ICAO South America Seminar

Thierry TIN HIN
Airline CNS/ATM Support
Flight Operations Support & Services

Solutions and Roadmap
FANS and ADS-B

Contents

- Data Link Communication Reminders
- The Complete Range of AIRBUS FANS Solutions
- ADS-B Reminders
- The Complete Range of AIRBUS ADS-B Solutions
- The AIRBUS Support
FANS concept – Ground networks

ACARS

Aircraft Communication and Addressing Reporting System

Oceanic and Remote areas

**AIRBUS solution**: FANS A+ package

FANS A+ = Upgrade of FANS A

FANS B+ = Upgrade of FANS B

ATN

Aeronautical Telecommunication Network

Continental areas since end of 2006

**AIRBUS solution**: FANS B+ package

Architecture in ACARS Environment – FANS A+

SATCOM

VDL-A

VDL-2

HFDL

ATSU

Avionics

Air/Ground media

Ground network

Ground users

ACARS

AOC

ATC
Architecture in ATN Environment – FANS B+

Datalink Roadmap for the Future

SC214/WG78 – Advanced ATS Datacomm Services
Active AIRBUS participation
1st SC214/WG78 deliverable: DEC 2011
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AIRBUS FANS Solutions

- FANS A+ over ACARS in oceanic and remote areas
  
  COM: CPDLC
  SURV: ADS-C

- FANS B+ over ATN in continental areas
  
  COM: CPDLC

ATS 623 applications
  - Digital ATIS – D-ATIS
  - Departure Clearance – DCL
  - Oceanic Clearance – OCL

ATS 623 applications
  - Digital ATIS – D-ATIS
  - Departure Clearance – DCL
### Introduction to FANS A+

| FANS A | 1st AIRBUS product capable of CPDLC over ACARS  
|        | Certified in 2000 on A330/A340  
|        | Initial CPDLC & ADS-C operations in the Pacific |
| FANS A+ | Upgrade of FANS A  
|        | Certified in 2004 on A330/A340 aircraft, later on A320 Family aircraft and A380 aircraft  
|        | Enhancement (in-service experiences) for FANS 1/A operations all over the world |
| FANS A+ Options | HF Data Link (HFDL)  
|        | VHF Data Link Mode 2 (VDL 2): Higher data rate compared to VDL Mode A  
|        | ATS 623 Departure & Oceanic Clearances, D-ATIS |
| FANS A+ DR | Upgrade of FANS A+  
|        | Certification planned in 4Q2011 on A320/A330/A340  
|        | Data link recording by CVR (FAA/EASA)  
|        | Enhancement based on in-service experiences (e.g. frequency loading into RMP) |

*A380 FANS A+ already capable of data link recording by CVR*  

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### Introduction to FANS B+

| FANS B | 1st AIRBUS product capable of ATN/VDL2 for CPDLC  
|        | Certified in OCT 2006 on A320 Family  
|        | LINK 2000+ Pioneer phase |
| FANS B+ | Upgrade of FANS B  
|        | Certified in NOV 2010 on A320 Family  
|        | Eligible to LINK 2000+ Incentive & Mandate phases  
|        | Protected Mode (PM): Voice read-back no longer required |
| FANS B+ Options | Frequency loading into RMP  
|        | Data link recording by CVR (FAA, EASA)  
|        | ATS 623 Departure Clearance & D-ATIS |
AIRBUS FANS in A320/A330/A340 Cockpit

DCDU: Datalink Control & Display Unit

AIRBUS FANS in A380 Cockpit

A350 will apply the same with integrated HMI for FANS A+ and FANS B+, to be retrofitted on A380 afterwards.

Commonality with A320/330/340 operating principles

A380 Cockpit interactivity = More efficient workflow
Functional Architecture of Current Solutions

Applications
- FANS A+ (AFN, CPDLC, ADS-C, OCL, DCL, D-ATIS)
- FANS B+ (CM, CPDLC, DCL, D-ATIS)

Cockpit Interfaces
- FMS
- CVR
- RMP

A/G Router
- ACARS

Comm Means
- VDL A
- VDL2
- SATCOM
- HFDR

System Architecture of Current Solutions

Applications
- IMA ATC

Cockpit Interfaces
- RMP

A/G Router
- ACR

Comm Means
- VDR
- SDU
- HFDR

LRU ATSU

A320/A330/A340

A380/A350
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ADS-B Concept – ADS-Broadcast

Surveillance with ADS-B
Mode S Transponder

Automatic: No action required from flight crew
Dependent: Aircraft position provided by aircraft
Surveillance

Broadcast:
Transmission of data without solicitation

ADS-B data:
- GPS position (lat, long, altitude)
- Aircraft identification
- Ground speed
- Vertical speed
- Track
- Wake vortex category
- Etc.

Surveillance with SSR
Modes A, C, S

Interrogation
1030 MHz

Reply
1090 MHz

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### ADS-B Concept – ADS-B Applications

**Surveillance with ADS-B**
- Mode S Transponder

**ADS-B IN**
- TCAS capable of ADS-B IN

**ADS-B OUT**
- CAPABILITY TO TRANSMIT ADS-B DATA
  - ADS-B NRA: Non Radar areas
  - ADS-B RAD: Radar areas
  - ADS-B APT: Airport surfaces

**ADS-B IN**
- CAPABILITY TO RECEIVE ADS-B DATA
  - ATSA AIRB: Airborne operations
  - ATSA ITP: In Trail Procedure
  - ATSA VSA: Visual Separation on Approach
  - ATSA SURF: Airport Surfaces

### ADS-B Concept – Operational Benefits

**ADS-B OUT**
- **Ground perspective**
  - ADS-B NRA (Non Radar Areas)
    - Provides SSR-like surveillance services (e.g. 5 NM longitudinal separation)
    - With cheaper installation
    - Where SSR does not exist or is not justified by traffic volumes.
  - ADS-B RAD (Radar)
    - Provides SSR surveillance services
    - Decommissioning of redundant SSR
    - In combination with other surveillance sensors (WAM, SSR, or PSR).
  - ADS-B APT (Airport)
    - New tool for surface movement surveillance.

**ADS-B IN**
- **Cockpit perspective**
  - ATSA SURF
    - Enhanced traffic awareness during surface operations (taxi, take-off, landing) = safety enhancement.
  - ATSA AIRB
    - Enhanced traffic awareness during airborne operations.
  - ATSA – ITP (In Trail Procedure)
    - More FL change opportunities (optimum FL, turbulence) = fuel savings, safety enhancement.
  - ATSA VSA (Visual Separation on Approach)
    - More successful landing, less go-arounds = approach throughput, fuel savings, etc.
### ADS-B concept – Operational benefits

<table>
<thead>
<tr>
<th>ADS-B OUT</th>
<th>ADS-B IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground perspective</td>
<td>Cockpit perspective</td>
</tr>
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</table>

- **Flight efficiency**
- **Safety**
- **Fuel burn**
- **Environmental emissions**

### Contents

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## AIRBUS ADS-B Roadmap

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<th>ADS-B OUT</th>
<th>ADS-B IN</th>
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<tr>
<td>Step B</td>
<td>ELS/EHS Certification &amp; ADS-B OUT Capacity</td>
<td>Available</td>
</tr>
<tr>
<td>Step 1A</td>
<td>ADS-B NRA</td>
<td>DO 260 (certified): A320/330/340</td>
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<tr>
<td>Step 1B</td>
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<td>TBD</td>
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<td>Step 1C</td>
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<td>TBD</td>
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<td>Step 2B</td>
<td>ATSA SURF</td>
<td>Feasibility study in progress</td>
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<tr>
<td>Step 3</td>
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<td>Step 4</td>
<td>Separation</td>
<td>R&amp;T</td>
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### AIRBUS Solutions and Roadmap for FANS and ADS-B

### ATSAW in A320/330/340 Cockpit

- **New Interaction Means**
- **New Symbology**
- **Additional Textual Information**
TCAS and ATSAW Symbols

<table>
<thead>
<tr>
<th>TCAS Only</th>
<th>ADS-B Only</th>
<th>TCAS + ADS-B</th>
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<tbody>
<tr>
<td><img src="image1" alt="Symbol" /></td>
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<td><img src="image5" alt="Symbol" /></td>
<td><img src="image6" alt="Symbol" /></td>
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</tbody>
</table>

- **Other Proximate**
- **TA**
- **RA**

- Track oriented
- Flight ID
- Ground Speed (kt)
- Wake Vortex Category (L/M/H)

ATSAW in A350 Cockpit

- **Same Symbology**
- **Commonality with A320/330/340 operating principles**

- **A350 Cockpit interactivity**
- **More efficient workflow**

- **Interaction Means**

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ATSAW display samples

- Better identification of traffic
- Better understanding of traffic environment
- Improved flight efficiency
Avionics architecture

Cockpit Interfaces

Applications

Computer

Sensors

SURV

AESS

ADS-B OUT

ATSAW

XPDR*

TCAS*

Mode S Antennas

GPS

TCAS Antennas

RA

* Capable of ADS-B Out  * Capable of ATSAW  Also capable of TCAS Chg 7.1

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AIRBUS Support to Airlines for FANS and ADS-B

**Engineering**
- Support to aircraft definition
- In-service support: Technical assistance to avionics configuration, investigation on in-service issues, technical briefing

**Flight Operations**
- Flight operations expertise
- Routine support, assistance to EIS and operational approval
- Academic training

**Documentation**
- AFM, FCOM, MMEL, AMM
- Airworthiness certification document for FANS/ADS-B/ATSAW
- Getting to Grips with FANS and Surveillance

**Summary 1/2**

<table>
<thead>
<tr>
<th>CPDLC</th>
<th>ADS-C</th>
<th>ADS-B OUT</th>
<th>ATSAW</th>
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<td>FANS A+ A350</td>
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<td>FANS A+ &amp; FANS B+ on A350 at EIS</td>
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</tbody>
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Summary 2/2

AirBUS is ready to support its operators for FANS, ADS-B, ATSAW EIS

- Same operating principles across A320/A330/A340 and A380/A350
- Optimized Flight Crew Workflow
- Designed to cope with future requirements with minimum hardware changes
- SESAR, NextGen Standard Applications

Cockpit Commonality
Seamless Cockpit Integration
Upgradable per design
Roadmap aligned with the Future