

Presented by

Christophe MAILY

Airbus Engineering - Avionics

Airbus Status on ADS-B Out / In

Automatic Dependent Surveillance – Broadcast (ADS-B)

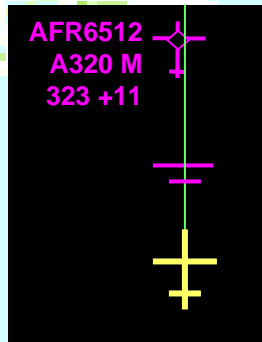


AIRBUS

ADS-B Airbus roadmap

Step 3. ASAS SPACING

A/C instructed to maintain Spacing with target aircraft



Step 2. ATSAW

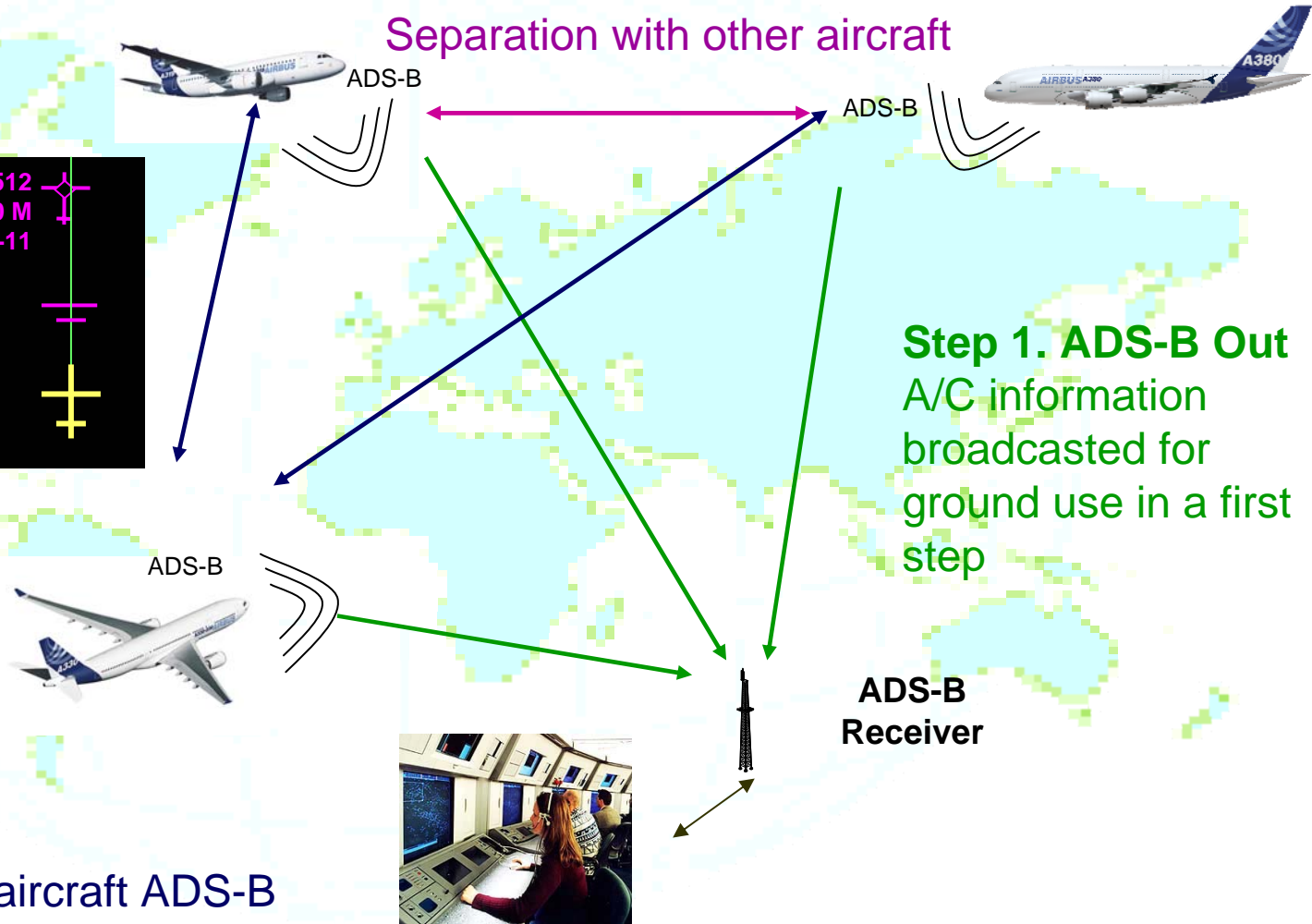
Display of other aircraft ADS-B Info in the cockpit

Step 4. ASAS SEPARATION

A/C instructed to maintain Separation with other aircraft

Step 1. ADS-B Out

A/C information broadcasted for ground use in a first step



ADS-B Step 1 : ADS-B OUT on A320/A340

- Transponder installations with ADS-B capability have been certified on a non-interference basis.
- Certification ongoing on A318/319/320/321, A330/A340 family, for Non Radar Operations (with DO-260)
 - ▶ No change in current installations expected
 - ▶ Target date : End 2007
- Close cooperation between Eurocontrol, Airservices Australia and Airbus

ADS-B Step 1 : ADS-B OUT on A380

- **A380 is the first aircraft certified for Non Radar Operations, in compliance with EASA AMC (DO-260A compliant)**
 - ▶ SIA first delivered A380 certified as EASA AMC compliant (Aug 2007)
 - ▶ AFM update provided by Airbus
- SIA A380 recorded for its first commercial flight from Singapore to Sydney
 - ▶ “SIA A380 approved by CASA for receipt of ADS-B based services in Australia”

Europe / Australia / Canada implementation

- Eurocontrol & Airservices Australia key participant to international standardisation and harmonization process
- Pragmatic approach:
 - ▶ Use existing installations as far as possible (DO-260)
 - ▶ ADS-B used for separation services
- Incentives for qualified a/c (through better Flight Levels or Pioneer phase)
- RAD implementation in Europe may require updates in ADS-B set of messages/performance

USA implementation

- Specific ADS-B RAD application (mandate for 2020)
 - ▶ High Density area
 - ▶ New set of messages required (DO-260A or above??)
 - Mode A code, Emergency, Accuracy, Length/Width code...
 - ▶ **High level of NAV performance required. NAV system architecture upgrade to be considered**
- This approach will require a/c and equipment modifications
 - ▶ Wiring change
 - ▶ Software upgrades to Mode S transponders (e.g. DO-260X)
- Considered as a next step for Airbus (after 2010)

Certification purpose

- ADS-B capability implemented on a non-interference basis.
- Implementation of Enhanced Surveillance has brought ADS-B OUT capability in the a/c
 - ▶ No formal certification activities
- On-going certification exercise aims at verifying the installation and assess conformity with AMC 20-24 draft
 - ▶ Approval from EASA expected for end of 2007 on A320/A340
- “Capability declaration” document referenced in Aircraft Flight Manual to support airline operational approval
- Update of FCOM to indicate ADS-B OUT capability

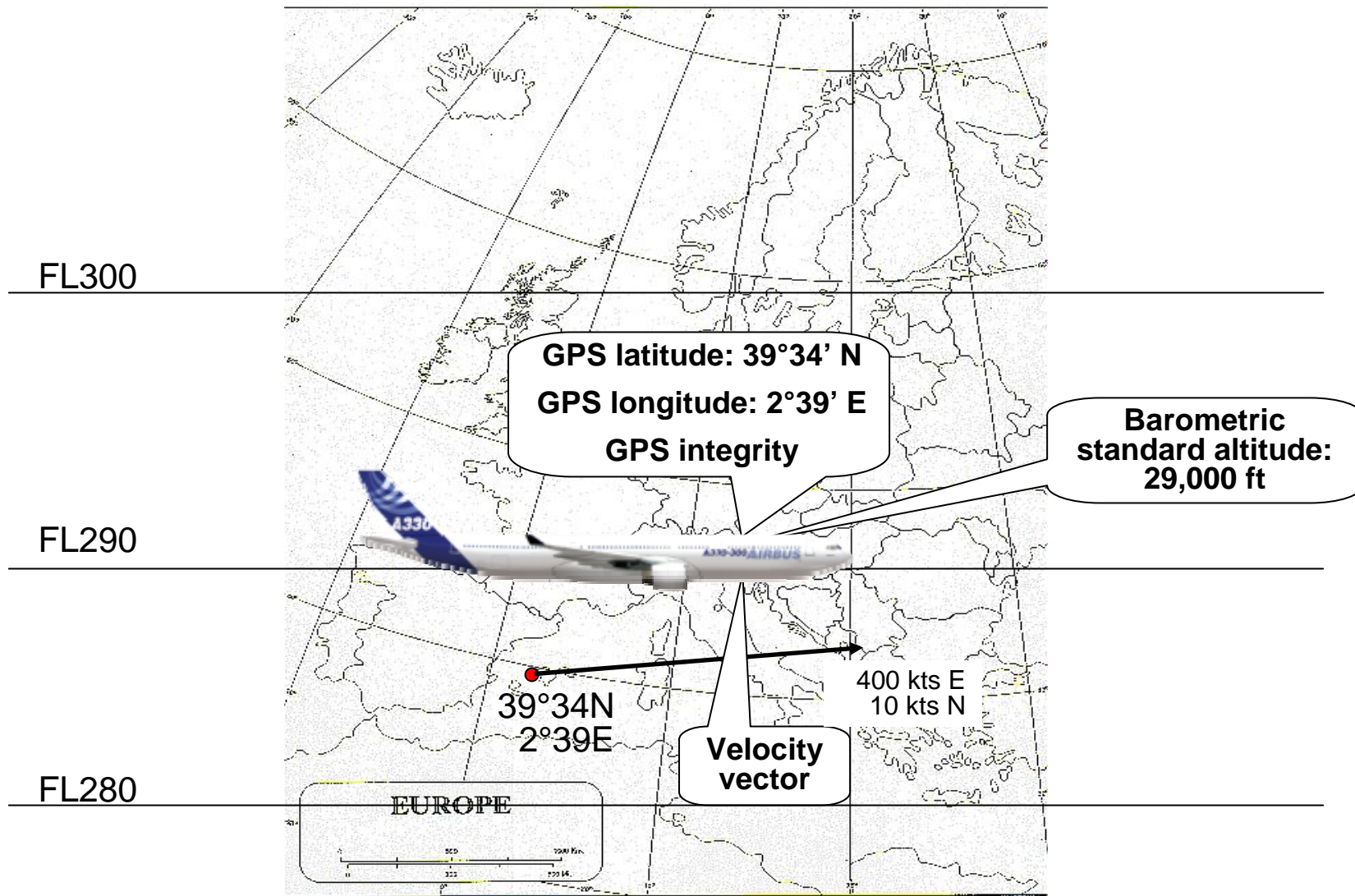
Program offerability

- Applicability: A320 family, A330, A340, A380
- Forward fit
 - ▶ ADS-B OUT certification will be proposed as an option on production a/c
- Retrofit (A320/A330/A340)
 - ▶ Airbus Service Bulletin for EHS transponder installation and EHS wiring already available
 - ▶ Airbus Service Bulletin for ADS-B OUT certification should be available by early 2008
- *Note: EHS certification is not a prerequisite to ADS-B OUT certification*

Target configuration

- A320 family, A330 and A340 a/c with the following installation can apply for ADS-B OUT certification:
 - ▶ ADS-B OUT capable transponder
 - Collins TPR-901 P/N -021, Honeywell TRA-67A P/N -1402, ACSS XS-950 P/N -10005A
 - ▶ EHS wiring
 - ▶ MMR (any vendor) OR GPSSU from Honeywell
 - ▶ Hybrid IRS
- Non eligible configurations:
 - Autonomous IRS
 - Litton/Northrop Gruman GPSSU (no output of integrity)
 - Case by case study to be foreseen for a/c without this minimum configuration
- *Note: A380 a/c can all apply for ADS-B OUT certification*

Parameters required in EASA AMC (1/2)

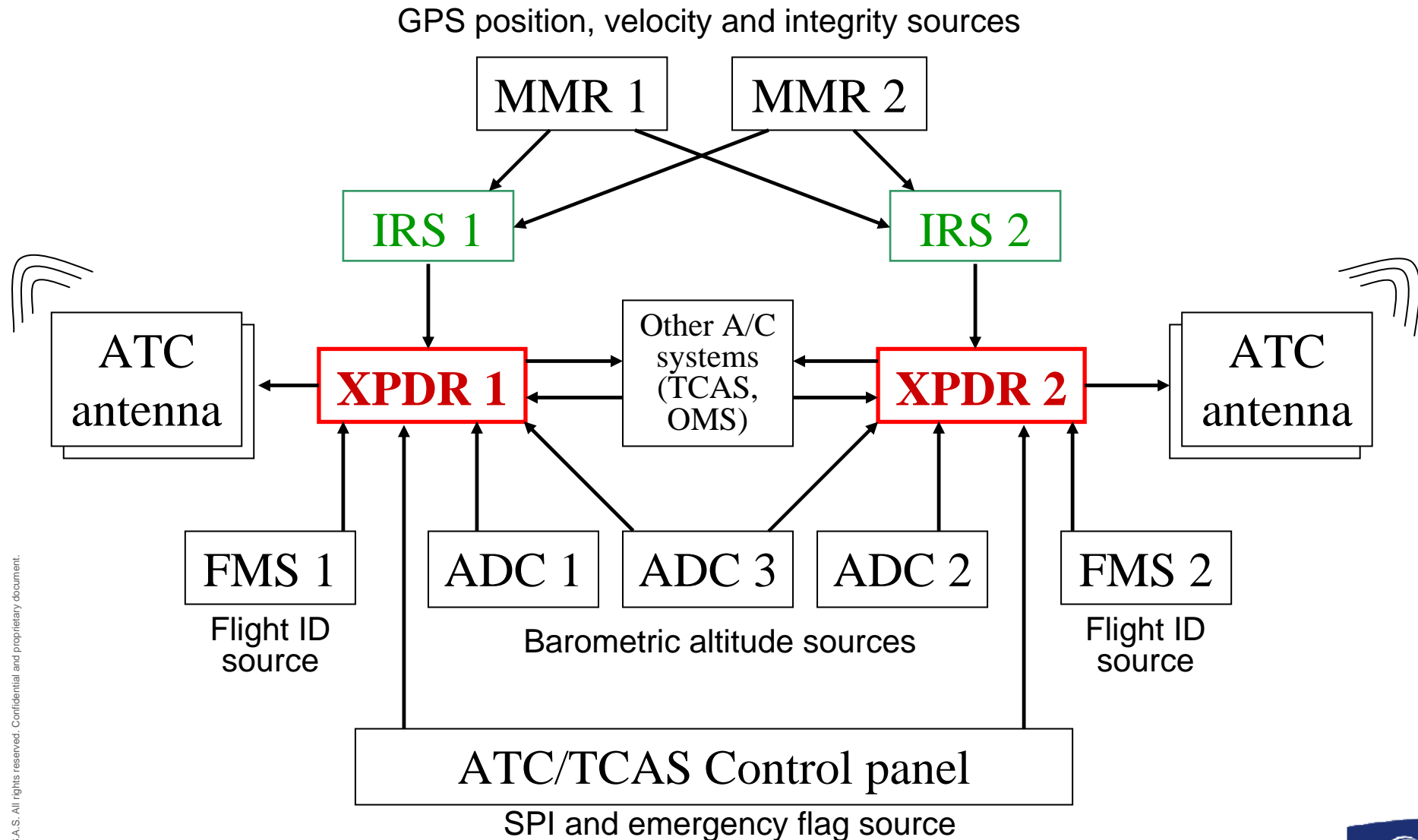


Parameters required in EASA AMC (2/2)

The diagram illustrates the parameters required in EASA AMC (2/2) through three main components:

- MCDU init page:** A cockpit display showing flight initialization data. The left side has a vertical column of buttons labeled 1L through 6L. The right side has a vertical column of buttons labeled 1R through 6R. The display content includes:
 - INIT ←→
 - CO RTE LSGGLGAT01 FROM/TO LSGG/LGAT
 - ALTN/CO RTE
 - 2L LGTS
 - 3L FLT NBR **AB1234** IRS INIT>
 - 4L
 - 5L COST INDEX 540 WIND>
 - 6L CRZ FL/TEMP FL290 / -42° TROPO 36090
- Flight Map:** A map of Europe with a callout box indicating **Flight ID: AB1234**. An Airbus A330 aircraft is shown flying over the map.
- ATC/TCAS control panel:** A control panel with various buttons and indicators. A callout box points to the **SPI (IDENT) Emergency indicator**. The panel includes:
 - Buttons for STEV, AUTO, ON, OFF, DN, ALT, RPTD.
 - Buttons for ATC, FAIL, 1, 2, 3, 4, 5, 6, 7, 0, CLR.
 - A digital display showing 8888.
 - Buttons for IDENT, THRT, ALL, ADV, BLW, STBY, TA, TASA.

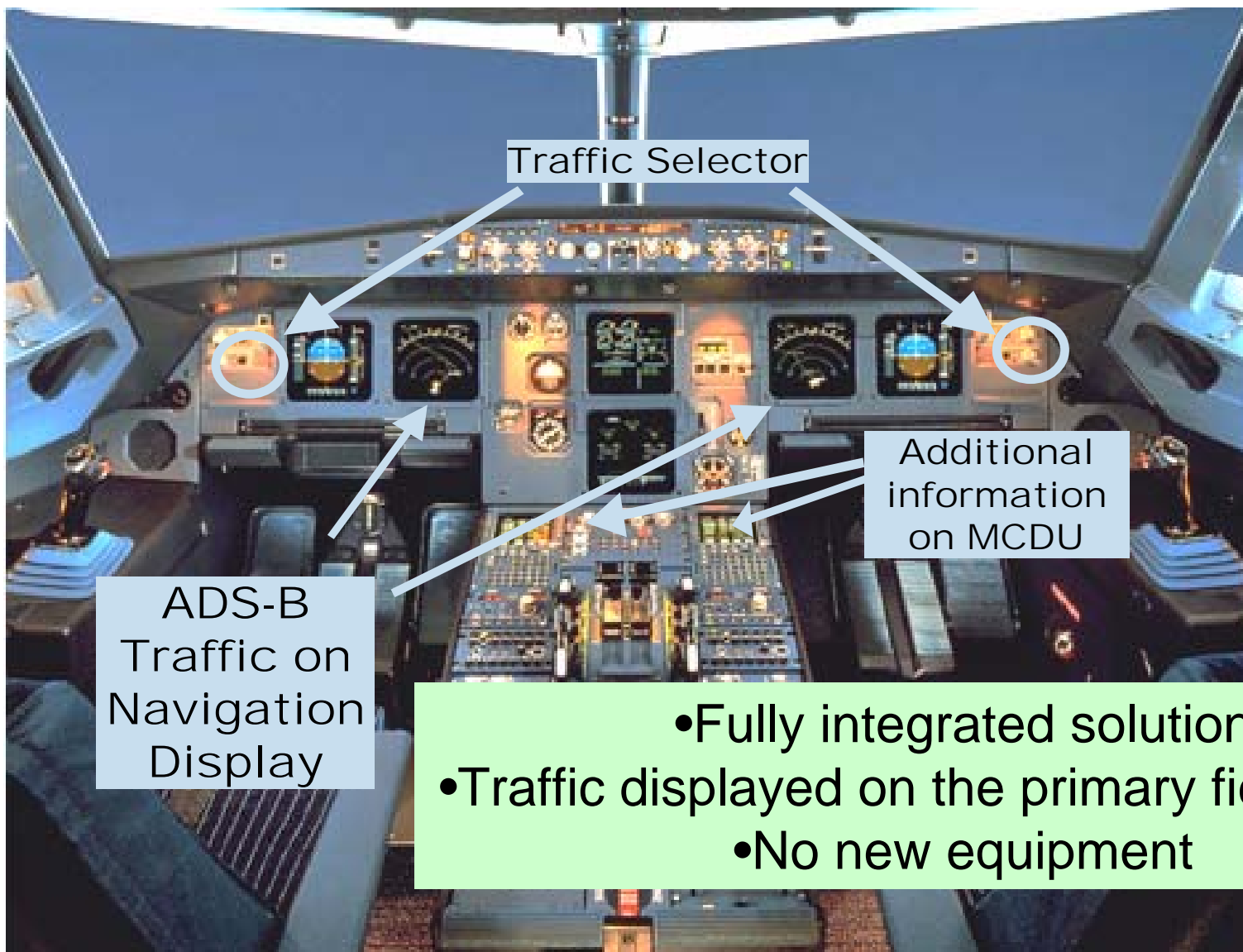
ADS-B OUT A320/A330/A340 architecture



ADS-B Step 2 : ATSAW

- **ATSAW step 2A: Airborne applications**
 - ▶ End 2009 on A320/A340
 - ▶ 2011 on A380
 - ▶ Available at Entry Into Service on A350
 - ▶ ATSAW project launched in Airbus on SA/LR
 - Certification activities on-going with EASA
 - ATSAW concept and HMI well appreciated
- Traffic Computer prototypes currently tested in Airbus lab and on Flight Test a/c (A320, A340-600)
- **ATSAW step 2B: Surface applications**
 - ▶ 2010 (TBC) on A320/A340
 - ▶ TBD on A380 and A350

ATSAW in A320/A340 cockpit



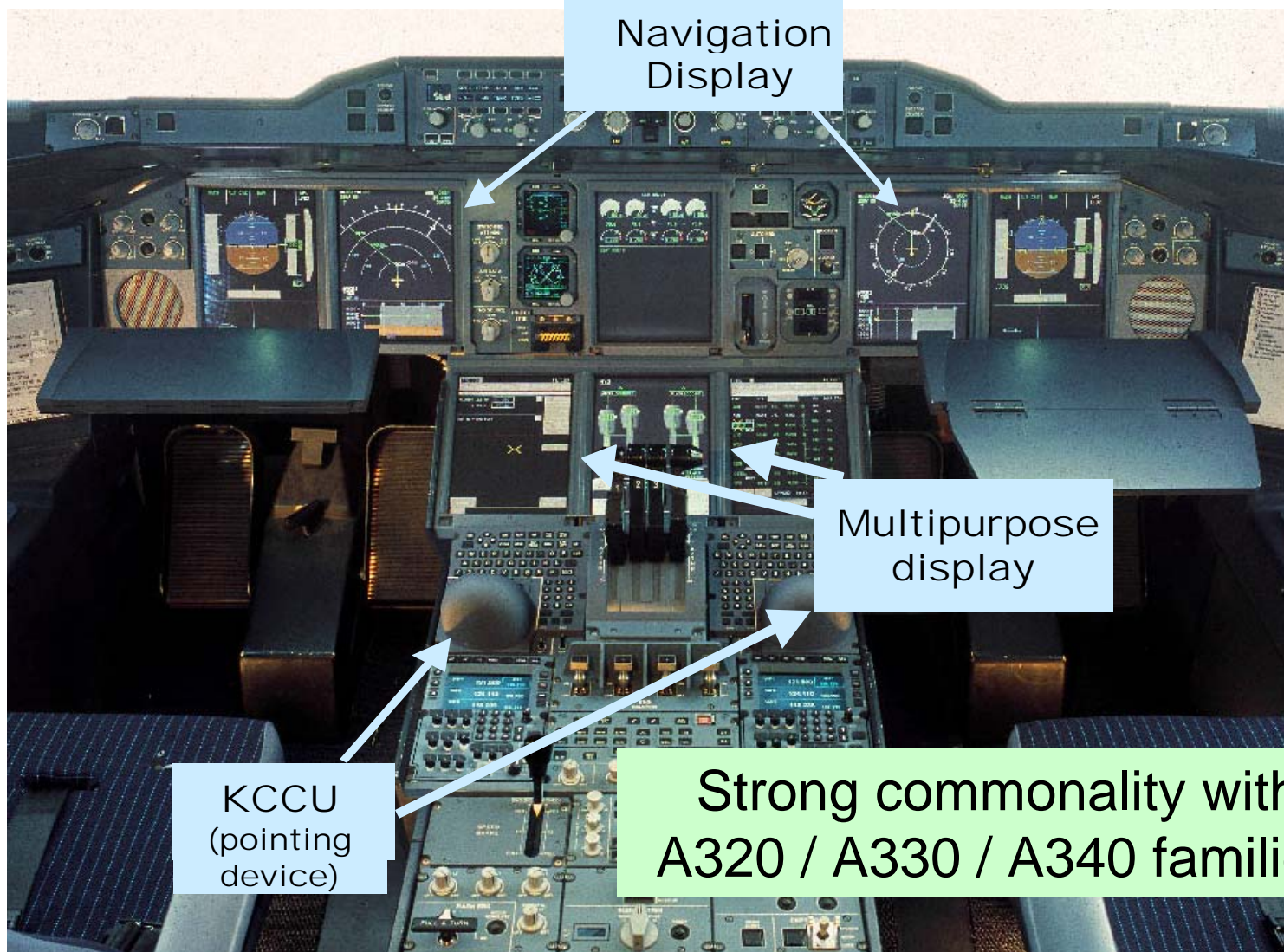
ADS-B
Traffic on
Navigation
Display

Traffic Selector

Additional
information
on MCDU

- Fully integrated solution
- Traffic displayed on the primary field of view
- No new equipment

ATSAW in A380 cockpit



Same cockpit philosophy on A350

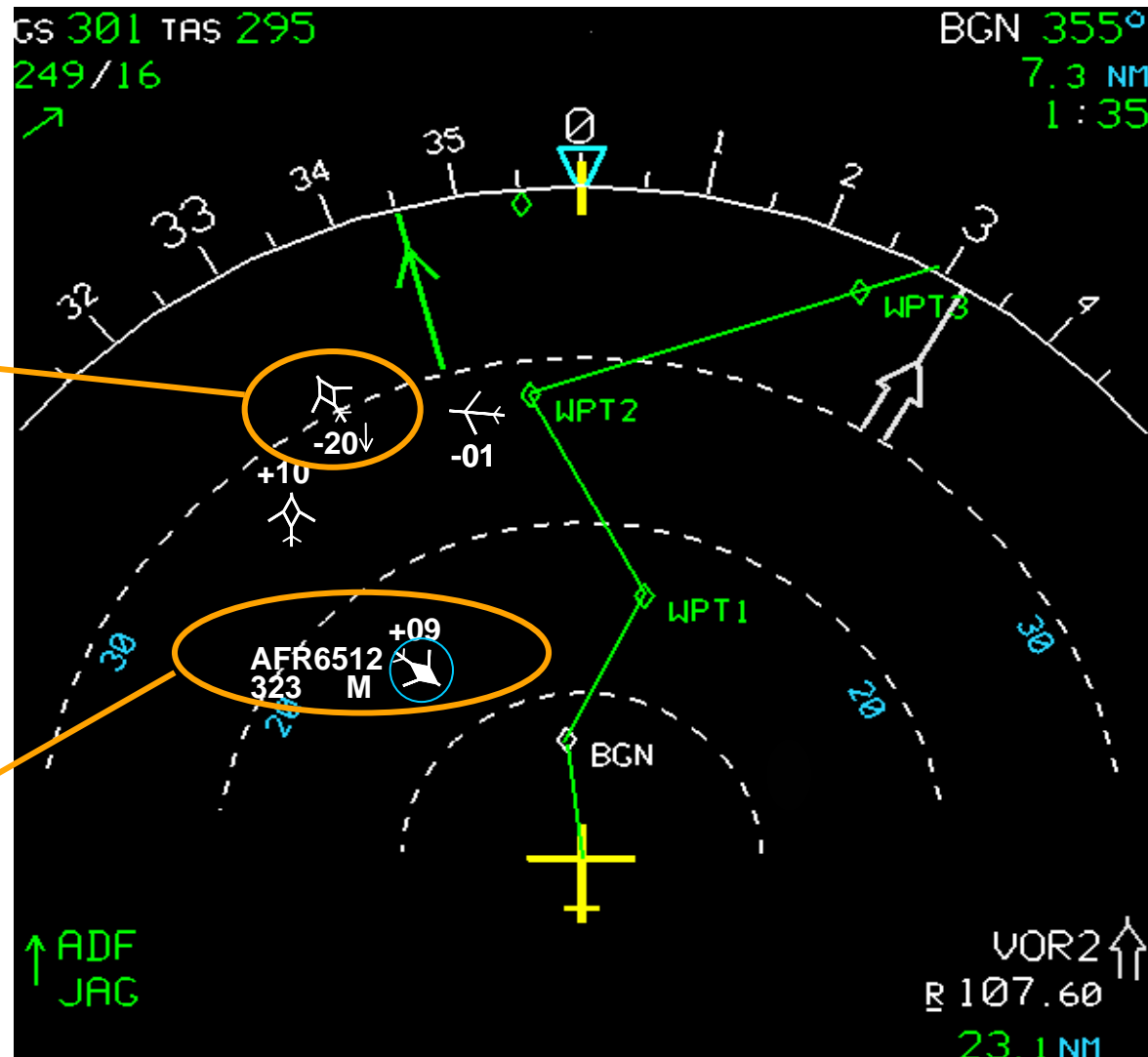
ADS-B Step 2A : ATSAW In Flight

By default

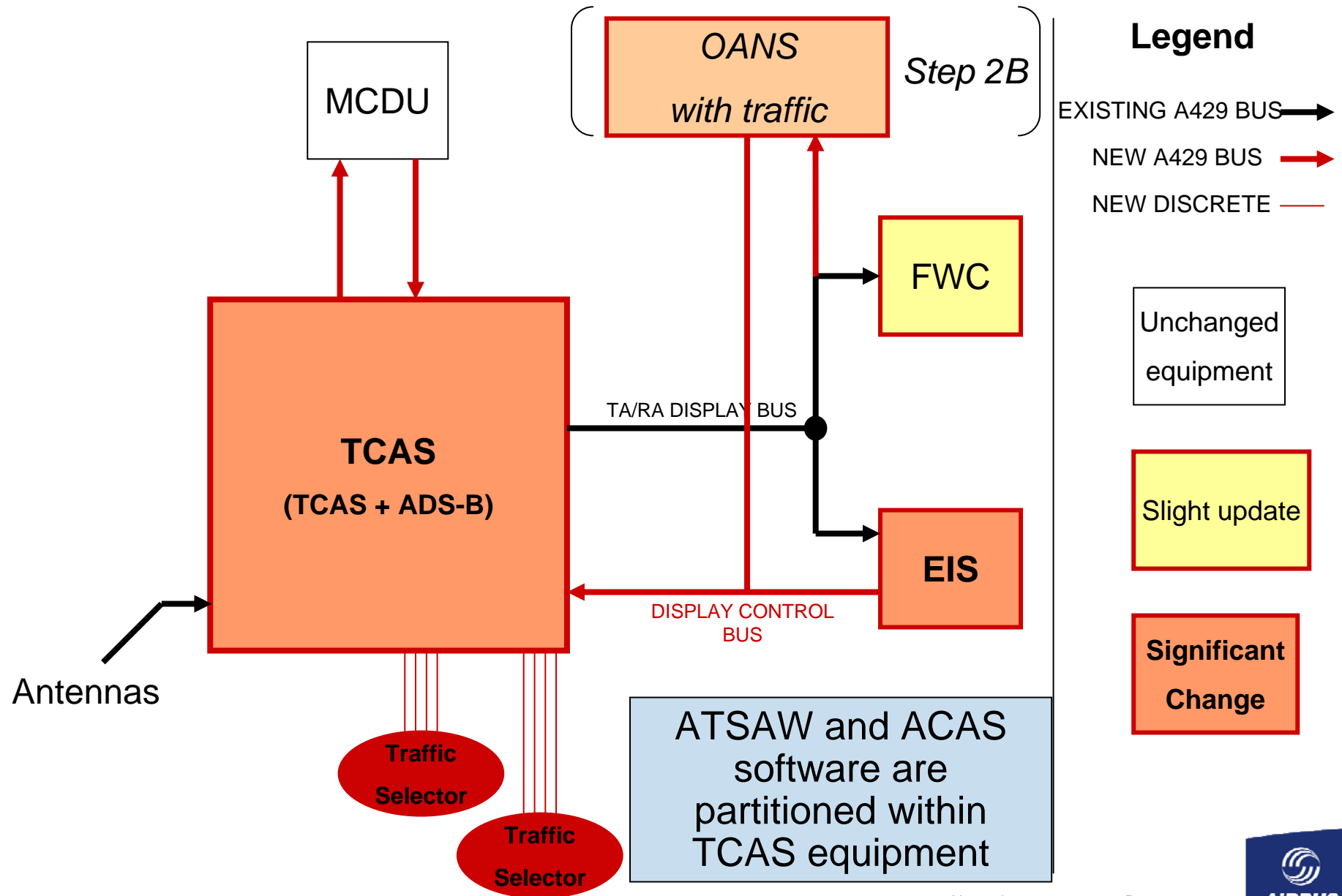
- Position
- Orientation
- Relative Altitude
- Vertical Tendency

More info using traffic selector or KCCU

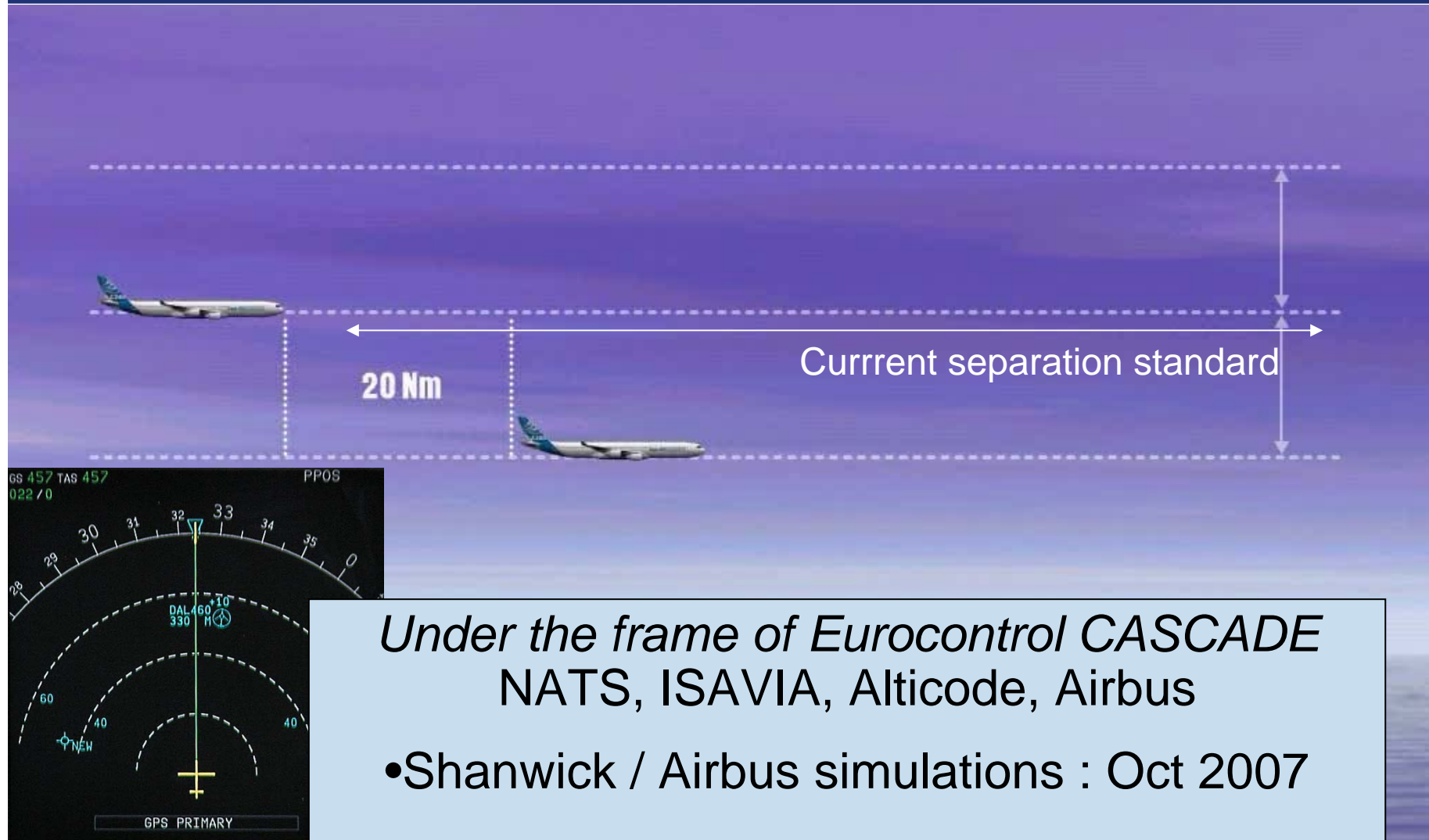
- Default information +
- A/C ident
- Ground Speed
- Wake Vortex category



ATSAW Step 2: A320/A340 Architecture



CRISTAL ITP : In Trail Procedures (ITP)



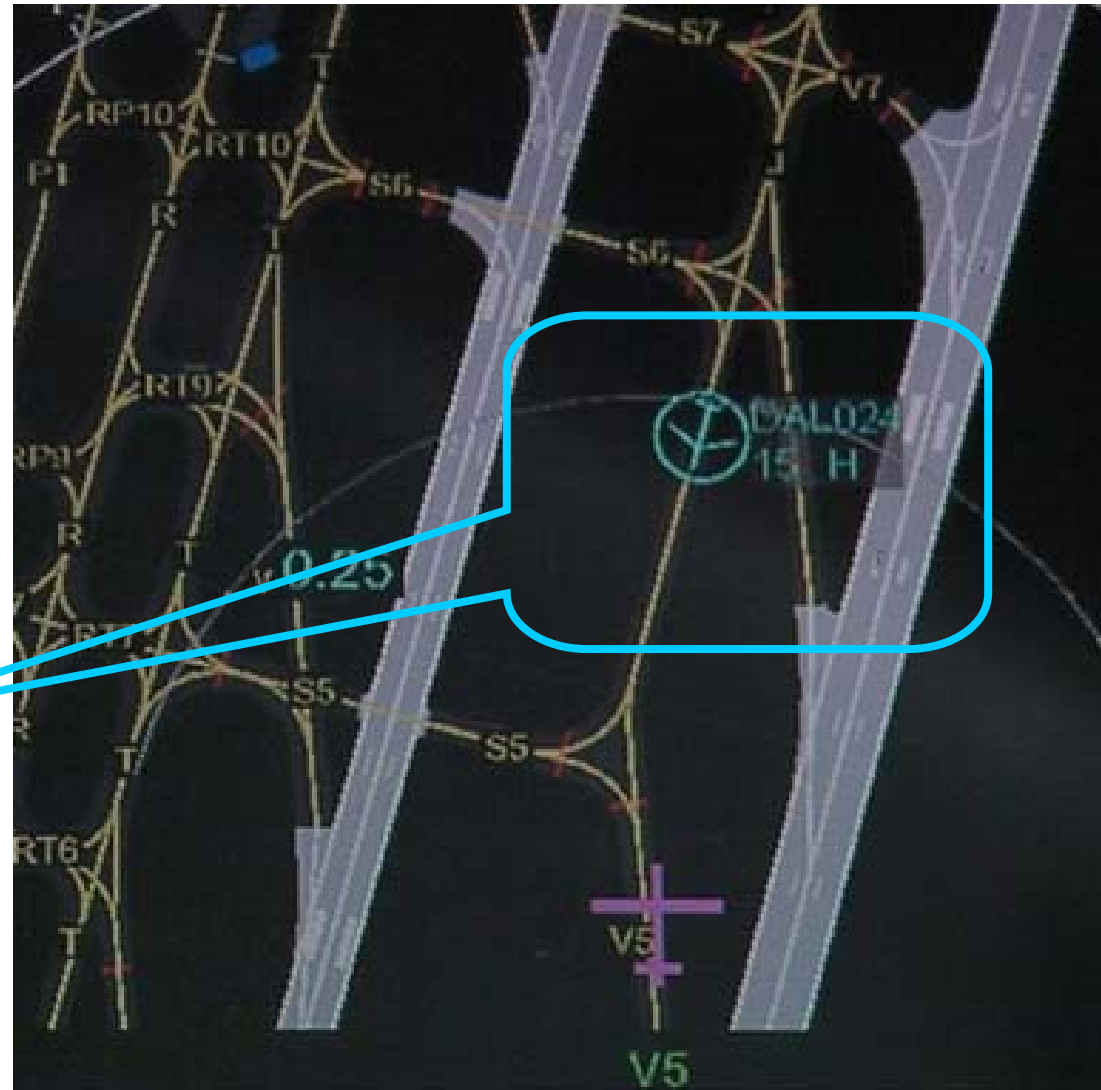
*Under the frame of Eurocontrol CASCADE
NATS, ISAVIA, Alticode, Airbus*

- Shanwick / Airbus simulations : Oct 2007
- Flight Test over Iceland : Feb/Mar 2008
- Pioneer airlines trials : 2009

ADS-B Step 2B: ATSAW on Airport Surface

MOVING MAP
(provided by On-board
Airport Navigation
System/OANS)

+ TRAFFIC



Airbus Status on ADS-B : Conclusion

Step 1. ADS-B Out

A/C information
broadcasted for ground
use in a first step



**First aircraft certified for
Non Radar Operations**

Step 2. ATSAW

Display of other aircraft
ADS-B Info in the cockpit



**Development launched
Already flying (tests)
Target date : 2009**

- Pioneer phase in Europe, Separation in Australia/Canada, Trials in China... will help gaining experience on ADS-B, and capture operational requirements
- Airbus objective is to implement the best ADS-B products, while limiting the number of retrofit

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