ADS-B and WAM Implementation

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Christos Rekkas,
Head of the CASCADE Programme Section
Directorate Network Management, EUROCONTROL
ADS-B/WAM Deployment – CASCADE

- Wide Area Multilateration (WAM)

Ground Surveillance Applications (ADS-B Out)
- Enhanced ATS in Non-Radar areas (NRA)
- Enhanced ATS in Radar areas (RAD)
- Airport Surface Surveillance (APT)
- Aircraft derived data (ADD)

- Airborne Surveillance Applications (ADS-B In ATSAW)
  - Enhanced TSA during Flight operations (AIRB)
  - In Trail Procedure (ITP)
  - Visual separation on approach (VSA)
  - Enhanced TSA for Surface operations (SURF)

ATS – Air Traffic Services
TSA – Traffic Situation Awareness

Interval Management (FIM - ADS-B In Spacing)
ADS-B and WAM deployment in Europe

**WAM**

WAM / ADS-B Ground system Deployment

**Pioneer Phase**

Voluntary implementation in pocket areas
Certified existing equipage
Avionics: AMC20-24

European Commission Single European Sky Surveillance Performance & Interoperability Implementing Rule (SPI IR)

**Mandate Phase**

IR based implementation in wider areas
Upgraded equipage
Avionics: EU Reg. 1207/2011

**ADS-B OUT**

2015 Forward-fit
2017 Retro-fit

**ADS-B IN**

Pioneer Phase
Voluntary implementation in wider areas
New equipage
Avionics: AMC20-24 and later Regulation 1207/2011
EC Implementing Rule (1/2)

Regulation (EU) 1207/2011

- All aircraft flying IFR/GAT
  - Mode S ELS
- Aircraft flying IFR/GAT >5700 kg or >250kts TAS
  - Mode S EHS & ADS-B Out
- Option for ADS-B specific airspace mandate

Aircraft operators
- Forward fit 8 Jan 2015
- Retrofit 7 Dec 2017
- Provisions for State a/c (Article 8)
  - 7 Dec 2017 (Mode S ELS)
  - 1 Jan 2019 (Mode S EHS and ADS-B in transport-type aircraft)
EC Implementing Rule (2/2)

Regulation (EU) 1207/2011

Exemptions for State a/c (Article 8):

- Mode S ELS (to be communicated by 1 July 2016)
- ADS-B and Mode S EHS (by 1 July 2018)
- Justifications necessary
  - Technical Reasons
  - Out of operations by 1/1/2020
  - Procurement constraints
    - Procurement Plans
Expected ADS-B coverage from current and planned WAM & ADS-B deployment

The date for ADS-B operational use varies per ANSP and aircraft equipage:

- **Current avionics**
- **SPI IR avionics** (from 2015-2017)
Aircraft readiness for ADS-B Out operations

Compliance to EASA AMC20-24 provisions
- ~5500 aircraft compliant
- ~1300 aircraft operationally approved

Compliant to the EU Regulation 1207/2011 (SPI IR) provisions
- First a/c from mid-2012 onwards
- Few test aircraft analysed so far (AIRBUS A380 and Dassault Falcon)
- EASA CS-ACNS NPA expected to be released Q4 2013

Global harmonisation on ADS-B
- Australia, Canada, Europe, USA, ICAO etc.
11000 ADS-B aircraft in the Database
11 billion ADS-B reports
2700 aircraft monitored
1300 aircraft are approved for ADS-B based ATC services (AMC20-24)

International co-ordination

Latency 95% (sec)

Total Position Error 95% (m)
ADS-B Out Mixed Traffic

- Proposed position by the CASCADE Deployment TF
  - Need to establish a homogenous (non-mixed) traffic of ADS-B
    - ASAP at local level (the option selected will be site specific)
    - From 2020 Europe wide mandate (SPI IR2)
  - In parallel…
    - Continuous ADS-B performance analysis to establish “List of non-performing a/c”
    - Consider Incentives
    - Co-ordinate use of Flight plan as indication of ADS-B approved aircraft
    - Investigate banning of transmissions from non-approved aircraft

- CASCADE Deployment TF Consultation practically completed
- Includes MIL considerations (non-unique 24-bit address, lead time for Rule etc.)
- Proposal to be submitted to SUR SG in October and then to CNS Team
- Aim is to complete the approval process asap and start actions (e.g. SPI IR2)
### ATSAW Pioneer Project

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>ADS-B IN installation type</th>
<th>Number of Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>B777</td>
<td>EFB Class 3</td>
<td>4</td>
</tr>
<tr>
<td>B767</td>
<td>EFB Class 3</td>
<td>3</td>
</tr>
<tr>
<td>A330</td>
<td>Integrated display system</td>
<td>16</td>
</tr>
<tr>
<td>A330</td>
<td>EFB Class 3</td>
<td>5</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>28</strong></td>
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</tbody>
</table>

- First ATSAW certified aircraft delivered June 11
- First ATSAW Operations by Swiss 7 Feb 12
- Hundreds of flights performed so far
- Results and pilot feedback by Swiss being analysed
- Delta and Virgin about to start operations
Security Issues

• Security issues raised were addressed through a Civil-Military Action Plan
• Mitigation measures were defined
  • Identification
  • Spoofing
    • Mono-sensor environment
    • Multi-sensor environment (e.g. ADS-B with WAM)
• Prototypes under development by major European manufacturers including relevant functionality
  • SESAR project 15.4.5a & b
• ASTERIX Category 021 updates specified
ADS-B In/Out for Military Aircraft
SESAR Project 9.24

- Alenia (PM), Selex, Thales, EUROCONTROL
- May 2010 – Dec 2013
- Define requirements (functional, HMI, architecture) and demonstrate the feasibility of ADS-B In/Out solutions for all types of State a/c
- Identify solutions to re-utilise the Mode S component of military transponders to support ADS-B

WA 1
Concept definition

WA 2
ADS-B integration

WA 3
Technical validation

- Currently in WA3 (Technical Validation)
- C27J selected for validation
Conclusions

- ADS-B “out” & WAM deployment ongoing
- Implementing Rule published
- Rationalised high performance Surveillance system
- ATSAW operations ongoing
- Civil-Military Interoperability