

# CASCADE

## ADS-B

Implementation across Europe

WG-51 SG1 Position on  
Proposed DO260A Change 3 Items



# Joint ED102A/DO260B 1090 ES MOPS Starting Point

- Objective: development of Joint MOPS (one document with different headers)
- SG1 accepts DO260A change 2 as “de facto” baseline
- Focus on existing & emerging DO260A change 3 items
  - See following slides for SG1 position on currently proposed items
  - Focus to be put on needs of EUR & US ADS-B Out Rules !
- Accommodate RFG top-down interoperability requirements !
  - NB: not only ADS-B-RAD & ADS-B-NRA
  - Overall: operational top-down justification & near-/mid-term implementation relevance to lead decision making process
- Ensure (timely) co-ordination with :
  - ICAO ASP
  - Co-ordination with WG-49/SC-209
  - Co-ordination with WG-51/SG4 (1090 Ground Station Spec)

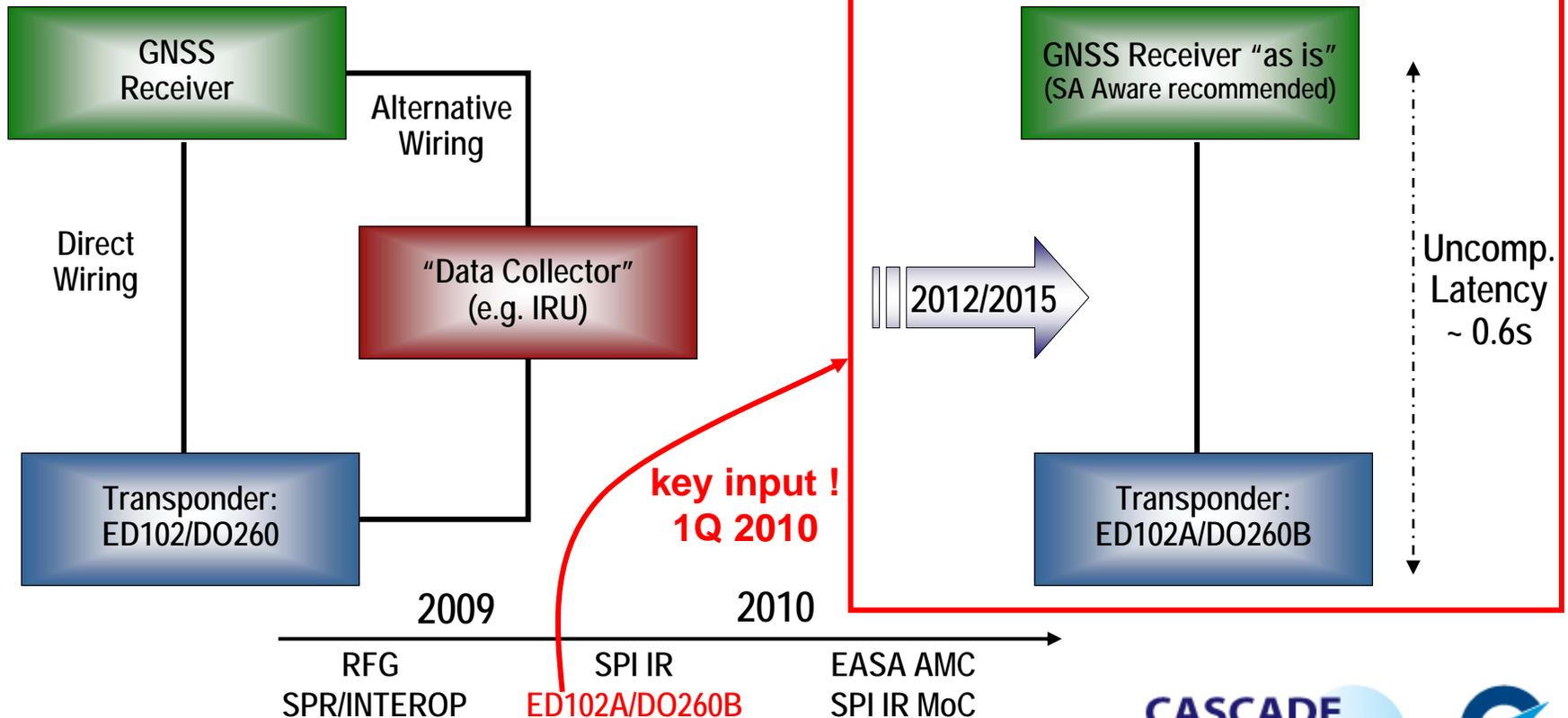
# "ADS-B out" Deployment In Europe Avionics Perspective

Pioneer Phase (existing "opportunity" avionics):

- Pocket implementations in Europe
- Australia, Canada, USA (TBD)

"ADS-B out" mandate (avionics upgrade):

- SES "SPI IR"
- USA (Australia, Canada) NPRMs



SPI IR: Surveillance Performance & Interoperability Implementing Rule  
MoC: (SPI IR) Means of Compliance





# Discussion of RTCA List of “DO-260A Change 3 (DO-260B) Change Candidates” plus additional SG1 Items

(using respective RTCA list reference numbers ‘#’)



# Discussion of DO-260 A Change 3 Items Latency

- #3 - Latency requirements and STP MOPS definitions integrated
  - High priority item
  - On-going discussion within STP MOPS Redo Ad-hoc group (incl. EUR contributions)
  - Important elements to be satisfied:
    - NACp to (only) “echo” the position source accuracy quality indicator (HFOM)
    - ADS-B-RAD requirement (uncomp. latency 0.6s/95% ) to be treated as key & baseline requirement
    - Feasibility of proposed advanced solutions to be secured first

# Discussion of DO-260 A Change 3 Items ES Surface Position (BDS 0,6)

- #2 - NIC=7 on surface
  - High priority item
  - Only one possibly required fix – there is quite likely more to be considered
  - ATSA-SURF (& ADS-B-APT) requirements to apply ! This implies that the on-going RFG (& WG1) work feeds into the 1090 ES MOPS work !
  - Legacy GPS equipage to be considered !
  - NIC: application needs & accommodation of legacy GPS equipage might require some (simple) "TIS-B validation mode" scheme
  - NACp: knowledge of GPS source being used rather than reported accuracy (at least for SA ON solutions) ?

# Discussion of DO-260 A Change 3 Items Quality Indicators (1/3)

- #9 - NACv determination; remove scaling NACv from HFOM
  - Supported by SG1 as current HFOM-based provisions appear to be flawed
  - To be clarified:
    - What is going to drive the NACv encoding, in the absence of current position sources providing a quality indication.
    - Which role will the FAA NACv=1 “ad-hoc” certification play ?

# Discussion of DO-260 A Change 3 Items Quality Indicators (2/3)

- #10 - Remove vertical component from NACp, NIC and SIL
  - Supported by SG1
  - On a similar token, the Type Codes 20-22 should be reviewed as well:
    - Whilst there is (some) operational justification (ATC tools) for downlinking GNSS Height (HAE), why is it only considered – as an absolute value – to be broadcast for the case of baro alt not being available ?
    - The three codes might be better used for other purposes
  - Within this context, how can we express the integrity performance of the (useful) “Difference between baro alt and HAE” within the Velocity Squitter (Type Code 19) ?

# Discussion of DO-260 A Change 3 Items Quality Indicators (3/3)

- #11 - Revise SIL definition
  - High priority item
  - Supported by SG1
    - Primary item to be encoded should be the measurement integrity (system integrity is a secondary item)
    - No reflection of VPL (see #10)
  - In addition, consider the explicit downlinking of info about the position source being used (see also surface application related discussion)
  - RFG ADS-B-RAD Issue Paper applies (led by Boeing, drafting on-going)

# Discussion of DO-260 A Change 3 Items Event Squitter Scheduling

- #8 - Event-driven squitter scheduling Mode 3/A and TCAS RA
  - SG1 agrees that, overall, the scheduling of the event squitters need particular attention
  - Detailed guidance material should be developed to ensure that the MOPS material does not become subject to interpretation by the implementers

# Discussion of DO-260 A Change 3 Items Mode A Code (BDS 6,1)

- #4 to 6 - Mode 3/A code:
  - High priority item
  - Supported by SG1
  - Removal of the geographic filter, message squitter & transmission rate & Mode 3/A code; future method of inhibiting broadcast: all to be in line with ICAO ASP proposal
  - TBD: redundant encoding of 7500, 7600 & 7700, both as Mode A codes and discrete emergency indicators, should be avoided !

# Discussion of DO-260 A Change 3 Items ACAS RA Broadcast (BDS 6,1)

- #20 - TCAS RA Broadcast in Emergency/Priority Message (opt.)
  - SG1 agrees that the 1090 MOPS provisions should be aligned with ICAO

# Discussion of DO-260 A Change 3 Items Selected Altitude (BDS 6,2)

- #17 - Selected Altitude Broadcast
  - SG1 agrees that the matter should be resolved as a medium priority item
  - CASCADE supports the inclusion of Selected Altitude information in 1090 ES to the maximum practical extent (key ADS-B-ADD parameter)
  - Key task: review of BDS 4,0 versus existing BDS 6,2 provisions regarding (sufficient) completeness of the latter
  - Alignment with ICAO to be considered regarding the removal of the ICAO BDS 6,2 "reserved" state

# Discussion of DO-260 A Change 3 Items General

- #14 - Update test procedures
  - SG1 (obviously) agrees with improving/amending/deleting where necessary
- #24 - Updates required if changing to Version 2 ?
  - SG1 agrees that the matter needs to be addressed

# Discussion of DO-260 A Change 3 Items General ADS-B Out (1/2)

- **#7 - Time synchronization (T=1) in non precision modes**
  - To be understood by SG1
- **#12 - Transmission Class (Add A0\* or A1\* for medium power, non diversity)**
  - To be understood by SG1
- **#13 - Change CDTI Installed/Operational to ADS-B In capable**
  - Overall, SG1 proposes a general “tidy-up” of BDS 6,5 (which elements are operationally justified or technically feasible (sources ?))
  - The specific proposal needs to be better understood by SG1 – it would appear that the proposal yields something rather open-ended (at least notionally)

# Discussion of DO-260 A Change 3 Items General ADS-B Out (2/2)

- #16 - Wake Vortex Weather Information
  - To be understood by SG1
- #21 - Type Code ZERO Mods ?
  - SG1 agrees that the matter needs to be addressed

# Discussion of DO-260 A Change 3 Items General ADS-B In

- #1 – (Output of) Duplicate Addresses
  - SG1 agrees that the matter needs to be addressed
  - Possibly to be aligned with existing/emerging SG4 provisions
- #15 - Modify Position Outlier Test upon transition ground-air
  - To be understood by SG1
  - Possibly to be aligned with existing/emerging SG4 provisions
- #19 - TIS-B Management Messages
  - To be understood by SG1
  - See also surface position squitter related discussion

# Discussion of DO-260 A Change 3 Items Additional items proposed by SG1 (1/3)

- Consideration of swapping “single antenna flag” (BDS 0,5) & “NIC supplement” (BDS 6,5)
  - Depending on the outcome of the surface squitter NIC encoding discussion
- Draft 1.0 of DO260 Change 3 (WP23-02) states than an update of the NIC can take up to 5 seconds before NIC is set to “unknown”
  - What is the reasoning behind the 5 seconds ?
  - NIC related source info (HPL) should be available with each measurement (refer e.g. to RAD IR13 req't) !
- ADS-B Position Reference Point (DO-242A matter)
  - For Surface operations, the aircraft’s nose would be the preferred reference point – to be clarified if current reference point plus length/width info effectively achieves that

# Discussion of DO-260 A Change 3 Items Additional items proposed by SG1 (2/3)

- Validation ground/switch
  - Alignment with ED73C/DO181D
  - Airborne status to be independent of the Emitter Category
- Clarify start/end of squittering
  - Airborne position squitter: Clarify what happens when position is lost and when altitude remains (60s) + what happens when altitude disappears and reappears during a loss of position
  - Aircraft identification squitter (always squittered even after a loss of input)

# Discussion of DO-260 A Change 3 Items Additional items proposed by SG1 (3/3)

- CPR
  - Verify compatibility between reasonableness test and Duplicated addresses
- Check NIC supplement coding and testing
  - Verify NIC supplement and type code coding for  $RC < 0.6NM$  and  $RC < 0.5NM$
  - Clarify what happens when cannot determine NIC supplement and adapt the testing

# SG1 Proposed Way Forward Short-term

- Consolidate list of change proposals, incl. prioritization/ benefit for each point
- Develop an action plan (incl. the who's) for each change proposal
- Develop criteria for deleting items from the list as we progress
  - One key criterion to assess upfront is the feasibility of implementation !
- Look into the availability of additional bits on a global basis
  - Also allocate bits on a global basis to the various items requiring new bits (based on priority and need)
- Objective:
  - **Stable** document to support ADS-B out regulation
  - Find a way to manage further evolutions (ADS-B In)