Airborne Separation Assistance System (ASAS) Thematic Network 2: ASAS applications maturity assessment

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• Automatic Dependent Surveillance – Broadcast (ADS-B)
  – ADS-B allows aircraft to broadcast identification, position, velocity, intent over ranges ~ 100 NM
  – ADS-B ground receivers enhance information for air traffic controllers
  – ADS-B technology invented 1980s. Now 40% of flights in Europe equipped with ADS-B Mode S extended squitter of which half broadcasting position
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Introduction (2/3)

• Airborne Separation Assistance System (ASAS) applications
  – **1983** “Analysis of in-trail following dynamics of Cockpit Display of Traffic Information (CDTI)”, Sorensen & Goka, NASA
  – **1994** Term “ASAS” introduced by CENA, France
  – **2001**: Principles of operation of ASAS, FAA/EUROCONTROL
  – **2002**: First package of ground surveillance and airborne surveillance applications defined, EUROCONTROL, European Commission
• ASAS Thematic Network 2
  – Sponsored by European Commission Directorate General Research 6th Framework
  – Three year project from April 2005
  – Aim: to accelerate the application of ASAS operations in European Airspace taking into account global applicability in order to increase airspace capacity and safety.
  – Managed by consortium: BAE Systems, ENAV, LFV, NLR, Thales ATM & Thales Avionics, EUROCONTROL (leader)
Objectives

• 5 ASAS workshops & final seminar
  – Malmo (Oct 2005), Rome (Apr 2006)
  – Glasgow (Sep 2006), Amsterdam (2007)

• Web-based ASAS related documentation

• Annual assessment of the maturity of global ADS-B/ASAS applications by ASAS-TN2 partners
Method (1/3)

• 17 ASAS applications in clusters
  – ADS-B surveillance
  – Airborne traffic situational awareness
  – ASAS spacing
  – ASAS separation
  – ASAS self-separation

• 12 ASAS specialists from:
  BAE systems (UK), ENAV (Italy), LFV (Sweden), NLR (The Netherlands), Thales ATM (France), Thales Avionics (France) and EUROCONTROL
• **Maturity metrics scale 0 to 4:**
  - Operational concepts
  - Benefits and constraints
  - Safety assessment
  - Procedures and human factors
  - Systems, HMI and technology
  - Transition issues

• **Results reviewed by 9 selected peers from US**
  (e.g. pilot working for Boeing) and Europe (e.g.
  EUROCAE)
Example metric - Operational concept

1 = Problem statement, identify solutions, concept generation (concept of operations)

2 = Preliminary Operational Concept Description (R&D Operational Service and Environment Description (OSED))

3 = Draft Requirements Focus Group (RFG) OSED in development (e.g. from R&D OSEDs, trials and experiments, initial OSED) – mature and in review.

4 = Consolidated OSED - Published
Air Traffic Control surveillance in non-radar areas (ADS-B surveillance)

- **Objective:** to provide ATC surveillance in non-radar areas e.g. remote areas, offshore, operation areas, any continental areas and certain oceanic areas, which, due to traffic level or cost of equipment could not justify installation of radars.

- **Benefits:**
  - Surveillance with accurate position and track prediction (accuracy does not vary with range and bearing)
  - Controller can provide radar-like separation services instead of procedural

- **Implementation considerations**
  - No detrimental impact on flight crew
  - Large network of ground ADS-B receivers
Results (2/5) – relatively mature

Air Traffic Control surveillance in non-radar areas (ADS-B surveillance)

- European R&D projects: NUP-1 & 2, MEDUP, SEAP
- EUROCONTROL CASCADE CRISTAL validation trials
- Australia plan daily nationwide upper airspace coverage by 2007
- Capstone Alaska since 2001
- ICAO OPLINK and SASP developing separation standards
Results (3/5) – medium maturity

In-trail procedure in non-radar oceanic airspace
(Airborne traffic situational awareness)

• Objective: to allow in-trail ADS-B equipped aircraft in non-radar oceanic airspace, which may not be longitudinally separated from each other, to climb or descend through each other’s flight levels.

• Benefits: Improved utilisation of the North Atlantic oceanic airspace by facilitating a higher rate of flight level changes yielding better flight efficiency (e.g. fuel savings, increased payload, reduced gaseous emissions, avoiding turbulent flight levels)
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Results (4/5) – medium maturity

In-trail procedure in non-radar oceanic airspace
(Airborne traffic situational awareness)

- Concept quite stable - RFG draft OSED
- Benefits identified
- Safety – Operational Hazard Analysis on-going
- Procedures – defined in OSED and validation on-going
- Real-time simulations performed for airborne
- Mixed fleet equipage acceptable

Maturity scores

- Operational concept
- Transition issues
- Benefits & constraints
- Systems, HMI & Technology
- Procedures & human factors
- Safety

Concept quite stable - RFG draft OSED
Benefits identified
Safety – Operational Hazard Analysis on-going
Procedures – defined in OSED and validation on-going
Real-time simulations performed for airborne
Mixed fleet equipage acceptable
Enhanced crossing and passing (ASAS spacing)

- Objective: to provide controller with new set of instructions to solve conflicts e.g. directing flight crews to cross or pass designated traffic aircraft while maintaining a given spacing value.
- Immaturity due to similar application in ASAS separation being preferred.
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Conclusion

• Presented to audience of over 120 at ASAS-TN2 workshop in April 2006 in Rome
• Feedback positive – useful for planning priorities
• Report available on ASAS-TN2 website (http://www.asas-tn.org)
• Notification of 7,000 ATM stakeholders through article in EUROCONTROL Experimental Centre newsletter
• Annual updates by ASAS-TN2 in 2007 & 2008