

ICAO Regional Coordination Meeting in preparation of the ITU WRC-2003
Lima, Peru 27-28 March 2001

HFDL, VDL and GBAS frequency planning

Presented by:

Alessandro Capretti
Technical Officer, CNS
ICAO



Frequency planning for new systems

- Frequency planning criteria for existing (analog) systems in a band do not necessarily apply to new (digital) systems in the same band
- New criteria may need to be developed to cater for new systems
- Protection of existing systems needs to be guaranteed



HF voice frequency planning (1)

- ITU Radio Regulations Appendix S27:
 - Title: “Frequency allotment Plan for the aeronautical mobile (R) service and related information”
 - Content
 - A plan allotting HF frequencies to Major World Air Route Areas (MWARA), Regional and Domestic Air Route Areas (RDARA) and World-wide Areas
 - Explanation of the principles used to establish the plan (eg 15 dB protection ratio)
- Frequencies to be used for HF voice communications are:
 - those in the Appendix S27 plan for the relevant area; and
 - those that are not in the Appendix but satisfy the same principles



HF voice frequency planning (2)

- Frequency assignment coordination to be conducted by national telecommunication administrations through ITU
 - coordination is required to ensure adequate protection to all frequencies in Appendix S27 and other assigned frequencies
- Assigned frequencies are recorded by ITU in the Master International Frequency Register (MIFR)
- ICAO is developing frequency assignment planning tool for use by States/Regions



HF data link frequency planning

- Based on ITU-R Recommendation M.1458
- M.1458 ensures that the same principles defined in Appendix S27 for HF voice can be used for HF DL
- Therefore, Appendix S27 frequencies can be used for HF DL under the same conditions as for HF voice
- Additional constraints:
 - in order to guarantee that HF DL transmission are restricted to coordinated coverage areas, global coverage areas are preferred (if global coverage is not available, larger areas are preferred to smaller)
 - within Appendix S27, world-wide and MWARA frequencies are preferred



VDL frequency planning

- VHF Digital Link (VDL)
 - Mode 1: deleted from Annex 10
 - Mode 2: 31.5 kbit/s data (currently in Annex 10)
 - Mode 3: 31.5 kbit/s (up to 4 integrated data+voice channels)(in Annex 10 from November 2001)
 - Mode 4: 19.2 kbit/s data(in Annex 10 from November 2001)
- Signal characteristics and protection requirements are different from VHF voice
 - VDL behaves differently from analog VHF both as a victim and as an interferer
- Frequency planning criteria for VDL are under development by AMCP WGB



VDL frequency planning (1)

- All combinations need to be catered for:
 - Analog (DSB-AM) vs self (already in Annex 10)
 - Analog (DSB-AM) vs Mode 2
 - Analog (DSB-AM) vs Mode 3
 - Analog (DSB-AM) vs Mode 4
 - Mode 2 vs self
 - Mode 2 vs Mode 3
 - Mode 2 vs Mode 4
 - Mode 3 vs self
 - Mode 3 vs Mode 4
 - Mode 4 vs self
 - all modes vs adjacent NAV band systems



VDL frequency planning (2)

- AMCP Working Group B is developing the frequency planning criteria
- Extensive equipment testing required
- Testing conducted at minimum desired signal level to assess maximum permissible interference under agreed test conditions
- Criteria agreed so far by WG B
 - Mode 2 vs DSB AM (air-air): 2 x 25 kHz guard channels
 - Mode 2 vs self: 1 x 25 kHz guard channels
 - Mode 2 vs self (co-channel): 20 dB D/U



VDL frequency planning issues

- Only few combinations addressed so far
- Ground receiver specifications too tight to allow for undesired signal
- Validation of test criteria to be completed
- Use of DSB-AM and VDL on same aircraft raises compatibility issues
- Selection of VDL Mode 4 Common Signalling channels
 - COM and/or NAV band?
 - This issue is related to WRC-2003 Agenda Item 1.28



GBAS frequency planning

- GBAS: Ground-based augmentation system
- SARPs adopted in March 2001
- VHF data broadcast (ground-to-air)
- Band: 108 - 117.975 MHz (ILS/VOR band)
- Currently restricted to VOR band (>112 MHz) pending development of criteria to protect IL
- D/U ratio to protect VOR established “empirically”
- Geographical separation derived from D/U, signal power and propagation model
- Detail is Annex 10, Vol.I, Att. D, 7.2

