ADS-B Workshop SP/8

Presented by

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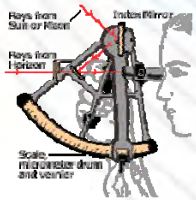


ADS-B OUT

ADS-B Airbus roadmap

ADS-B IN

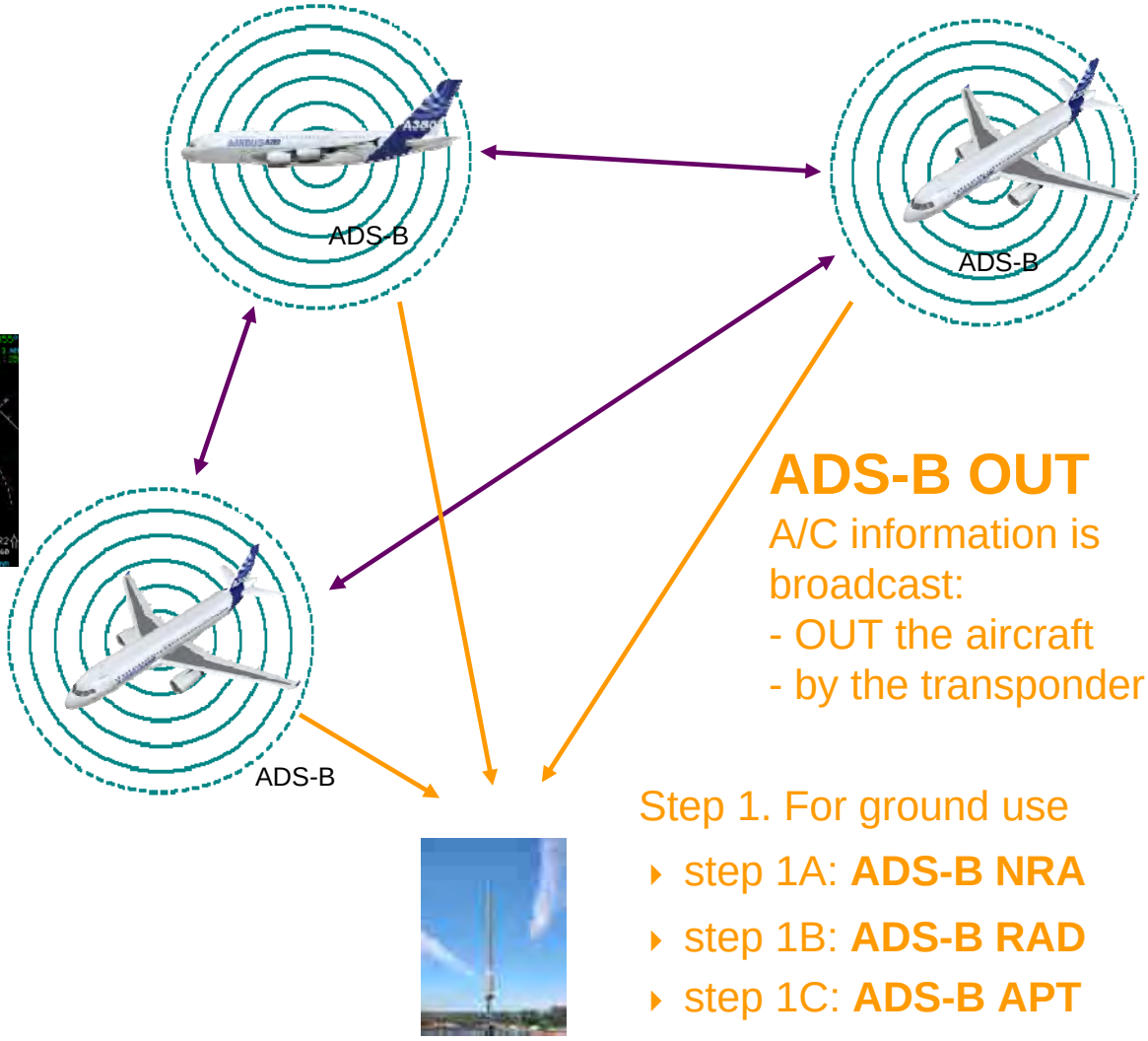
A/C information is received
- IN the airborne
- into the TCAS

Step 2. ATSAW

Display of other a/c information in the cockpit

Next Steps (part of **SESAR**)

- SPACING applications:
A/C instructed to maintain spacing with target aircraft
- Taxi Clearance:
Display of ground trajectory from the gate to the runway
- ATSA-SURF IA:
Indicating & Alerting on airport Surface



ADS-B OUT

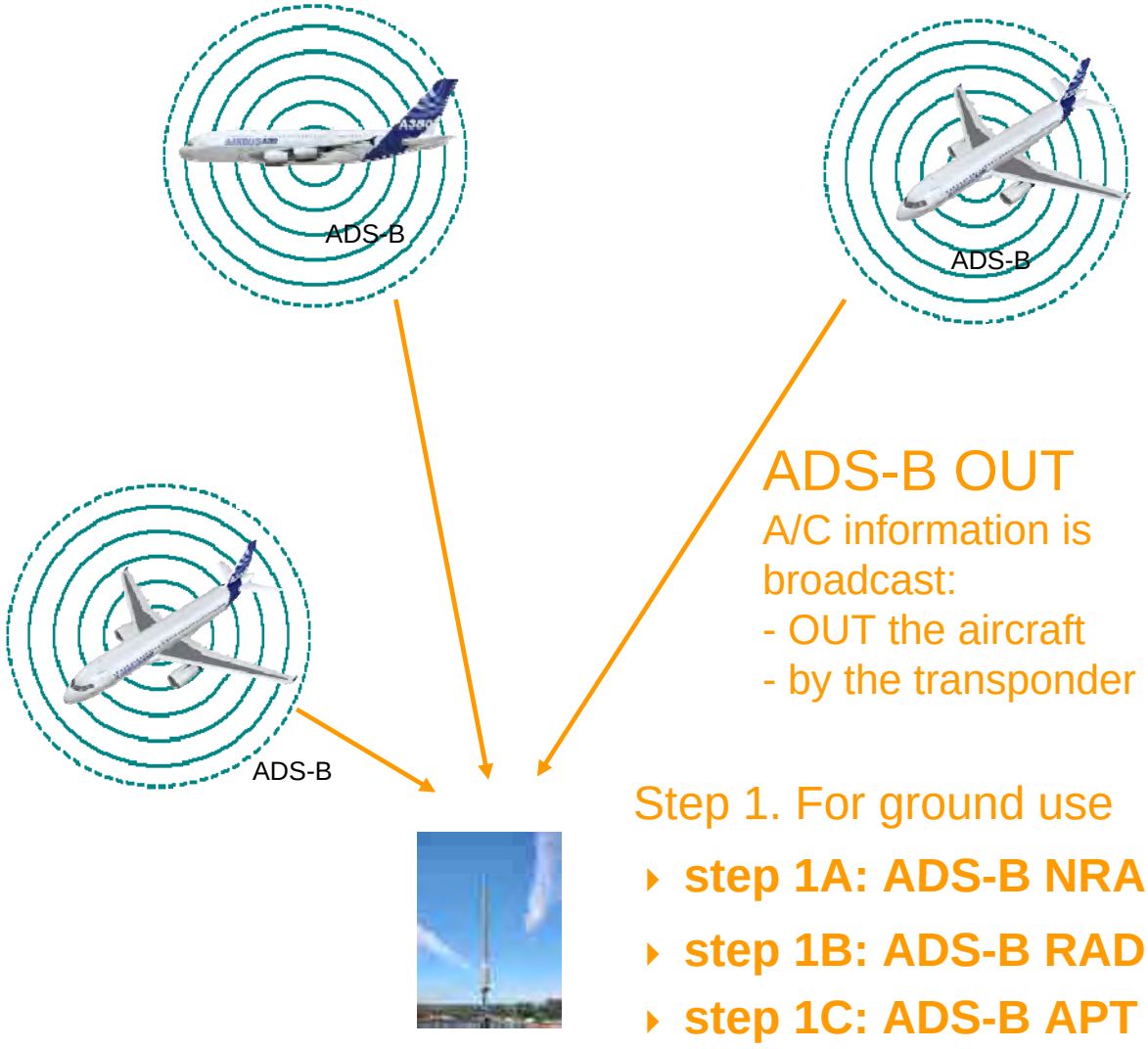
A/C information is broadcast:
- OUT the aircraft
- by the transponder

Step 1. For ground use

- step 1A: **ADS-B NRA**
- step 1B: **ADS-B RAD**
- step 1C: **ADS-B APT**

ADS-B Receiver for Air Traffic Control

ADS-B OUT



ADS-B OUT

A/C information is broadcast:
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Step 1. For ground use

- **step 1A: ADS-B NRA**
- **step 1B: ADS-B RAD**
- **step 1C: ADS-B APT**

ADS-B Receiver for Air Traffic Control

ADS-B OUT – Ground Infrastructure Benefits

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

Broadcast
1090 MHz

Interrogation
1030 MHz

Reply
1090 MHz

Surveillance with **SSR** Modes A, C, S Transponder

Light	Installation Maintenance	Heavy
Higher: GPS source	Precision	Lower: Computed by radar
0.5 second	Refresh rate	5 seconds
Less powerful (transponder)	Electro-magnetic	Powerful (radar)

ADS-B OUT – Operational Benefits

- **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 – NRA application (step 1A)

- **ADS-B NRA (step 1A): used in area not covered by SSR**
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ADS-B OUT for NRA - Airbus aircraft configuration

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

A320 & A330/A340 aircraft family:

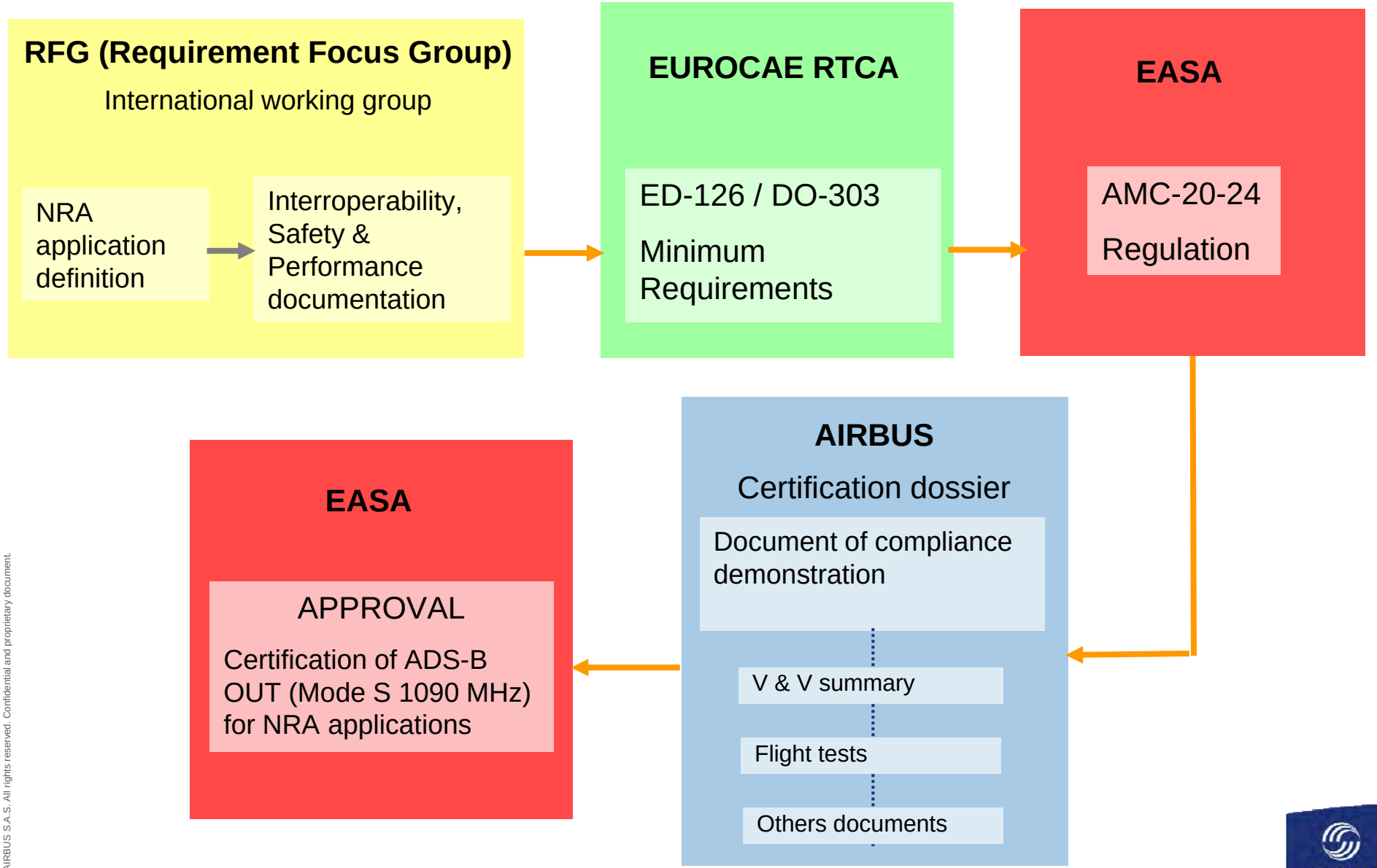
- **EHS/ADS-B wiring provision (basic)**
- **Transponders capable of ELS/EHS/ADS-B:**
  - ***–ACSS: P/N 7517800-10005A (DO-260)***
    P/N 7517800-10100 (DO-260A)
  - ***–Honeywell: P/N 066-01127-1402 (DO-260)***
  - ***–Rockwell Collins: P/N 822-1338-021 (DO-260)***
  - ➢ *All transponders proposed 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 for NRA - Certification process



ADS-B OUT for NRA - Certification status

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

ADS-B OUT for NRA - Certification status

- 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 documentaion update:
  - **FCOM:** System description.
  - **MEL:** As required by regulations. To refer to your Authority for dispatch conditions.

ADS-B OUT for NRA - Certification status

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 - Operational approval

Authorities

- 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 to airlines the aircraft requirements*

Airlines

- 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 to Authorities a compliance status*

Authorities

➢ *Provides to airline 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
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- **ADS-B APT (step 1C): used on airport surface**
  - New tool for surface movement surveillance
  - Safety enhancement

ADS-B OUT for RAD operations

- 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.
  - EASA & FAA requirements for RAD operations recently published:
    - Requirement to be compliant with DO-260B
    - Updates in ADS-B OUT set of messages/performance
      - NIC, NAC, Emergency status, mode A, latency<0.5sec,….
  - Development of Airbus transponders DO-260B compliant planned to start in 2011.
    - Software upgrade of current transponders will be needed
  - All next transponders standards will be certified with DO-260B compliance.

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
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ADS-B OUT for APT operations

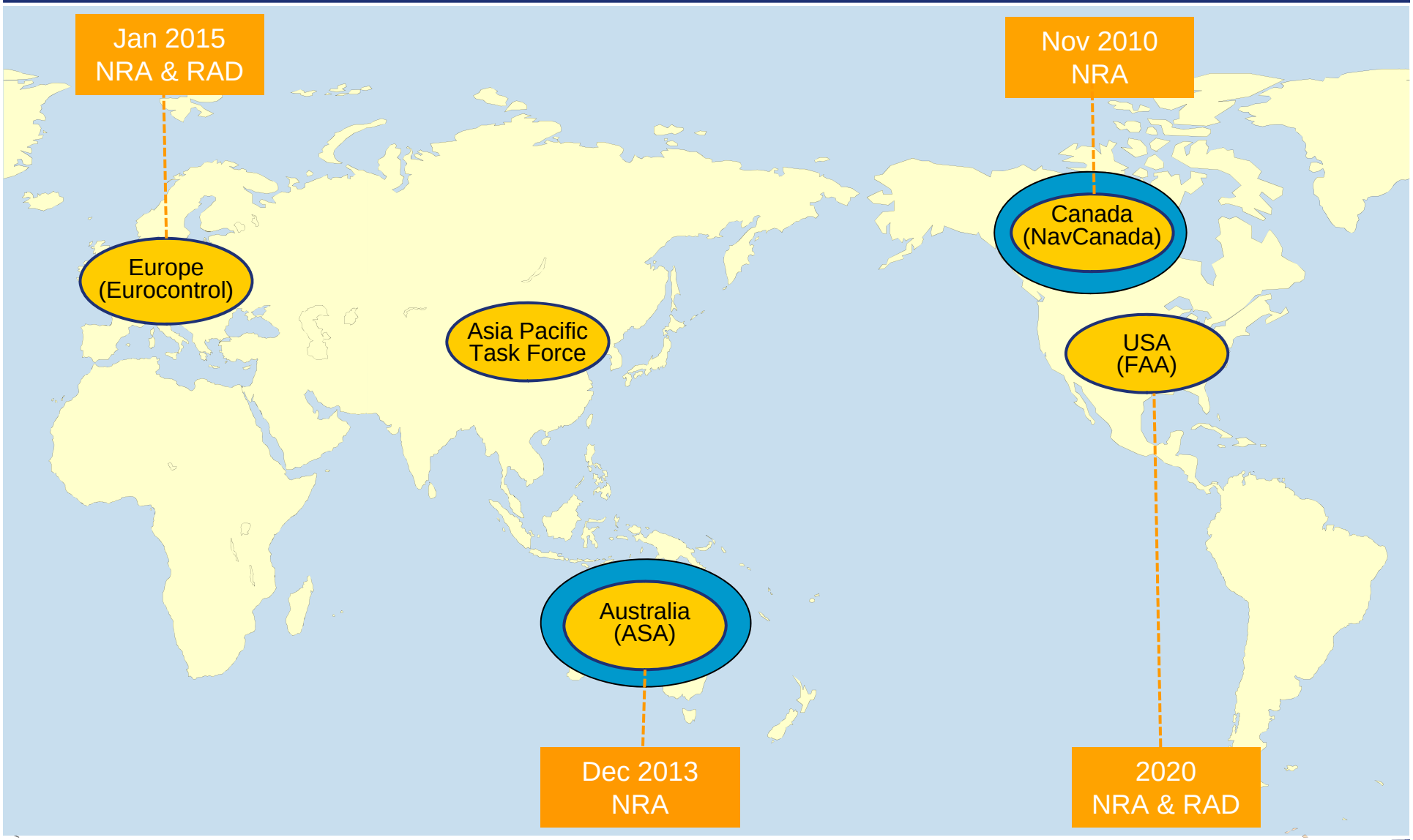
- ADS- B OUT for APT *(application for airports surface)*
  - New tool for surface movement surveillance
  - Standardization in progress
  - Light involvement from Airbus for the time being
  - DO-260B should fulfill APT requirements

- 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
  - Mandate for NRA operations: **November 2010**
  - First operations: January 2009
- **Australia** (Airservices Australia):
  - Mandate for NRA operations: **December 2013**
- **Europe** (Eurocontrol):
  - Mandate for NRA & RAD operations: **January 2015** (forward fit), **January 2017** (retrofit)
  - DO-260B required
- **US** (FAA):
  - Mandate for NRA & RAD operations: **2020**
  - Requirements in accordance between US & Europe

ADS-B OUT Implementation



Specific Airbus involvement

Requirements already covered by Airbus

ADS-B OUT - Installation on in-service aircraft

- Configuration 0:
  - ✓ Transponder not capable of ADS-B, minimum wiring not installed
- Configuration 1:
  - ✓ Transponder capable to transmit ADS-B information
  - ✓ No GPS installed, or GPSSU Litton (not acceptable per AMC 20-24), or ADIRU not able to convey GPS data
- Configuration 2 (compliant with AMC 20-24):
  - ✓ Transponder capable DO-260,
  - ✓ MMR installed in “hybrid” configuration (via ADIRU)
  - ✓ Wiring for EHS/ADS-B installed.
- Configuration 3 (compliant with AMC 20-24):
  - ✓ Transponder capable DO-260A Change 2,
  - ✓ Direct link between MMR and transponder
  - ✓ Wiring for EHS/ADS-B installed.
- Configuration 4:
  - ✓ Transponder compliant with DO-260B.

Conf 0 &1 not compliant AMC 20-24

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

- ADS-B in service installation status (Dec 31th, 2009)

Does not include configuration changes managed through STC

	A300/A310 a/c family		A320 a/c family		A330/A340 a/c family		A380	
Total number of a/c	640		4158		1049		23	
• Nb of a/c not compliant with AMC-20-24 (conf 0 or 1)	635	99%	1632	39%	214	20%	0	0%
• Nb of a/c transmitting ADS-B in compliance with AMC-20-24	5	1%	2526	**61%**	835	**80%**	23	**100%**
Transponder DO-260 (conf 2)	5		2523		835		0	
Transponder DO-260A (conf 3)	0		3		0		23	
• Nb of a/c certified AMC-20-24	5		229		340		15	
/ nb of a/c capable		100%		**9%**		**40%**		**65%**
/ total nb of a/c		0.8%		6%		32%		65%

➢ More the a/c is recent more the a/c configuration allows ADS-B transmission in compliance with AMC-20-24 (61% on A320, 80% on A330/A340, 100% on A380)

➢Even if the a/c is capable, operators don't request official certification for AMC-20-24 compliance (will change with the ADS-B mandate to come)

ADS-B OUT for NRA: GPS SA Aware

A/C type	MMR Supplier	P/N	HFOM		HIL		Comments
			SA ON	SA AWARE	SA ON	SA AWARE	
SA	Collins	822-1152-121 822-1152-122		**X**	**X**		
LR	Collins	822-1152-121 822-1152-130 822-1152-131		**X**	**X**		
SA/LR	Collins	822-1821-430		**X**		**X**	
SA/LR	Thales	755-01-0101B 755-01-0102A		**X**		**X**	
SA	Thales	755-14-0101A		**X**		**X**	MLS capable
SA/LR	Honeywell	066-50029-1161	**X**		**X**		

•No more produced in 2011
•SB availability: program decision not taken

MMRs only satisfying requirements for Australia mandate

THANKS FOR YOUR ATTENTION…

QUESTIONS?

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