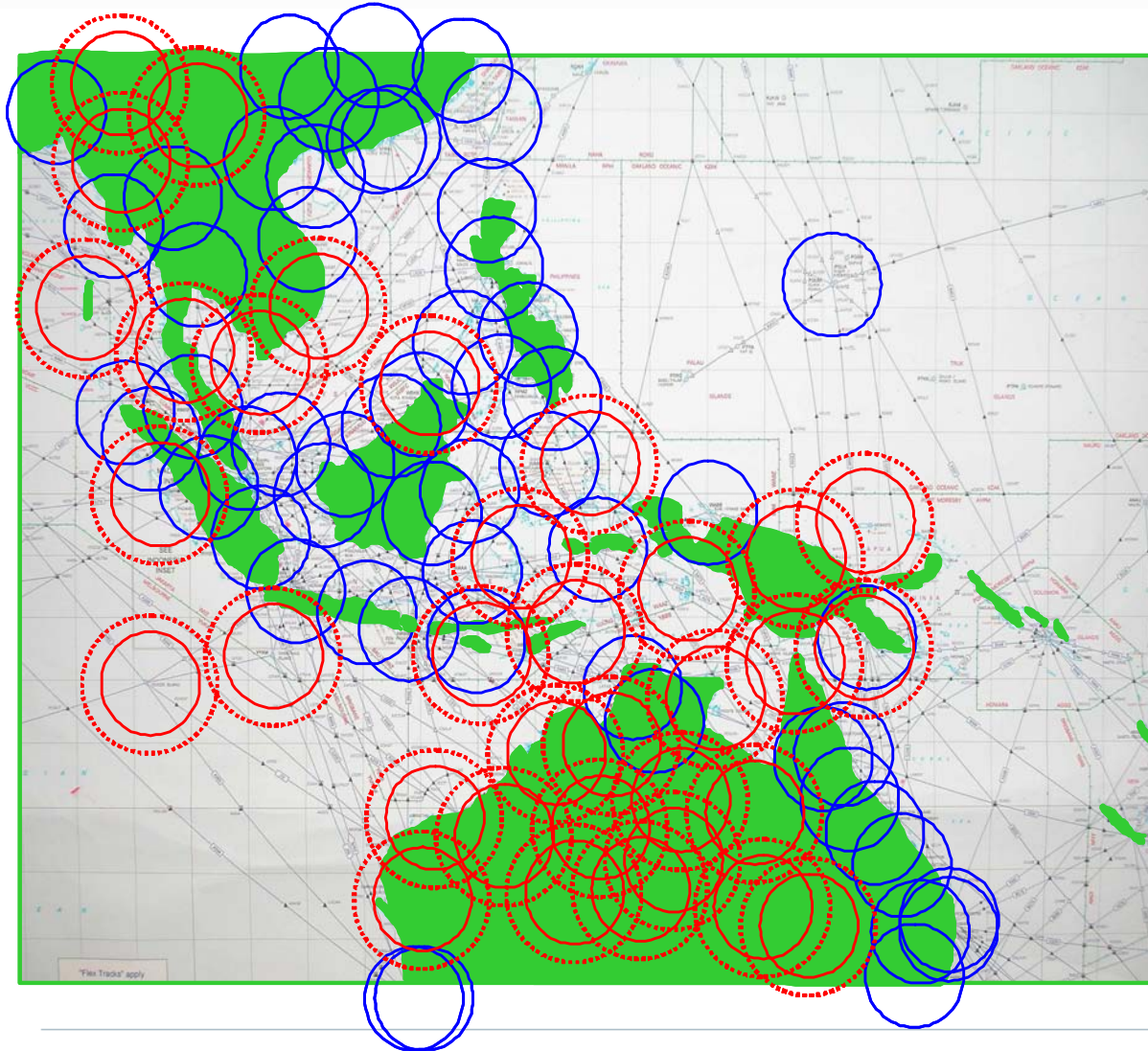


ANSPs will be able to buy the data :

- Price (unknown)
- Technical success (not yet demonstrated)

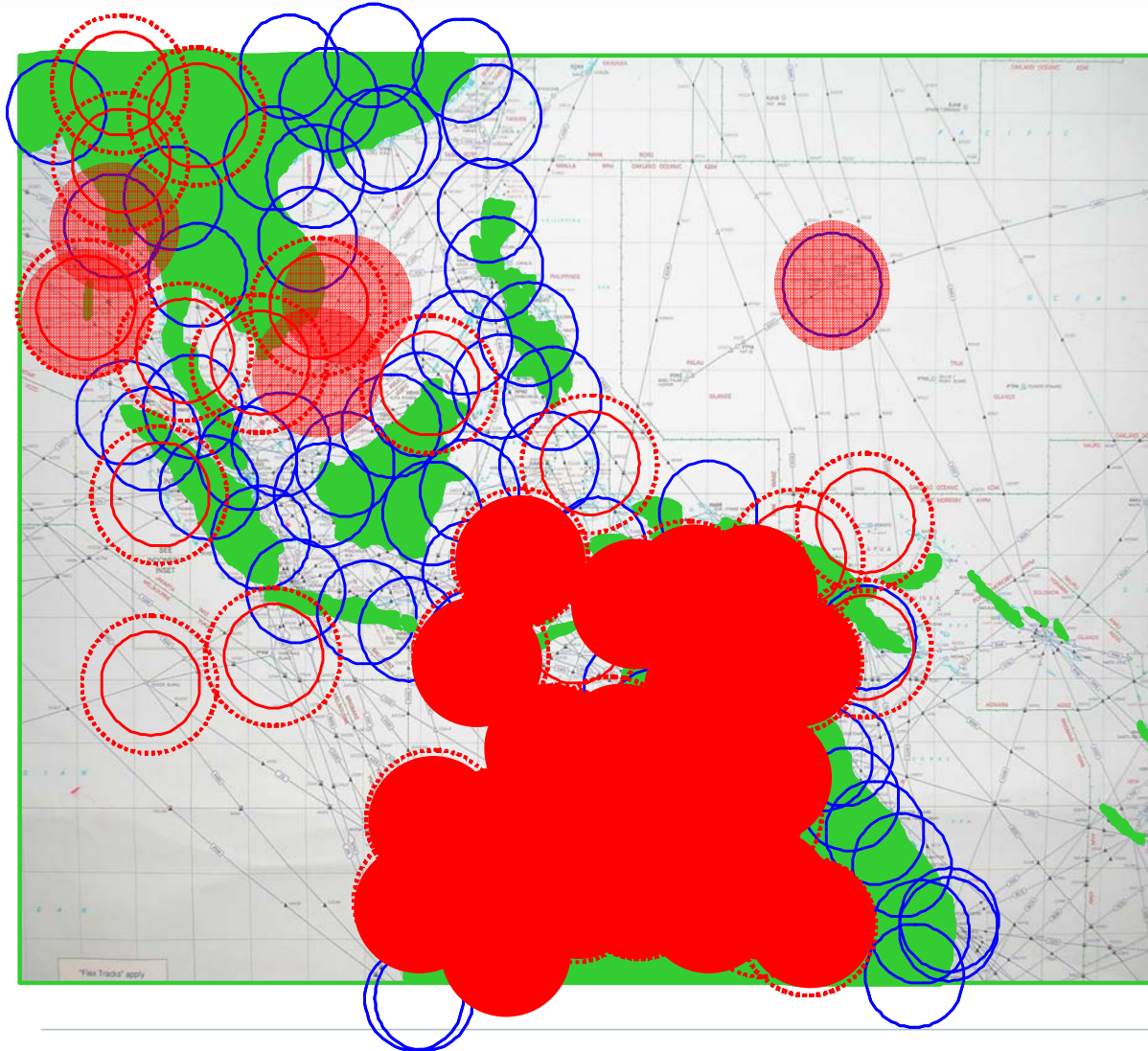
We watch & wait with interest

We dreamt of filling in Surveillance holes in SE Asia



- ADS-B (in red)
- More to do, but much achieved here !

We dreamt of filling in Surveillance holes in SE Asia



- ADS-B (in red)
- More to do, but much achieved !

Task Force has produced :



- ADS-B Implementation Guidance Material
 - Guidelines for Airworthiness/Operational Approval for ADS-B
 - Avionics Baseline ADS-B service performance parameters
 - Guidance on building a safety case for ADS-B
 - Sample data sharing agreement
 - Guidance on multisensor fusion inc ADS-B
 - Guidelines for development of an ADS-B Plan
 - Surveillance Strategy for Asia Pacific
 - Guidance Material on Comparison of Surveillance Technologies
 - Guidance material on use of Asterix Cat21 for ADS-B messages
 - Guidance for advice to military regarding ADS-B data sharing
 - Updated AIGD (TBD)
-
- We have also educated hundreds of people

We are planning multi state projects

-3-

SEA ADS-B WG/6 - WP/5
24/02/11

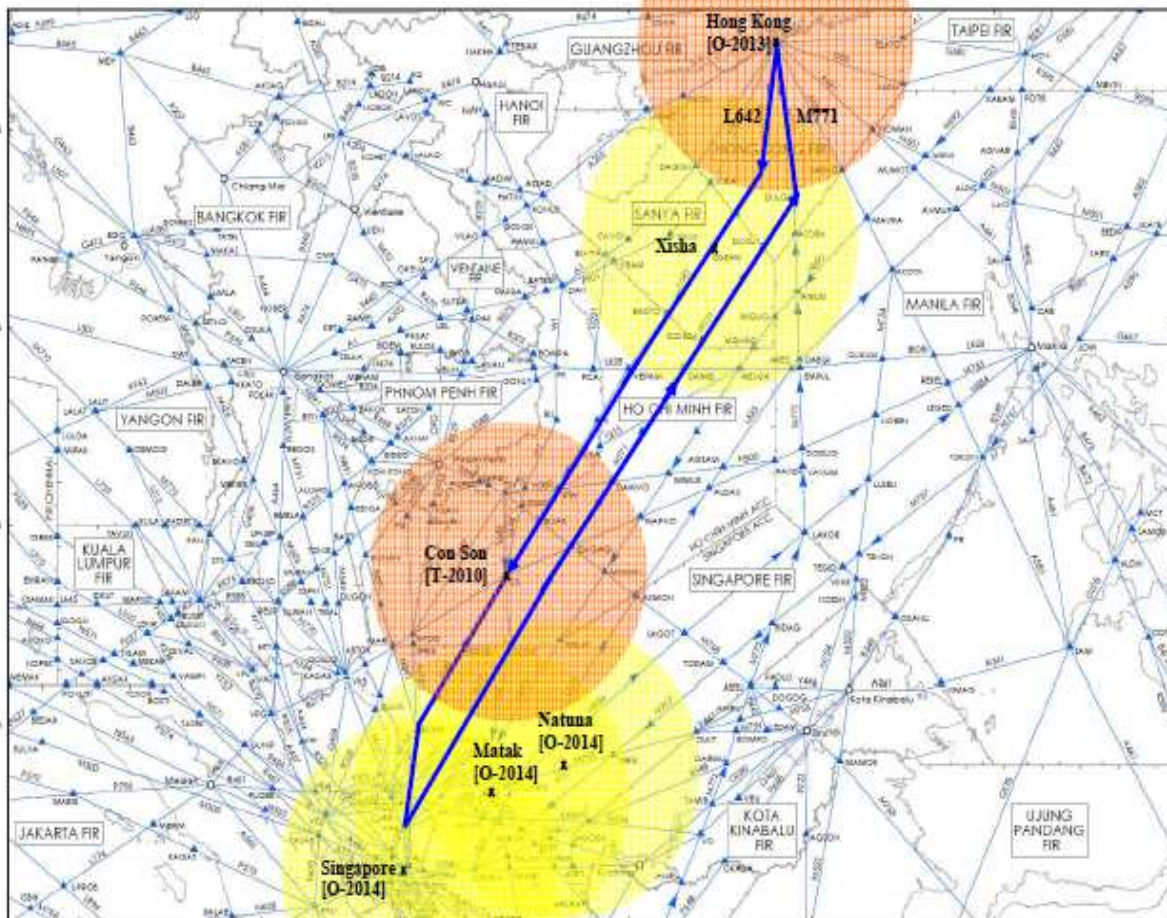


Figure 1 : ADS-B Implementation in South China Sea

SEA project 1

Singapore
Vietnam
Hong Kong China
China

SEA project 2

Singapore
Philippines
Malaysia
Indonesia

BoB

India
Myanmar
Maldives
Sri Lanka

First mandates effective in 34 weeks



- Australia (2013) **
- Singapore (2013) **
- Hong Kong China (2013) **
- USA (2020)

- Fiji (2010)
 - Domestic fleet equipage
 - exemptions granted till December 2013
- India ?
- Indonesia ?
- PNG ?

A poster with a dark blue background. At the top, a light blue banner reads "GET FITTED 12 DEC 2013". Below this, the text "ADS-B" is written in large, bold, light blue letters. To the right, a white commercial airplane is shown in flight, leaving a long, white contrail that streaks across the sky. At the bottom, there is white text providing information about the ADS-B mandate in Australia.

The deadline for mandatory fitment of ADS-B technology in Australian upper airspace is now less than two years away.

Operators of aircraft flying at and above 29,000 feet (FL290) must have ADS-B equipment installed and operating correctly by 12 December 2013.

More information: www.airservicesaustralia.com/projects/ads-b

The airservices logo is located in the bottom right corner of the poster, with the tagline "connecting australian aviation" underneath it.

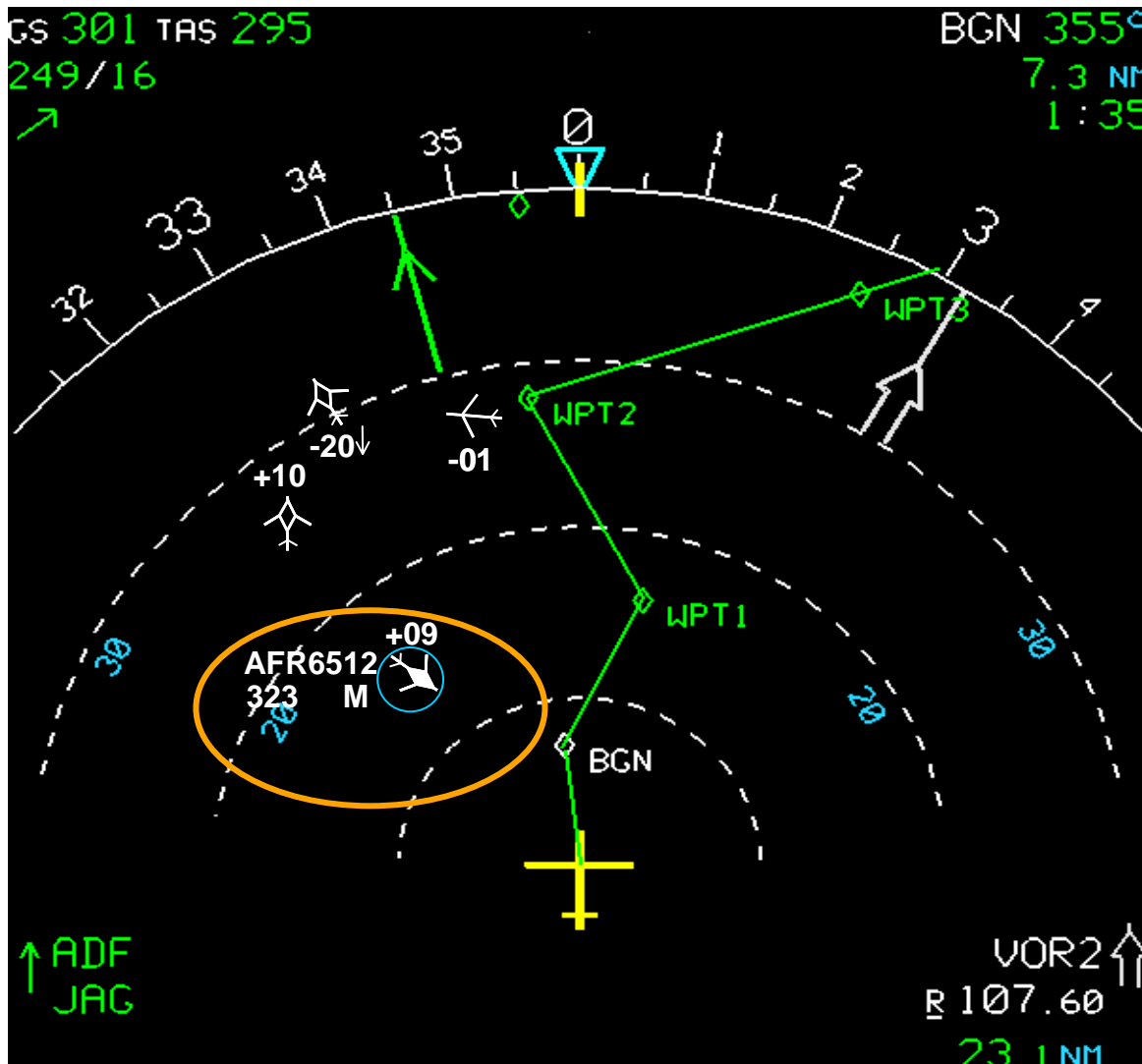
We know the Benefits of Surveillance



- Improved safety
 - ✓ Automated safety alerts for ATC
 - ✓ Increased situational awareness for ATC
 - ✓ Improved Search & Rescue
 - ✓ Less transactional work for ATC/Pilots
- Improved efficiency for users
 - ✓ Reduced & more flexible separation standards
 - ✓ More clearances to requested route/level
 - ✓ Reduced stepped climb/descent
 - ✓ Increased flexibility in poor weather
 - ✓ Less delay
 - ✓ Lower pilot workload
 - ✓ Reduced fuel burn & operating time

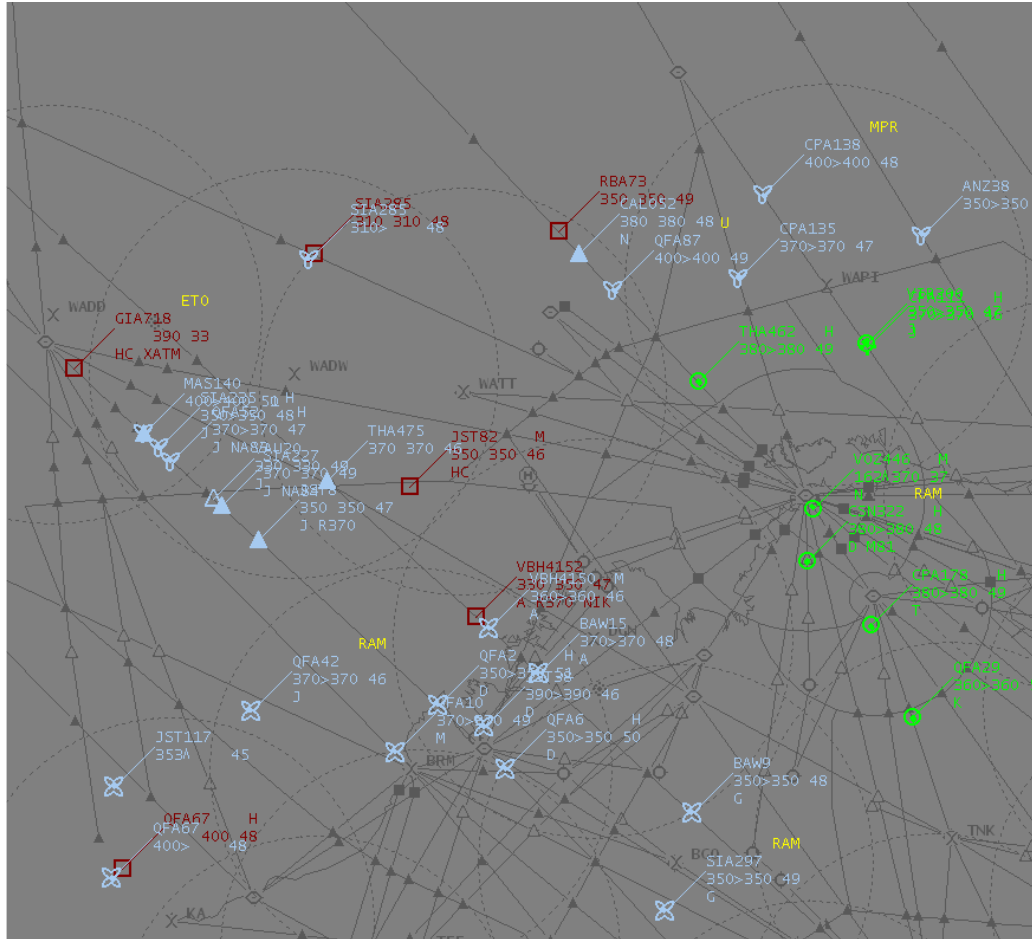


We know ADS-B provides lower cost surveillance



plus provides base for ADS-B IN

Some states : Fully operational



- Operational Ground stations
- ATC in operation with ADS-B
- 5 nautical separation standards
- Reaping benefits
 - ➔ Low cost surveillance
 - ➔ Safety
 - ➔ RVSM monitoring
 - ➔ Data sharing

Some states are implementing



- Ground stations being acquired and deployed
- ATC systems being upgraded
- Rulemaking in progress
- ATC training
- Procedure development
- Safety cases

Some states impeded



- Without a firm ADS-B plan
 - Some have radar and consider no need for ADS-B
 - But replacement is never far away
 - Others could benefit from ADS-B; but an impediment exists
Perhaps
 - Concern about reliance on GNSS
 - Too hard to equip fleet (always will be until you start)
 - Financial or budgetary constraints
 - NB: but customers want benefits from their investment
 - Unacceptable to mandate fitment of avionics
 - Capability constraints (complexity, knowledge, procedures, confidence)
 - Possibly blocking benefits to the Industry
 - Possibly preventing a seamless service

- How can ADS-B Task Force help?

ADS-B OUT and ADS-B IN features in ASBU Block 0

Recommendation 1/7 – Automatic dependent surveillance — broadcast

That States:

- a) recognize the effective use of automatic dependent surveillance — broadcast (ADS-B) and associated communication technologies in bridging surveillance gaps and its role in supporting future trajectory-based air traffic management operating concepts, noting that the full potential of ADS-B has yet to be fully realized; and
- b) recognize that cooperation between States is key towards improving flight efficiency and enhancing safety involving the use of automatic dependent surveillance — broadcast technology;

That ICAO:

- c) **urge States to share automatic dependent surveillance** — broadcast (ADS-B) data to enhance safety, increase efficiency and achieve seamless surveillance and to work closely together to harmonize their ADS-B plans to optimize benefits.

We are doing it already

To convert talk to reality !



How to get ADS-B fitment to occur

- Provide a service to those equipped
- Publish mandates – difficult if you do not provide a service
- Work with your key airlines (they become champions)

How to deliver a service

- Develop a step by step plan and obtain approval of the plan
 - Fill coverage holes to start
 - Talk to neighbours
- Get a project established to consider all aspects

Conclusion



- We have come a long way with ADS-B
- But we have taken a long time
- Consider your ADS-B plan
- And move to implementation
- Tell the Task Force meeting about what the blockages are.
 - ➔ How we can help?

Conclusion + 1

- Happy 10th Birthday !!!! = TEN years of ADS-B SITF

