ADS-B Applications

APANPIRG ADS-B TASK FORCE SEMINAR
Nadi, Fiji

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Technology Development
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ADS-B & Related Applications

Air-Ground Surveillance

- ADS-B In place of EXISTING RADARS (Controlled Airspace)
- ADS-B Instead of New RADARS (Controlled Airspace)
- Enable Airspace Access
- ADS-B At FIR Boundary
- Positional feed To Airlines
- Improved surface Movement “radar”
- Parallel Runway Monitoring

2006

- Improved TCAS
- ADS-B IN TRAIL CLIMB (Oceanic)
- ADS-B TRAFFIC DISPLAY SITUATIONAL AWARENESS (Safety)

2010

- SEQUENCING & MERGING Application
- PASS BEHIND Application
- DELEGATION TO PILOTS
- Non Precision Approach Without NAVAIDS
- Remove percentage of NAVAIDS
- Area navigation (Enablers for UPT, UPRs etc )
- LOW cost MOVING MAP displays
- Low cost TERRAIN AWARENESS
- Airport surface pilot situational awareness

Air-Air Surveillance

(only when appropriate aircraft have ADS-B out)

NAVIGATION “Spin offs”

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RFG Package 1 applications

• Documents being developed by RFG (FAA-Eurocontrol)

• Initial **Ground Surveillance** applications
  – ATC surveillance for radar airspace (ADS-B-RAD);
  – ATC surveillance in non-radar areas (ADS-B-NRA);
  – Airport surface surveillance (ADS-B-APT); and
  – Aircraft derived data for ground tools (ADS-B-ADD).
**Bundaberg trial**

- Deployed and operationally commissioned ADS-B
  - In a limited geographic area
  - Equipped 9 aircraft
  - Dh8, Shorts, B200, Jabiru

- Objective: Learn operational lessons

- One ground station (Sensis Corporation)

- CASA approved 5Nm separation services
A new era in air traffic surveillance

Automatic Dependent Surveillance Broadcast

What the air traffic controller sees

Recorded ADS-B operations from Brisbane Centre

= ADS-B derived position
= RADAR derived position
Incident review

Summary All Incidents

- Inadequate coordination at sector: CO-ORD TIME, 19
- AIRCRAFT at FIR without warning: AWARENESS, 24
- AIRCRAFT on wrong route: RAM-FLIPCY, 22
- AIRCRAFT with bad estimates: ETO, 27
- AIRCRAFT @ wrong flight level: CLAM, 62
- Not ADS-B: 262

ADS-B would not have assisted
ATM Discontinuities

• Every FIR boundary represents a
  – Discontinuity
  – Different database
  – Risk, errors, different views of “true” situation

• Surveillance provides
  – Feedback (closes the loop)
    → Rather than 30 minute position & level reports
  – Detects errors/ blunders
    → ATC, pilot, other ATC
    → Minimises the IMPACT of errors

• ADS-B provides inexpensive means to share data
  – For co-operative aircraft
  – No threat to military
Asia Pacific Perspective

• Need for basic surveillance

• Need for low cost and low maintenance infrastructure

• ADS-B can provide immediate
  – Safety & efficiency benefits
  – Compared to procedural ATC

• Can enhance radar coverage in some states
Asia Pacific Needs are different to USA/Europe
Asia Pacific Needs are different to USA/Europe

~33 ADS-B sites < $20M USD
~21 ADS-B sites
< $13M USD
1st Tier “Radar like” services

• Radar like performance
  – For separation
  – For vectoring

• High performance
  – Reliability
  – Integrity
  – Latency

DUPLICATED ADS-B GROUND
AT NEW or OLD SITE

DUPLICATED DATA FEED

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Second Tier service concept

• Where it is too expensive for
  – High reliability (eg duplicated)
  – Low latency (say 10 seconds)

• Could use a third party communications provider

• Reduced services
  – Eg No vectoring and perhaps increased separation
Envisaged 2nd Tier

- ADS-B
- ADS-C, ACARS data

Data provider site

EXISTING
- ADD ADS-B GROUND RECEIVER ONLY

Data Provider
Message network

SINGLE DATA FEED

NETWORK DELAYS

- Situational awareness
- Safety net alerts
- Search & Rescue
- Not 5nm separation
2nd Tier is useful & safe

• High integrity is retained (CRC, error correction, time tagged)

• Functions available
  – Safety alerts
  – Search & Rescue
  – ATC Situational awareness
  – FIR crossing coordination
  – Update FDP estimates
  – Support procedural standards (eg: aircraft passed)
Operational control
Airline Fleet management

• Obtain a “feed” from your ATC provider
  or

• Your own ADS-B Ground station

~$1200 USD on Internet
SURFACE MOVEMENT RADAR SUPPORT AT LOW COST
Cockpit Display Traffic Indicator
CDTI
CDTI & TCAS becoming available

- Garmin AT Certification flight of ADS-B avionics integrated with TCAS in UPS B767
- Other vendors have similar products available now or soon

Photo: Courtesy: UPS
Movie: Courtesy of Garmin AT
CDTI is being used

Email from UPS IPA Pilot to UPS Management

“Well, I’ve seen the light…

Last Friday night, I was flying into the SDF sort around midnight and the ADS-B/CDTI was showing almost all the inbound traffic as ADS-B equipped. The parade of inbounds could be easily seen on the screen. The reason for the occasional turn and/or speed reduction could be anticipated by a near radar like view of the traffic surrounding us and the flow to the final segment (NAV function displayed on CDTI). The situational awareness of the ATC environment was dramatically increased…

Pretty neat stuff”
A new era in air traffic surveillance

Cockpit Display of Traffic Information
PDA version for low end GA with moving terrain map
BAe Systems : Pass Behind application demo
ADS-B will change Air Traffic Management

• The world is adopting ADS-B

  – Significant impact on ATC, Procedures, Airspace, and Technology

  – In Europe
    ➔ Air-Ground : Eurocontrol just ordered 5 Thales ADS-B
      Ground stations & 4 Raytheon ADS-B ground stations
    ➔ Air-air surveillance : Significant work in progress & trials

  – In USA
    ➔ Significant investment in “Safe Flight 21 Project”
    ➔ Discussing replacement of enroute SSR radars with ADS-B
Discussion

More details on Airservices Website

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