Presented by

Christophe MAILY

Airbus Engineering - Avionics

Airbus Status on ADS-B Out / In

Automatic Dependent Surveillance – Broadcast (ADS-B)

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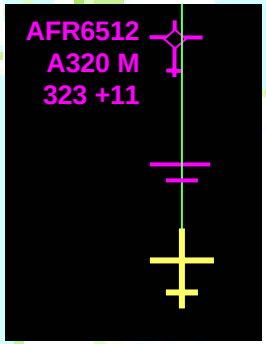
ADS-B Airbus roadmap

Step 4. ASAS SEPARATION
A/C instructed to maintain
Separation with other aircraft

ADS-B

ADS-B

Step 3. ASAS SPACING
A/C instructed to maintain Spacing with target aircraft



Step 1. ADS-B Out
A/C information broadcasted for ground use in a first step

ADS-B

ADS-B Receiver

Step 2. ATSAW
Display of other aircraft ADS-B Info in the cockpit

Air Traffic Control

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

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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”

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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

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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)

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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

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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*

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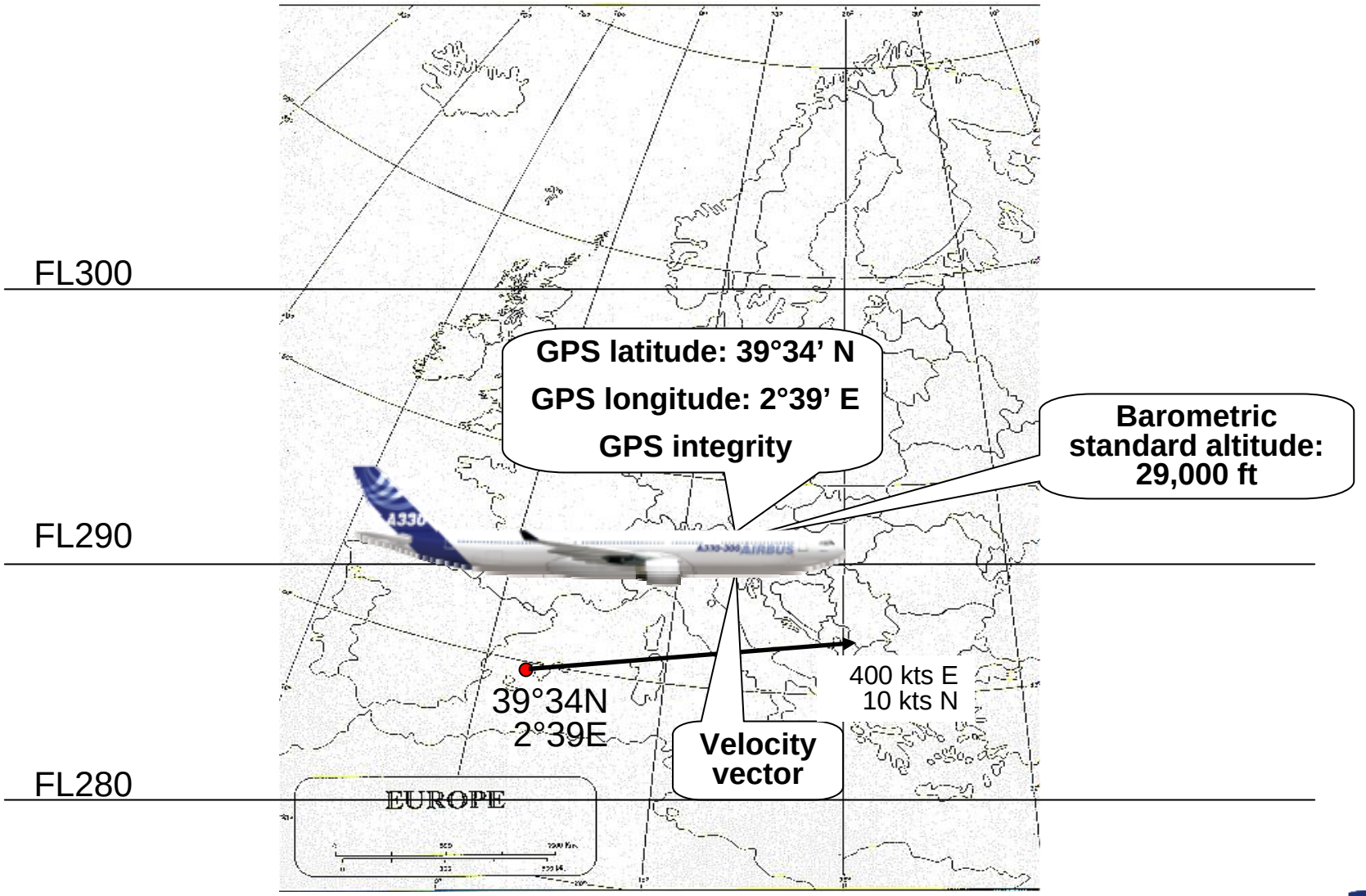
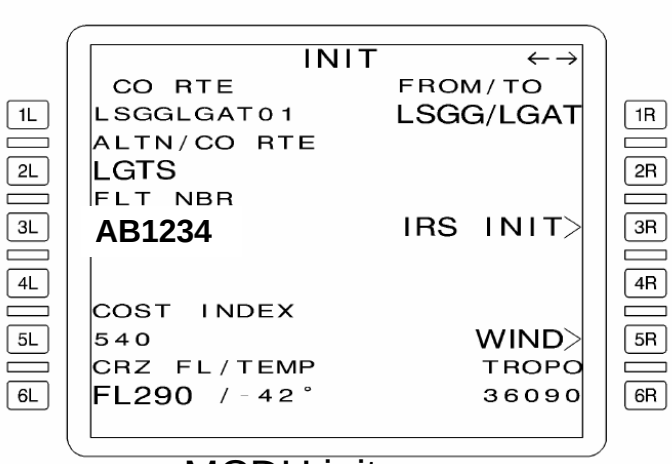
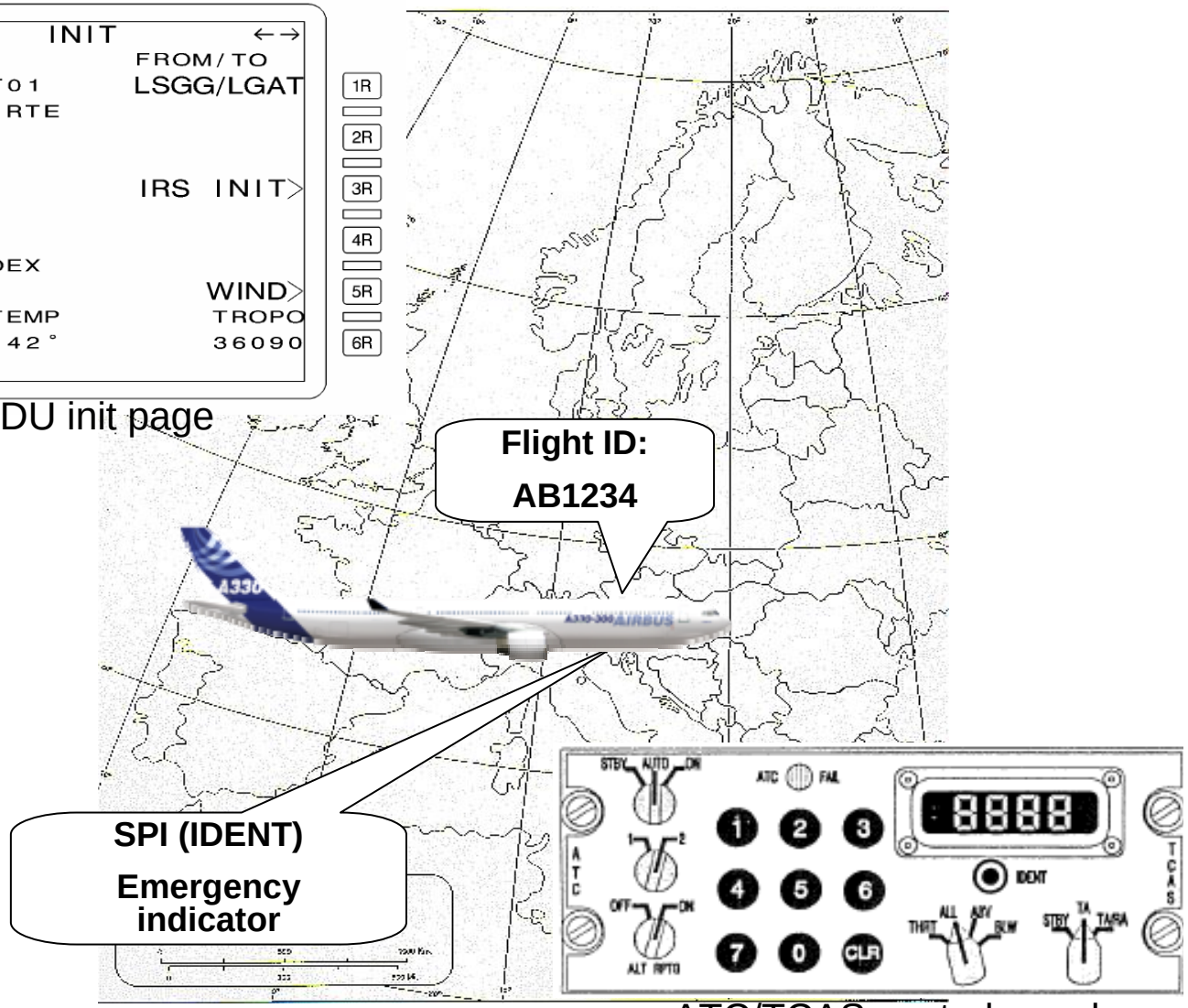
Parameters required in EASA AMC (1/2)



Parameters required in EASA AMC (2/2)

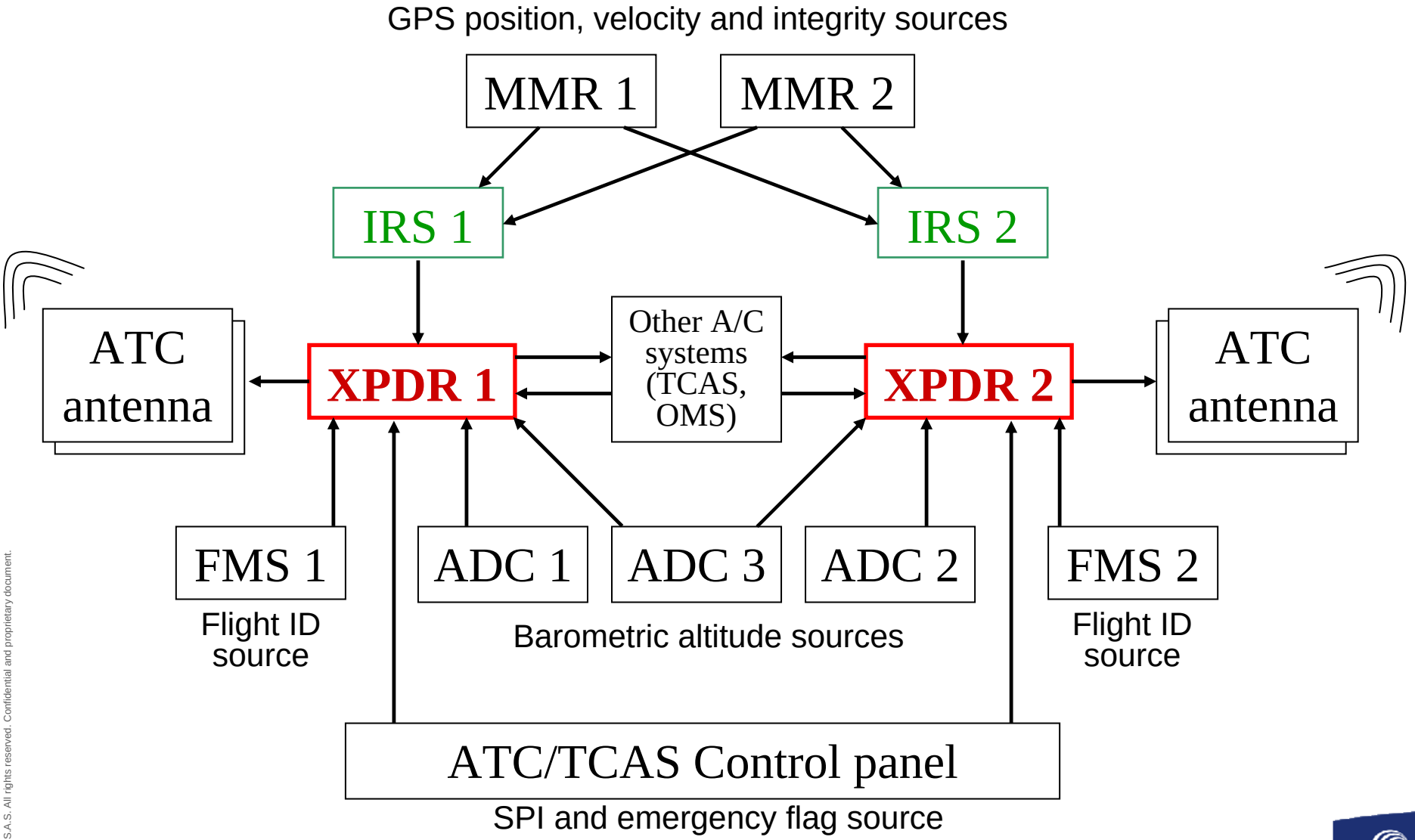


MCDU init page



ATC/TCAS control panel

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

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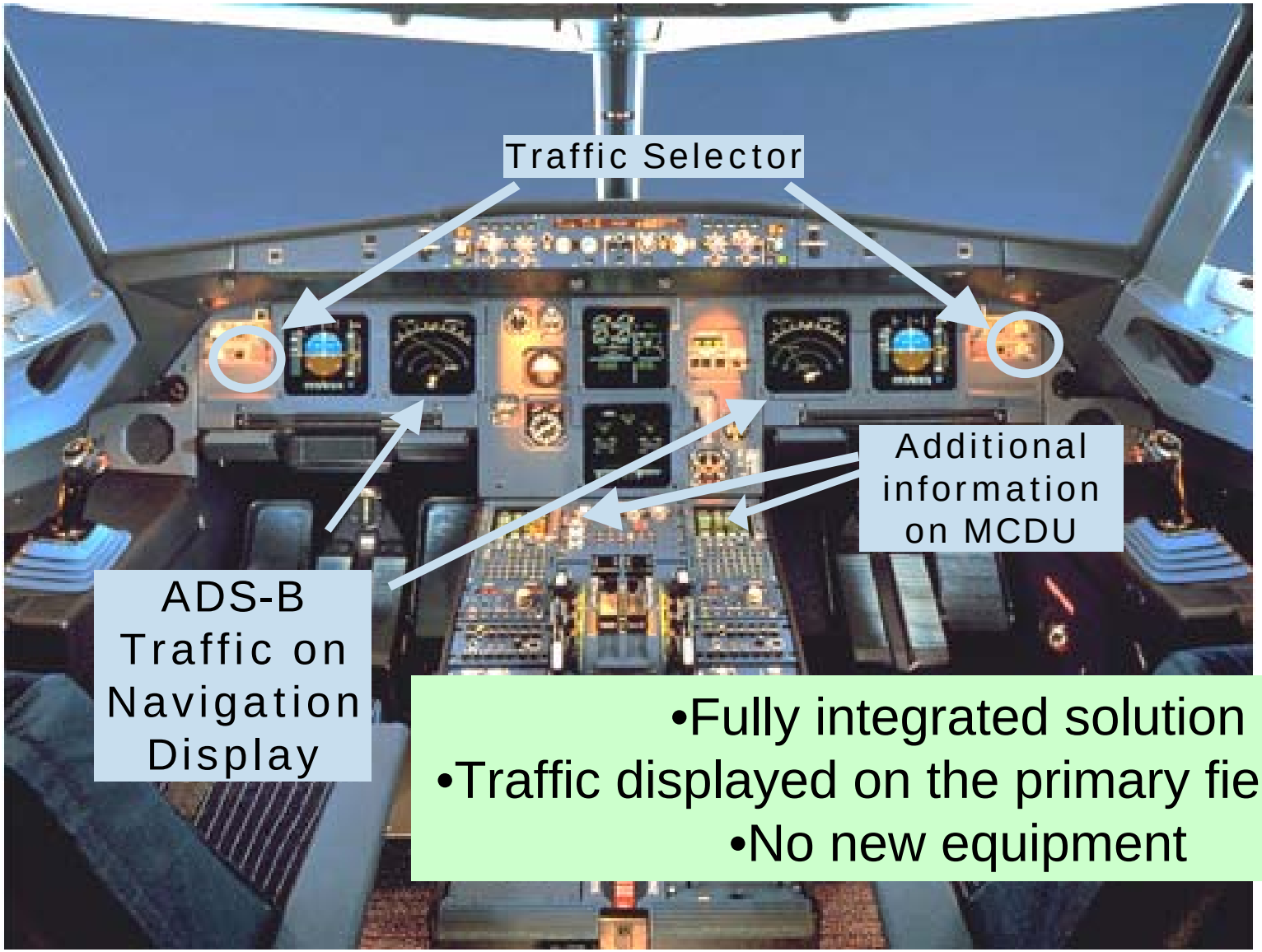
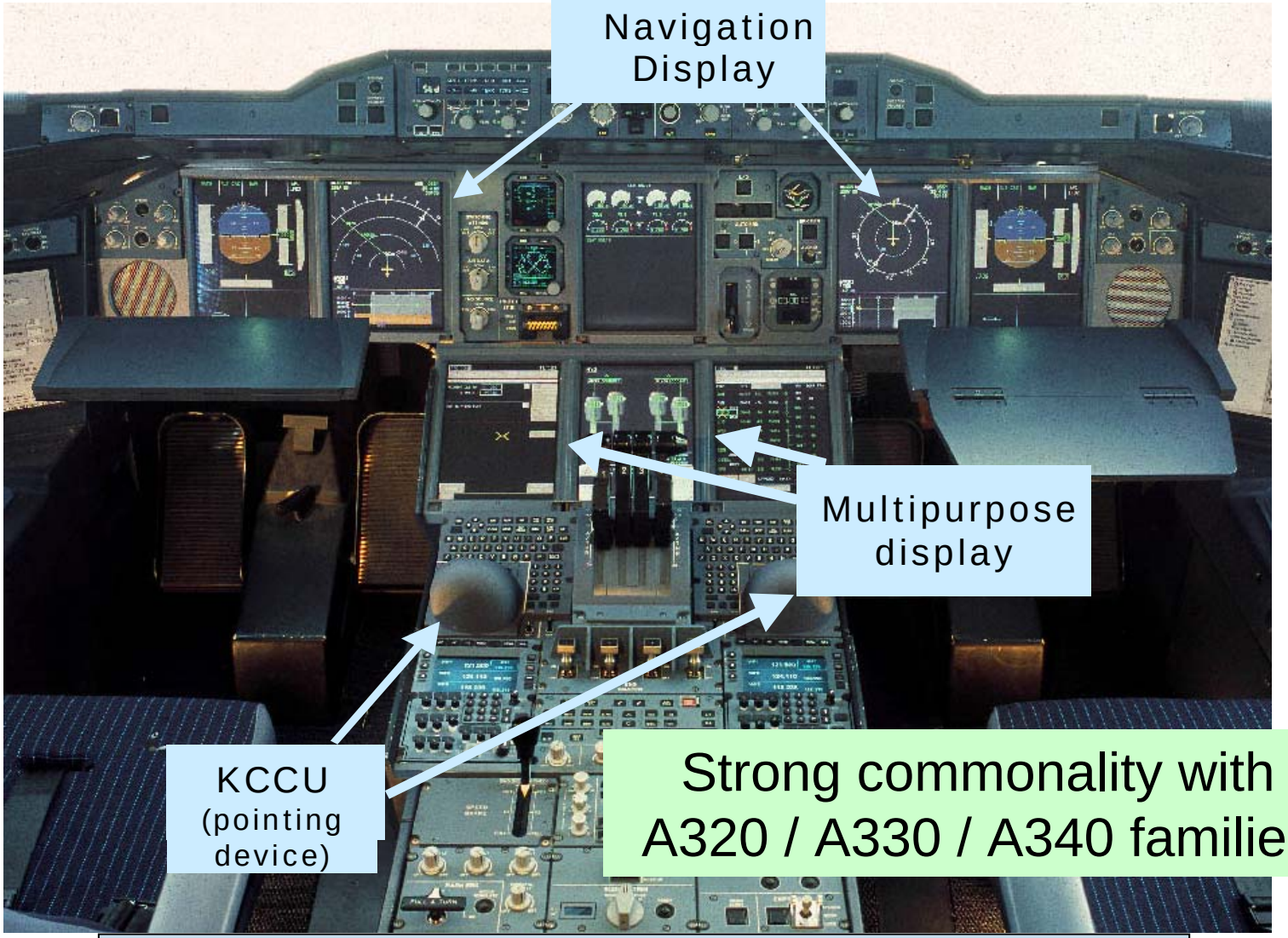
ATSAW in A320/A340 cockpit



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

ATSAW in A380 cockpit



Strong commonality with A320 / A330 / A340 families

Same cockpit philosophy on A350

ADS-B Step 2A : ATSAW In Flight

By default

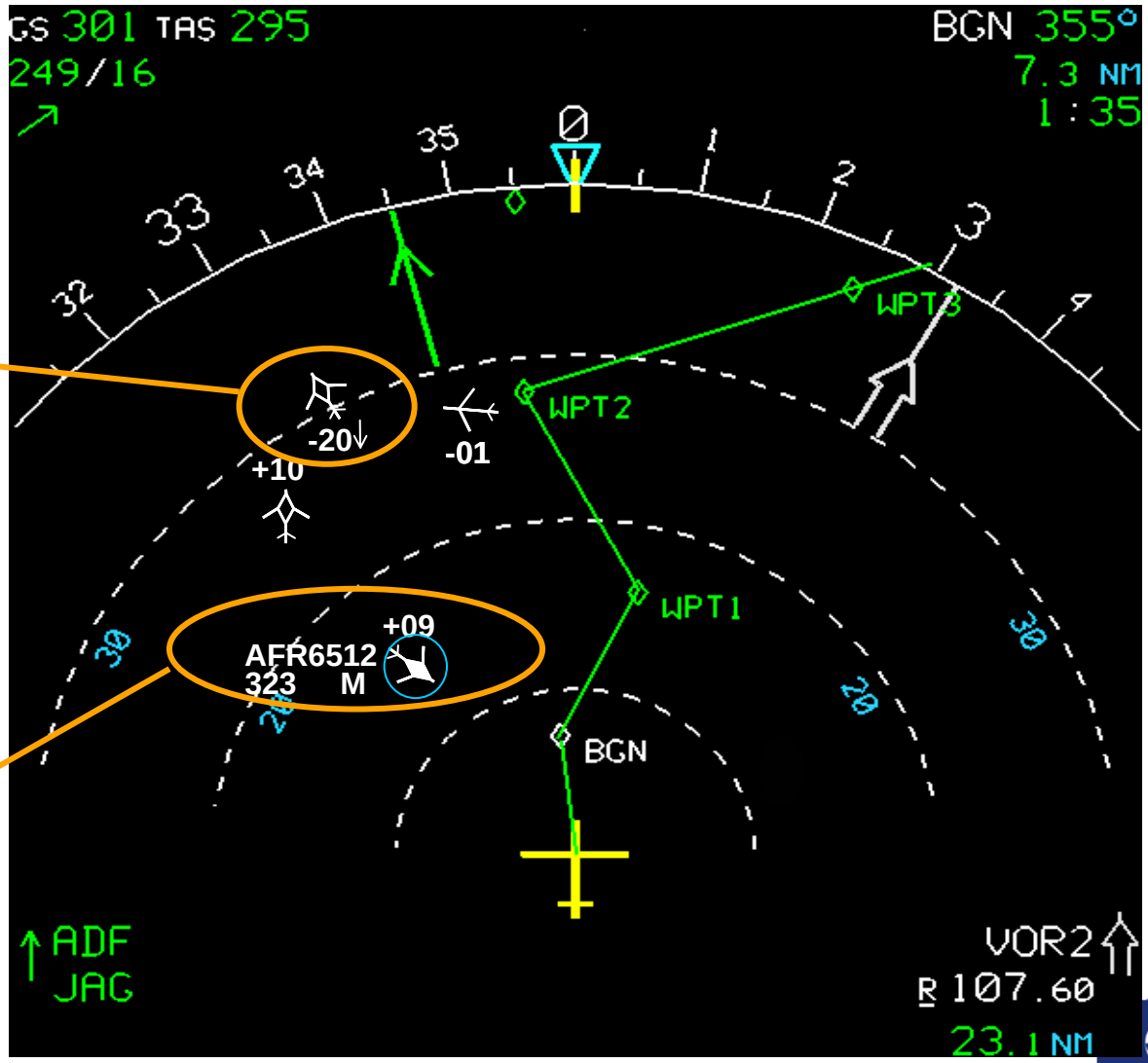
- Position
- Orientation
- Relative Altitude
- Vertical Tendency

More info using traffic selector or KCCU

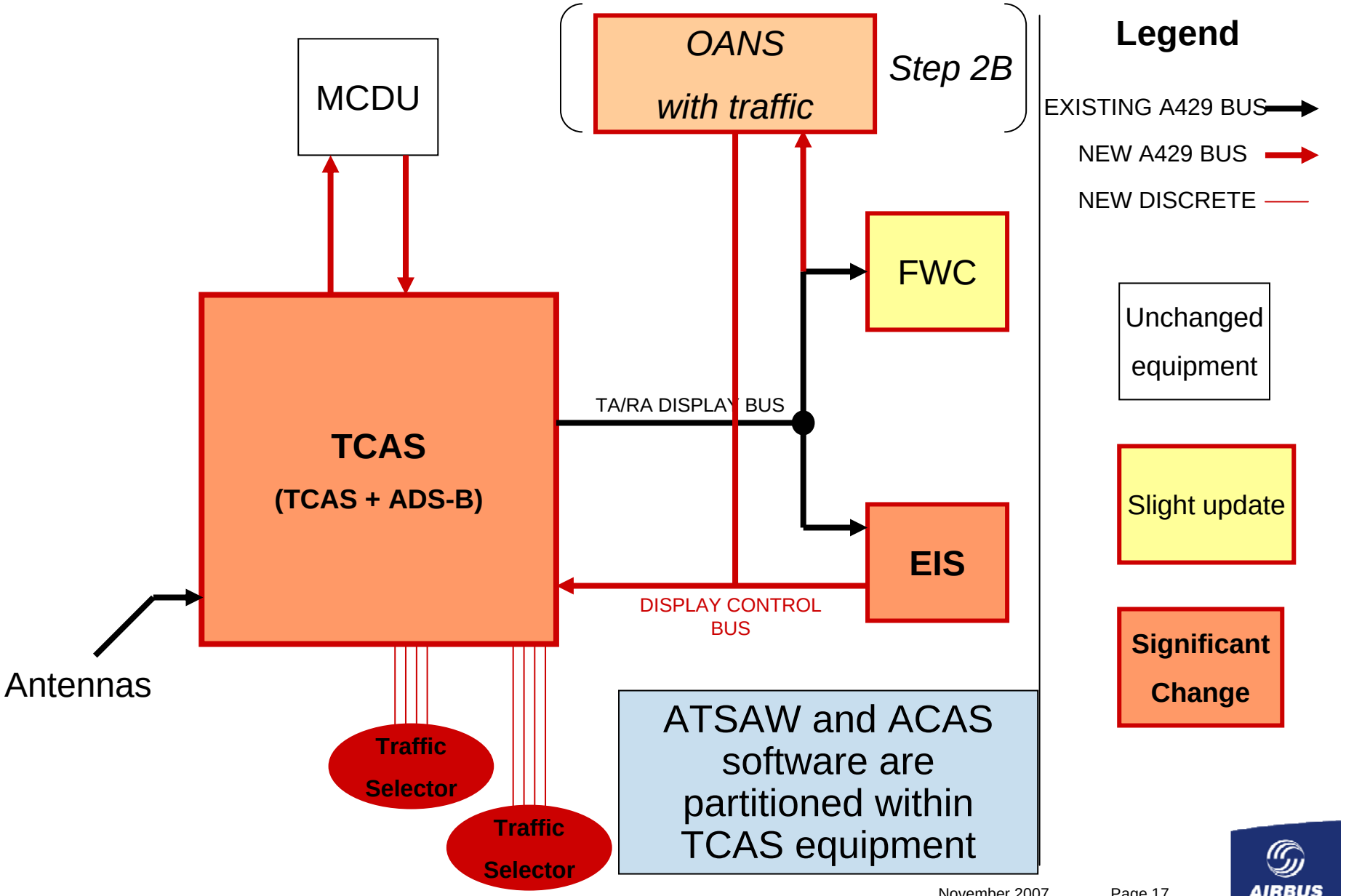
- Default information

+

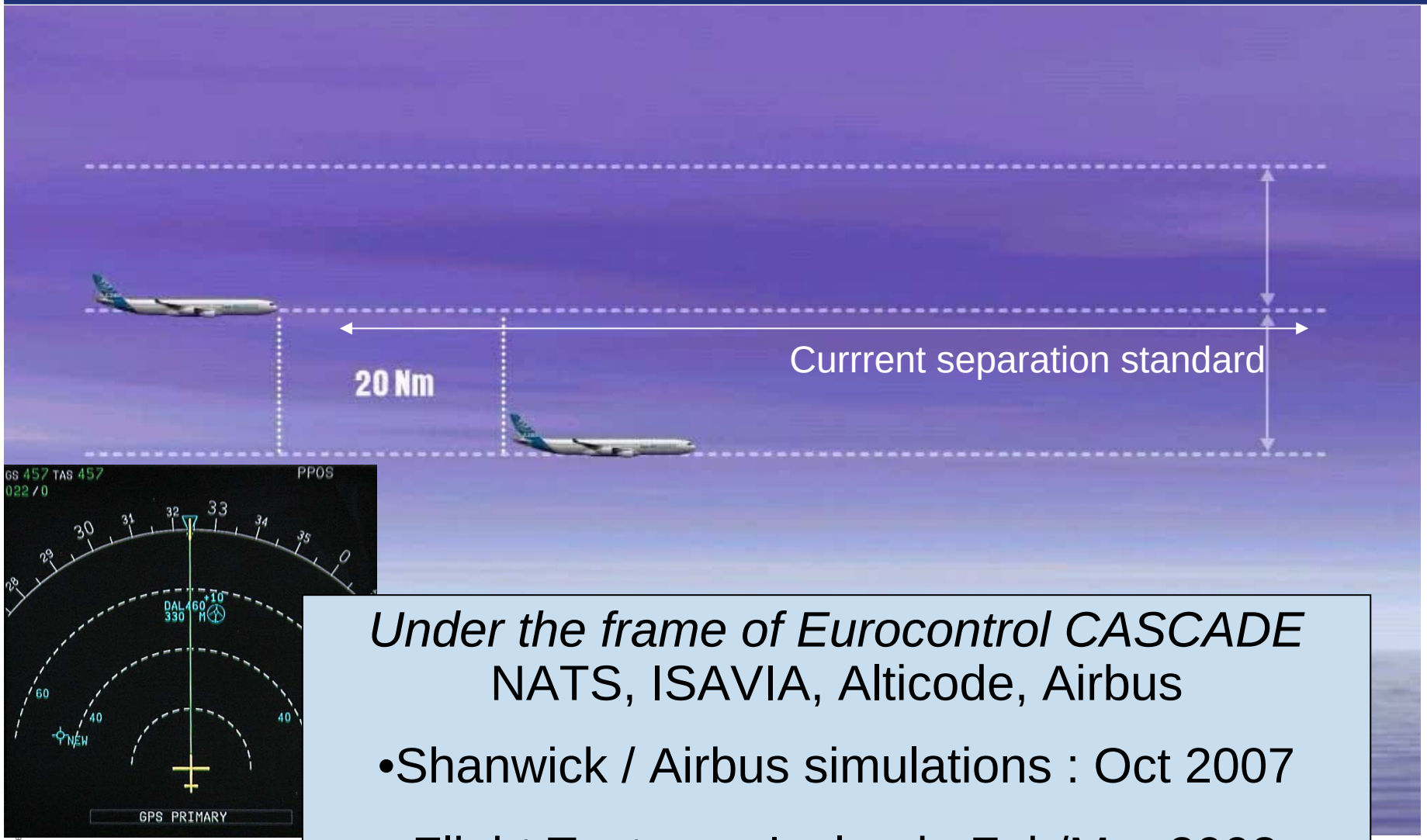
- A/C ident
- Ground Speed
- Wake Vortex category



ATSAW Step 2: A320/A340 Architecture



CRISTAL ITP : In Trail Procedures (ITP)



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

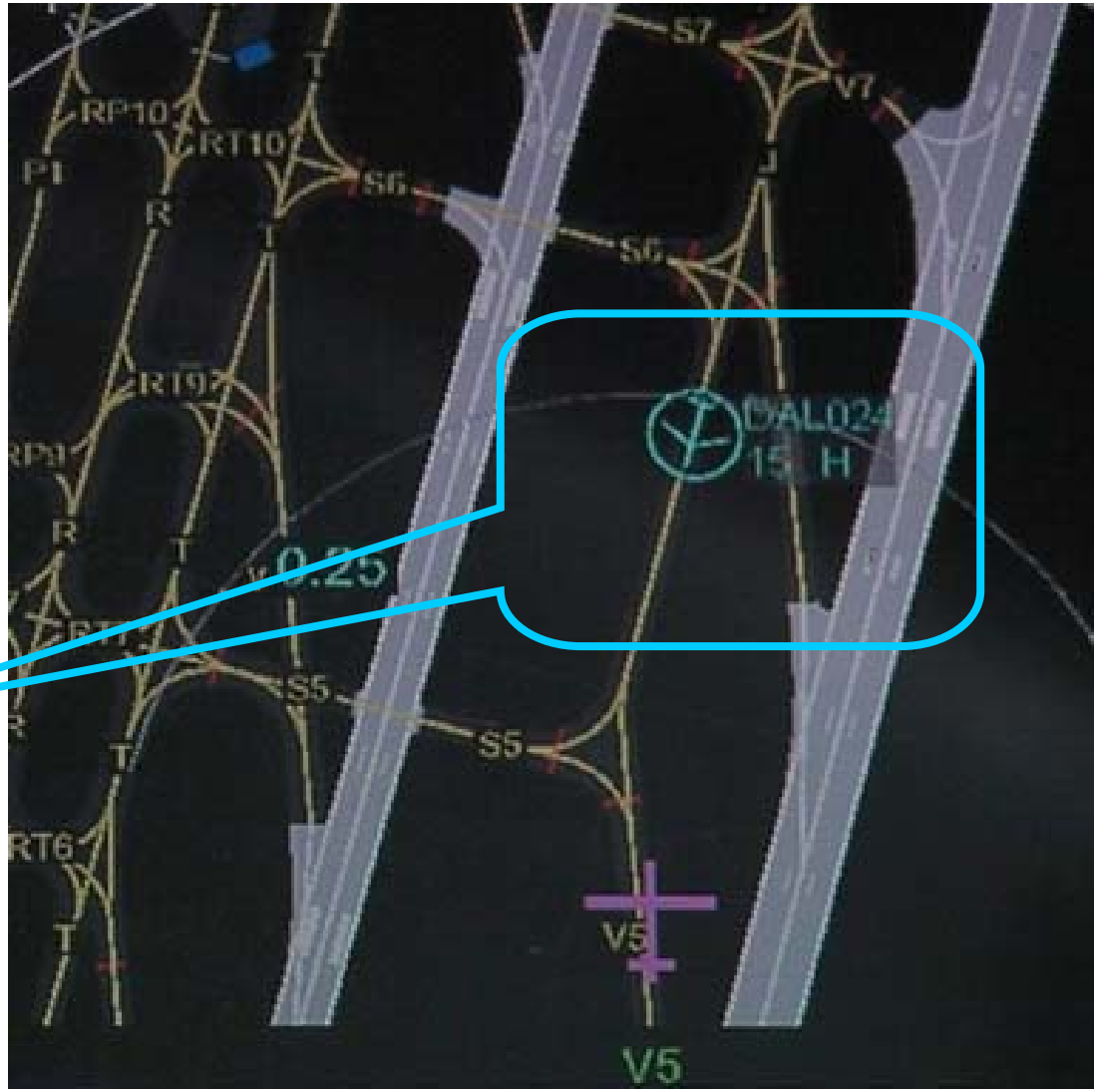
- Shanwick / Airbus simulations : Oct 2007
- Flight Test over Iceland : Feb/Mar 2008
- Pioneer airlines trials : 2009

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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