

Airbus work on VDL Mode 4

ICAO ACP

Working Group C Meeting

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WGC6/WP29



AIRBUS

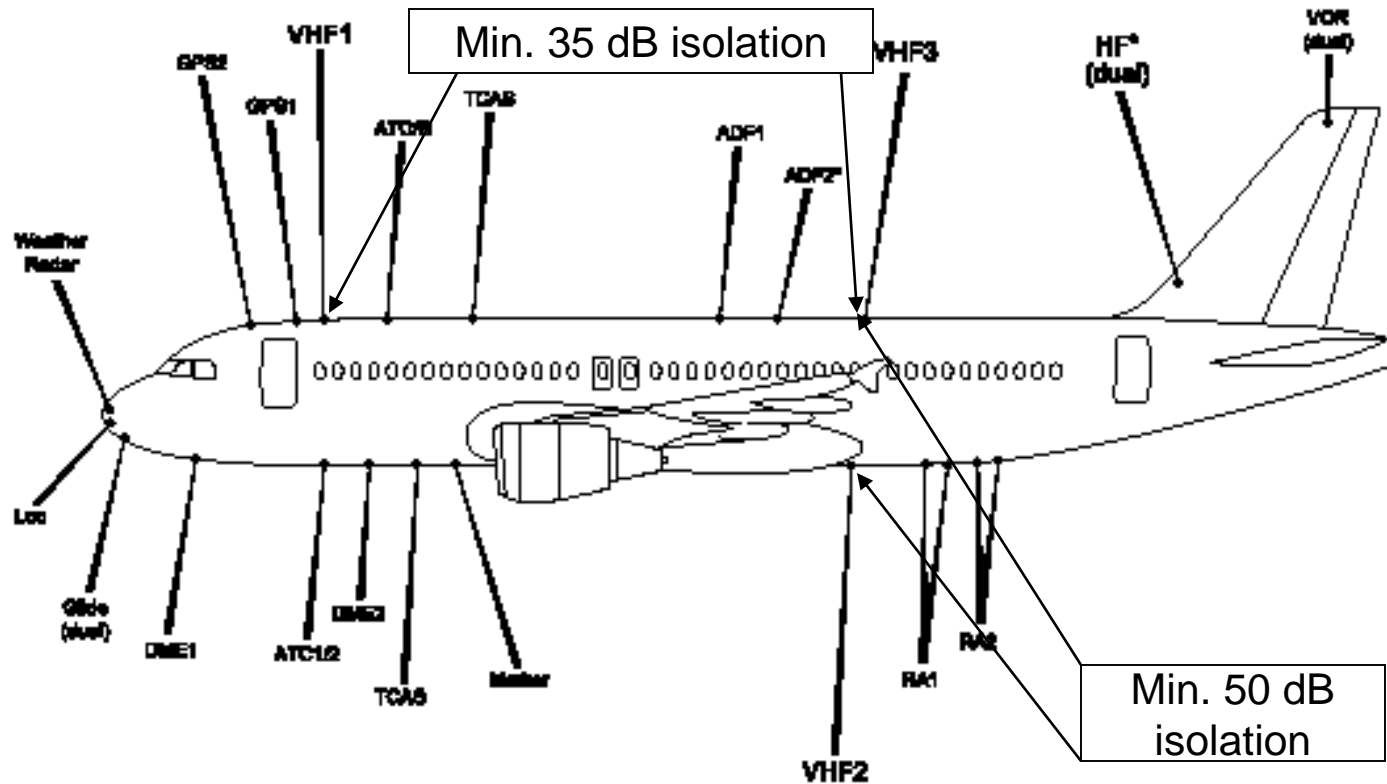
Airbus VDL Mode 4 background

- VHF installations on airliners
 - ▶ On over 20 different jet airframes, in service since 1954
 - ▶ Typically 3 or more makes/models of radio per airframe
 - Analogue, digital & multimode, several variants per make/model
 - ▶ Airline and government radios
 - ▶ Over 63 000 000 flight hours worldwide, mainly since 1974
 - ▶ Europe's prime source of airliner VHF safety, installation, problem identification and problem resolution expertise
- ICAO, EUROCAE/RTCA-EN & ARINC/AEEC standards participant
- CEC NUP II research programme participant
- CEC Data Link Roadmap Study participant
- ICAO ACP participant
- ICAO 11th ANC co-ordinator for ICCAIA
- EC VDL Mode 4 Airborne Architecture Study reviewer

Air transport aircraft – VHF Comm. antennas

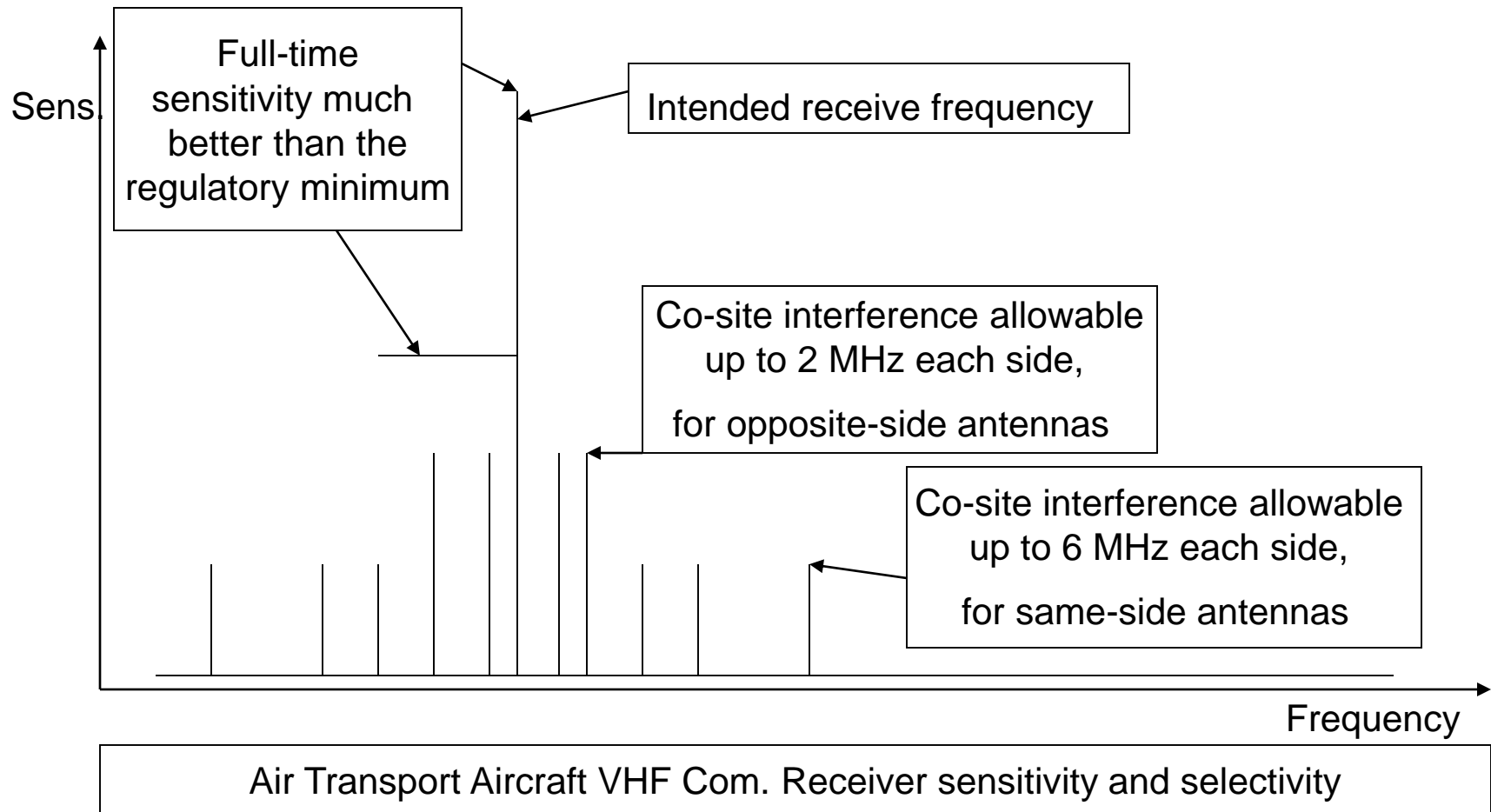
Figure 2.3 - Antenna location

A320 shown – A318, A319 & some B737s are shorter, but have same isolation



VHF Co-site interference is allowable and occurs

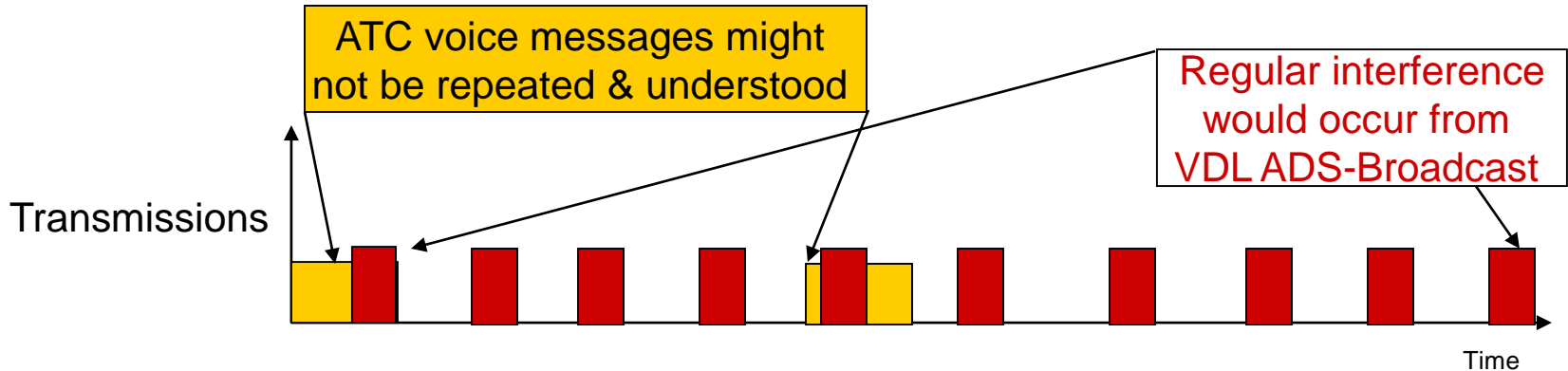
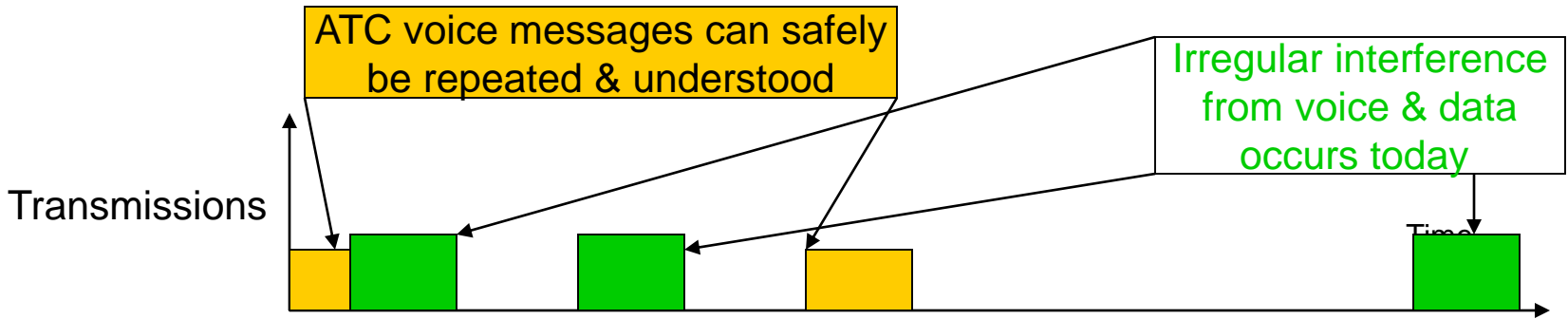
- Occurs on voice & ACARS, mitigations ensure safety



NUP II VDL-4 work

- NUP II is a surveillance-only programme – does not address Comms.
 - ▶ aimed at ADS-B-out/VDL-4 airline in-service trials by 2004
 - ▶ co-existing with VHF voice & ACARS utilisation
- Added VDL-4 antenna installations on wingtips contain interference at existing levels: expensive, and retrofit would need long down-time
- Analysis showed that added VDL-4 ADS-B radios would interfere with existing safety-of-life VHF Com. radios
 - ▶ because 6MHz frequency separation was not available
 - ▶ because ADS-B transmissions are repetitive and frequent; may not allow classic VHF Comm. mitigations.
 - planned airline Service Bulletin issuance consequently discontinued
- Air Transport VDL-4 radios much more expensive than expected
 - planned radio purchase consequently discontinued
- Consequently plan revised to trial a LFV-supplied VDL-4 radio, but only on an Airbus-operated flight-test aircraft
 - LFV is looking for another solution for an airline in-service trial

Interference mitigation



Existing voice mitigation measures might not be used with VDL ADS-Broadcast, unless surveillance is turned off

NUP II VDL Mode 4 initial trial

- Initial aircraft ground trial installation
 - ▶ Loaned non-air-transport (1/2-power) COTS VDL-4 transceiver, transmitting ADS-B frequently on one frequency
 - Connected to the VHF3 antenna, in lieu of the VDR3 transceiver
 - ▶ Distant low-power handheld VHF & ATIS desired-signal transmitters
 - ▶ VHF1 & VHF2 tuned to receive desired-signal transmissions
- No squelch breaks experienced due to VDL-4 when desired signal was not transmitted
- When desired-signal and VDL-4 test transmissions were active together, “metronome-like” clicks were heard
 - ▶ On a number of desired-signal test frequencies
 - ▶ Test results analysis is in progress

Datalink Roadmap Study and ICAO ACP

- Made available NUP II results that were available at the time
- Advised that Mode S ELS, EHS and ES would be the initial SSR surveillance and ADS-B air-ground & air-air media
- Advised that VDL-Mode 2 would be the initial air-ground medium
- Advised that core-area airlines, ANSPs and air-transport airframers were planning to use these media
- Expressed concern that VHF spectrum saturation would occur around 2013, dominated by safety-of-life voice use
- Expressed concern that VDL-4 service may add little to data efficiency, but be detrimental to spectrum availability
 - ▶ proliferation of standards, many core-area channels needed

ICAO ANC-11 with ICCAIA

- Recommended that ICAO consider frequency planning consequences
- Consider real VHF radio performance
 - ▶ Co-site interference within 6 MHz
 - From VDL used for ADS-B
- Consider that surveillance & voice
 - ▶ Are safety-of-life services
 - Unavailability of either impacts service levels
- Consider VHF spectrum availability
 - ▶ Poor in the core areas by 2013, due to voice
 - Needed mainly for safety-of-life voice services
- ANC-11 recommended use of 1090ES for initial ADS-B implementation
 - ▶ Without demurrals (including Mongolia, Russia & Sweden)
 - ▶ Recommended continued standards work on UAT & VDL-4
 - For eventual future surveillance implementation, if spectrum available
 - Did not recommend use for point-to-point communications
 - Recommended use of already-implemented standard systems (e.g. VDL-2)

Airbus views on VDL Mode 4

- VHF is an undesirable spectrum for ADS-B, due to
 - ▶ existence of the efficient, safe, inexpensive 1090 ES medium
 - ▶ added high aircraft costs, co-site interference, poor core-area spectrum availability & need for several channels separated by 6 MHz from ATC voice
 - VDL-4 was the only VHF candidate for ADS-B initial implementation
- Advantages claimed for VDL-4 point-to-point datalink are not widely accepted, and likely outweighed by added standards proliferation
- Architecture of VDL Mode 4 Airborne Architecture Study adds complexity & vulnerabilities, compared with existing
 - ▶ Would need much more safety studies
- VDL-4 was a good experimental medium
- Co-site interference is not a safety problem for voice, ACARS or VDL communications use

What next?

- Airbus supports AEA's view that ADS-B VDL-4 work should be terminated
 - ▶ Except for supporting existing experimental programmes
 - ▶ Implementation resources should be used for 1090ES
 - ▶ National surveillance aids can impact airline safety
- Impact on VHF Comm. safety-of-life spectrum should be reviewed, prior to continuing VDL-4 Comm. Work
 - ▶ VHF Comm. spectrum runs out around 2013 in core Europe
- We need to go up in spectrum for Comms & Surveillance
 - ▶ UAT? 1030ES?
 - ▶ Eurocontrol's Newcom?
 - ▶ Would STDMA protocols help significantly or hinder?

- Thank you for listening – any questions?