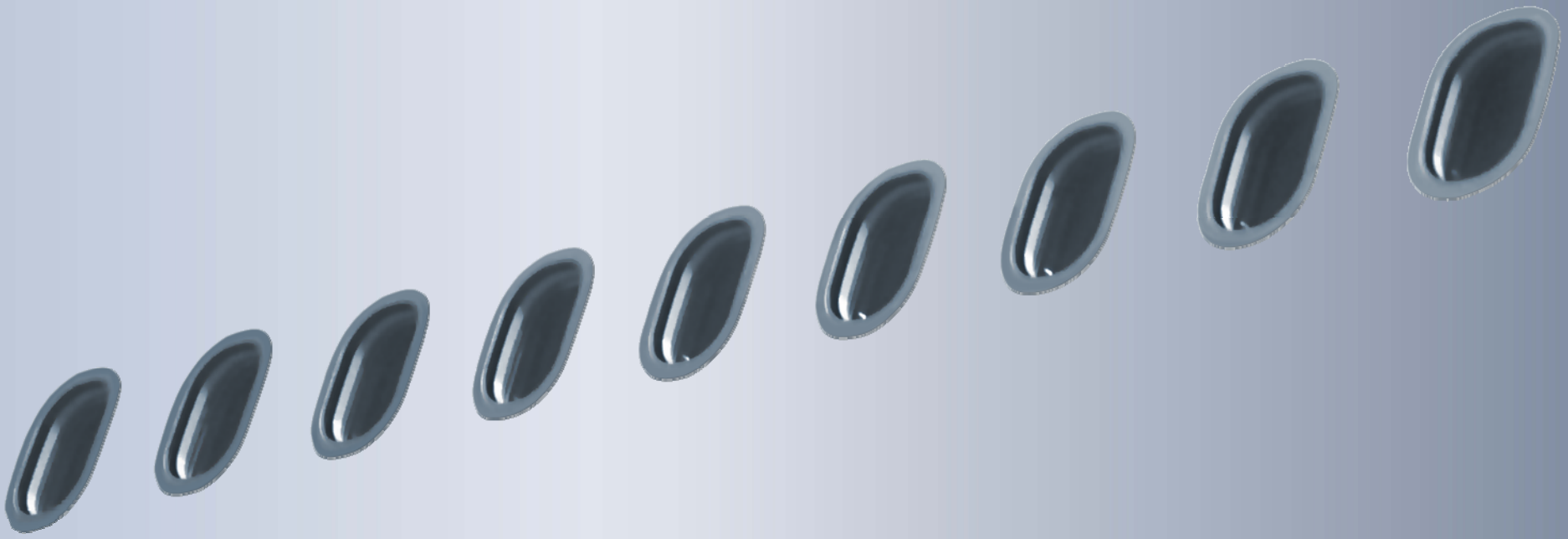

ADS-B task force - JEJU

ADS-B OUT

(Airborne Dependant Surveillance Broadcast)

Presented by
Laurent VIDAL - Surveillance systems manager – Support to sales & programs

AIRBUS

ADS-B Applications

ADS-B OUT

ADS-B IN

ADS-B OUT:
Capability to transmit ADS-B data

ADS-B IN:
Capability to receive ADS-B data

- **ADS-B data provided by transponder**
- **Need transponder ADS-B OUT capable**

- **ADS-B data received by TCAS**
- **Need TCAS ADS-B IN capable**

For ground use:

- ADS-B NRA: Non Radar areas
- ADS-B RAD: Radar areas
- ADS-B APT: Airport surfaces

For airborne use:

ATSAW (Air Traffic Situational Awareness)

- Step 2A: ATSAW operation in air
- Step 2B: ATSAW operation on ground

AIRBUS

ADS-B OUT - Operational Benefits

- **ADS-B NRA (step 1A):**
  - Traffic management as
  - Capacity increase by r
  - Cost effectiveness for
- **ADS-B RAD (step 1B):**
  - Enables to decommiss

  surveillance service.
  - Would be the primary
  - Usable in combination
- **ADS-B APT (step 1C):**
  - New tool for surface m
  - Safety enhancement

↗ Flight efficiency
↗ Safety
↘ Fuel burn
↘ Environmental emissions

ADS-B OUT – NRA application (Step 1A)

- **ADS-B NRA (step 1A): used in area not covered by SSR**
  - Safety enhancement
  - Traffic management as SSR like
  - Capacity increase by reducing the separation as SSR like (e.g. 5NM)
  - Cost effectiveness for airlines (better flight level…)
- **ADS-B RAD (step 1B): used in high density area (covered by SSR**
  - Enables to decommission redundant SSRs providing the same level of surveillance service.
  - Would be the primary mean of surveillance with radar as a back up.
  - Usable in combination with other surveillance sensors (WAM, SSR, or PSR)
- **ADS-B APT (step 1C): used on airport surface**
  - New tool for surface movement surveillance
  - Safety enhancement

ADS-B OUT – Airbus aircraft configuration for NRA

- Conditions to transmit ADS-B parameters on Airbus aircraft:

A320 & A330/A340 aircraft family:

- **EHS/ADS-B wiring provision (basic)**
- **Transponders capable of ELS/EHS/ADS-B:**
  - *–ACSS: P/N 7517800-10005A (DO-260)*
    P/N 7517800-10100 (DO-260A)
  - *–Honeywell: P/N 066-01127-1402 (DO-260)*
  - *–Rockwell Collins: P/N 822-1338-021 (DO-260)*
  - ➢ ***All transponders proposed by Airbus in line-fit are ELS/EHS/ADS-B capable.***
- **MMR (any vendor) OR some GPSSU (not all)**
  - ➢ **In line-fit, Airbus aircraft are only fitted with MMR**

A380:

- **EHS/ADS-B parameters provided by AFDX (basic)**
- ***AESS H04S05 (compliant DO-260A)***

- No need of pin programming to activate ADS-B data transmission.
- Need certification for operational use if required by regulation.

ADS-B OUT – Certification status for NRA

- ADS-B OUT for NRA operation has been certified on Airbus aircraft by EASA in compliance with AMC-20-24:
  - A330/A340 aircraft family since April 2008
  - A320 aircraft family since July 2008
  - A380 since June 2009

ADS-B OUT – Certification status for NRA

- As per EASA AMC-20-24 some AIRBUS documentation are required for operational approval:
  - **Update of AFM:** Statement of compliance with AMC 20-24
  - **ADS-B OUT Capability declaration document:**
    - Providing description, interoperability, safety and performance demonstration, specificities…etc
    - Referenced in AFM.
    - Useful for airline discussions with its Authority
- Others Airbus documentation update (not required by EASA):
  - **FCOM:** System description.
  - **MEL:** As required by regulations. To refer to your Authority for dispatch conditions.

ADS-B OUT – Certification status for NRA

Exemple of content of AFM page for A330/A340

Reference to compliance with AMC-20-24

ADS-B OUT

The extended squitter ADS-B Out function has been demonstrated to comply with airworthiness requirements for ADS-B Out in Non-Radar Areas contained in AMC 20-24. This approval is based on standards, descriptions, operational procedures and limitations contained in "ADS-B Out Capability Declaration" document reference X3452D07018335 (certification reference 00F340P5144/C0S) at the latest issue.

Note : 1. Direct ATC controller-pilot VHF voice communications must be available to conduct ADS-B out operations in non-radar areas.

2. Compliance with the above does not constitute an operational approval.

Reference to ADS-B OUT Capability Declaration

ADS-B OUT - Program Offerability for NRA

- Forward fit
  - ADS-B OUT certification proposed as an option on production aircraft
    - SA: CN.34.52.117 / 02
    - LR: CL.34.52.102 / 01
    - A380: CR.34.71.200 / 01

- Retrofit
  - Airbus Service Bulletin for ADS-B OUT certification available
    - SA: SB 34-1418
    - LR: SB 34-3219 (A330), SB 34-4223 (A340-200300), SB 34-5065 (A340-500600)
    - A380: SB 34-8012
  - Contact SEUY department for retrofit (C.Vigier: christine.vigier@airbus.com)
    - For all equipments relative to ADS-B OUT

ADS-B OUT - ADS-B in-service aircraft status

• ADS-B in service installation status (March 2012, March 2011)

Does not include configuration changes managed through STC

Aircraft family	A320		A330/A340		A380	
Total number of a/c	5013 *(4624)*		1228 *(1152)*		64 *(45)*	
Nb of a/c **NOT** ADS-B OUT capable	1523 *(1577)*	**30%** **(34%)**	109 *(118)*	**9%** ***(10%)***	0 *(0)*	**0%** ***(0%)***
Nb of a/c ADS-B OUT **capable** (*)	3490 *(3047)*	**70%** ***(66%)***	1119 *(1034)*	**91%** ***(90%)***	64 *(45)*	**100%** ***(100%)***
Nb of a/c ADS-B OUT **capable without** AMC-20-24 compliance (**)	2858 *(2636)*	**57%** **(57%)**	400 *(505)*	**33%** ***(44%)***	20 *(15)*	**31%** ***(33%)***
Nb of a/c ADS-B OUT **capable with** AMC-20-24 compliance (**)	632 *(411)*	**13%** ***(9%)***	719 *(529)*	**59%** ***(46%)***	44 *(30)*	**69%** ***(67%)***

(*) ADS-B OUT capable means the aircraft is equiped with the required equipments (transponder, MMR…)

(**) the AMC-20-24 compliance has to be requested by airline to Airbus (AFM, FCOM update…)

ADS-B OUT - ADS-B in-service aircraft status

• ADS-B in service installation status (March 2012, March 2011)

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Nb of a/c ADS-B OUT **capable without** AMC-20-24 compliance (**)						
Nb of a/c ADS-B OUT **capable with** AMC-20-24 compliance (**)						

- **More the a/c are recent more they are ADS-B OUT capable**
- **Increase of ADS-B OUT capability in 1 year**
- **Total of Airbus a/c ADS-B OUT capable: 74%**

(*) ADS-B OUT capable means the aircraft is equiped with the required equipments (transponder, MMR…)

(**) the AMC-20-24 compliance has to be requested by airline to Airbus (AFM, FCOM update…)

ADS-B OUT - ADS-B in-service aircraft status

• ADS-B in service installation status (March 2012, March 2011)

Does not include configuration changes managed through STC

Aircraft family						
Total number of a/c						
Nb of a/c **NOT** ADS-B OUT capable	(1377)	(34%)	(118)	(10%)	(0)	(0%)
Nb of a/c ADS-B OUT **capable** (*)	3490 *(3047)*	**70%** ***(66%)***	1119 *(1034)*	**91%** ***(90%)***	64 *(45)*	**100%** ***(100%)***
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Nb of a/c ADS-B OUT **capable with** AMC-20-24 compliance (**)	632 *(411)*	**13%** ***(9%)***	719 *(529)*	**59%** ***(46%)***	44 *(30)*	**69%** ***(67%)***

✓Even if the a/c is capable, operators don't request AMC-20-24 compliance if not necessary

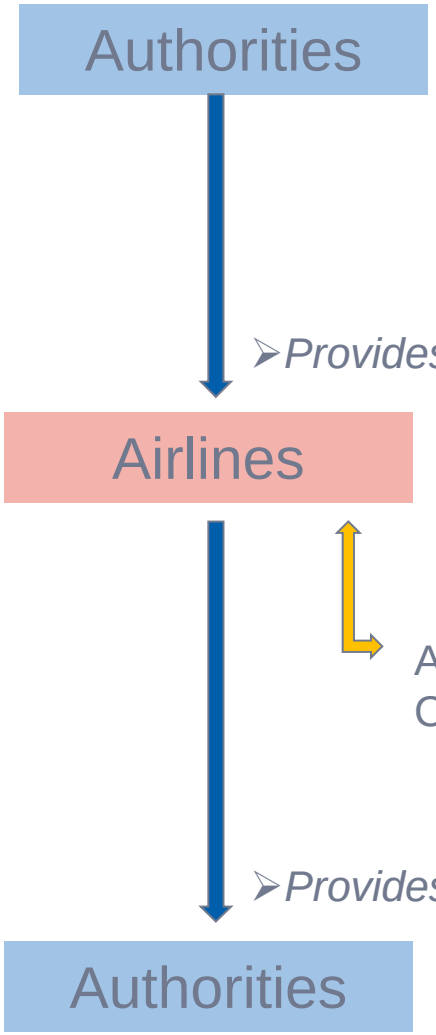
✓Most of them wait for mandates (e.g 2015 in Europe)

➢Authorities are urged to provide mandate.

(*) ADS-B OUT capable means the aircraft is equiped with the required equipments (transponder, MMR…)

(**) the AMC-20-24 compliance has to be requested by airline to Airbus (AFM, FCOM update…)

ADS-B OUT - Operational approval



- Define the operational safety case
- Identify their requirements for operational use:
  - At ground level (ANSP,…etc)
  - At the aircraft level
  - At operational level (procedure…)

➢ *Provides airlines with the aircraft requirements*

- Aircraft compliant with AMC-20-24
- Use ADS-B OUT Capability declaration document to verify if the Authorities requirements are met.

Airbus can support the airline if necessary through Customer Services departement :

- STL (Contact T.Tin-Hin: thierry.tin-hin@airbus.com)
- SEE (Contact J.L.Lacombe: jean-luc.lacombe@airbus.com)

➢ *Provides Authorities with a compliance status*

➢ *Provides airline with the operational approval*

ADS-B OUT – RAD application (step 1B)

- **ADS-B NRA (step 1A): used in area not covered by SSR**
  - Safety enhancement
  - Traffic management as SSR like
  - Capacity increase by reducing the separation as SSR like (e.g. 5NM)
  - Cost effectiveness for airlines (better flight level…)
- **ADS-B RAD (step 1B): used in high density area (covered by SSR)**
  - Enables to decommission redundant SSRs providing the same level of surveillance service.
  - Would be the primary mean of surveillance with radar as a back up.
  - Usable in combination with other surveillance sensors (WAM, SSR, or PSR)
- **ADS-B APT (step 1C): used on airport surface**
  - New tool for surface movement surveillance
  - Safety enhancement

ADS-B OUT – RAD application (step 1B)

ADS- B OUT for RAD *(application for high density airspace)*

- Enables to decommission redundant SSRs providing the same level of surveillance service.
- Would be the primary mean of surveillance with radar as a back up.
- Requirements documents for RAD operations:
  - AC-20-165 (FAA) and CS-ACNS-xxx(EASA – not published yet)
  - Requirements to be compliant with DO-260B
  - Updates in ADS-B OUT set of messages/performance
- Development of Airbus transponders DO-260B compliant has started in 2011 based on AC-20-165 (and CS-ACNS-xxx when available)
  - Need also new MMR requirements
- All next transponders standards will be certified with DO-260B compliance to satisfy the future European mandate (January 2015)

ADS-B OUT – RAD application (step 1B)

Scope of the modification for AC 20-165 compliance

- SW upgrade of all transponders:
  - New definition for integrity parameters (NIC/NAC/SIL)
  - Changes in transmission rates for the registers
  - Use of dual GPS input, taking the best source at any given time (between MMR 1 and 2)
  - Reduction of latency inside the transponder
  - ...
- HW modifcations for several transponders:
  - Depends on the supplier
- Aircraft level modifications:
  - New wiring
    - Connection between XPDR and FWC to declare the ADS-B failure at cockpit level: **NAV ADS-B RPTG FAULT**
    - Connection between XPDR and MMR1 and MMR2 to improve latency and availability of position source
  - New pin-programming
  - Pin reallocation
  - Operational documentation update
- MMR requirements: Sa Aware, availability, latency, velocity accuracy...

ADS-B OUT – APT application (step 1C)

- **ADS-B NRA (step 1A): used in area not covered by SSR**
  - Safety enhancement
  - Traffic management as SSR like
  - Capacity increase by reducing the separation as SSR like (e.g. 5NM)
  - Cost effectiveness for airlines (better flight level…)
- **ADS-B RAD (step 1B): used in high density area (covered by SSR**
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  - Would be the primary mean of surveillance with radar as a back up.
  - Usable in combination with other surveillance sensors (WAM, SSR, or PSR)
- **ADS-B APT (step 1C): used on airport surface**
  - New tool for surface movement surveillance
  - Safety enhancement

ADS-B OUT – APT application (step 1C)

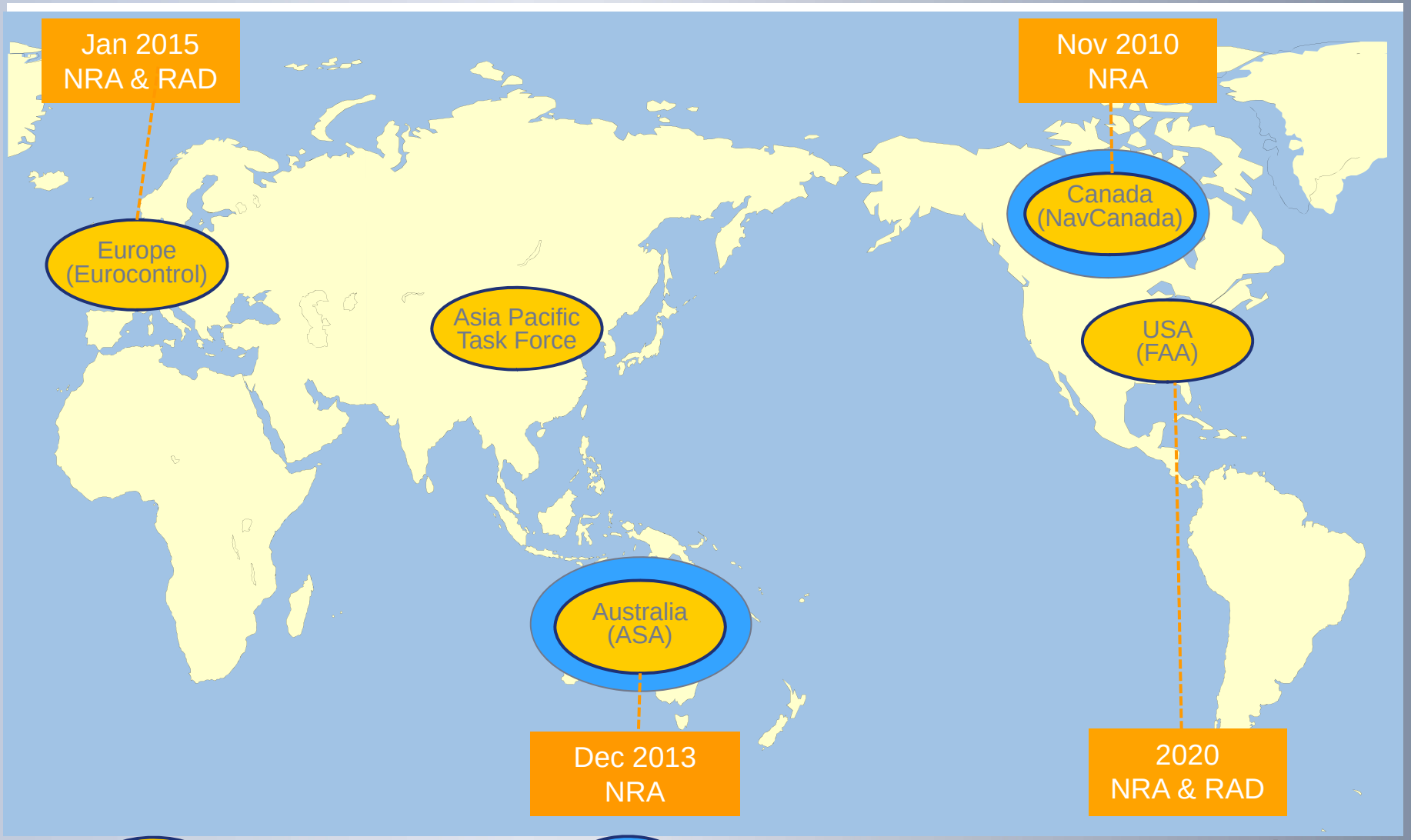
- ADS- B OUT for APT *(application for airports surface)*
  - New tool for surface movement surveillance
  - Standardization in progress
  - Light involvement from Airbus for the time being
  - DO-260B should fulfill APT requirements

- Airbus is aiming at minimizing implementation steps and ensuring cost effectiveness of standardized solutions

ADS-B OUT - Mandates

- **Canada** (Nav Canada): in the vicinity of Hudson Bay
  - Requirements for NRA operations: **Nov 2010** (first operations: January 2009)
  - DO-260 at the minimum
- **Australia** (Airservices Australia):
  - Mandate for NRA operations: **December 2013**
  - DO-260 at the minimum, GPS SA Aware
- **Europe** (Eurocontrol):
  - Mandate for NRA & RAD operations: **January 2015** (forward fit), **December 2017** (retrofit)
  - DO-260B required
- **US** (FAA):
  - Mandate for NRA & RAD operations: **2020**
  - DO-260B required

ADS-B OUT Implementation



Specific Airbus involvement

Requirements already covered by Airbus

QUESTIONS?

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