



International Civil Aviation Organization

**MIDANPIRG Communication Navigation and Surveillance
Sub-Group (CNS SG)**

Fifth Meeting
(Cairo, Egypt, 11 – 13 December 2012)

Agenda Item 4: Development related to CNS

**HANDBOOK ON RADIO FREQUENCY SPECTRUM REQUIREMENTS FOR CIVIL
AVIATION; VOLUME II FREQUENCY ASSIGNMENT PLANNING CRITERIA FOR
AERONAUTICAL COMMUNICATION AND NAVIGATION SYSTEMS**

(Presented by the Secretariat)

SUMMARY

This paper presents the new Volume II of Doc 9718 – *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation on Frequency assignment planning criteria for aeronautical radio communication and navigation systems*. This Volume II has been developed to update, as required, the current frequency assignment planning criteria as agreed in the Regional Air Navigation Plans and is intended to provide, when implemented in the Regional Air Navigation Plans, globally harmonize frequency assignment planning criteria. This paper also addresses aspects relevant to the incorporation, preferably by reference, these planning criteria in Regional Air Navigation Plans.

Action by the meeting is in paragraph 6.

1. INTRODUCTION

1.1 ICAO is progressing the development of a frequency assignment planning program Frequency Finder that is primarily intended to assist Regional Offices in frequency assignment planning for aeronautical radio communication and navigation systems. Frequency Finder is also to be made available for use by States. Eventually, Frequency Finder will support the development of the ICAO global database of frequency assignment. This database is to be used in frequency assignment planning and will be regularly updated by the ICAO Regional Offices.

1.2 During this activity, which started in 2008, it became evident that the frequency assignment planning criteria used in the various ICAO Regions need to be updated to include provisions that would enable better and more efficient frequency assignment planning. In response, the Aeronautical Communications Panel, through its Working Group F, took the task to review the current planning criteria and completed (September 2012) a comprehensive package with frequency assignment planning criteria for VHF COM systems, operating in the frequency band 117.975 - 137 MHz. Work on the development of frequency assignment planning criteria for radio navigation systems in ACP Working Group F and the NSP as necessary is on-going.

1.3 The now completed frequency assignment planning criteria for VHF COM systems (air/ground voice communication, VDL Mode 2 and VDL Mode 4) are contained in the new edition of the ICAO *Handbook on radio frequency spectrum requirements for civil aviation, Volume II, Frequency assignment planning criteria for aeronautical communication and navigation systems* (Doc 9718).

1.4 The development of Volume II of the Handbook took place in parallel with a revision of the ICAO SARPS in Annex 10, Volume V *Aeronautical Radio Frequency Spectrum Utilization*. The revision of Annex 10 concentrated on the material contained in Chapter 4, *Utilization of frequencies above 30 MHz*, Section 4.1 *Utilization in the band 117.975— 137MHz*. This revision, which was submitted to States for comments with State letter AN 7/1.3.99-12/33 on 24 April 2012, has been reviewed by the Air Navigation Commission in October 2012 and is expected to be submitted to Council for adoption during the first or second quarter of 2013.

1.5 The revision of Annex 10, Volume V included the deletion of the guidance material from Attachment A "*Considerations affecting the deployment of VHF communication frequencies*" from Annex 10. Relevant material from this Attachment was incorporated in the Handbook, Volume II.

1.6 The Handbook Volume II is attached as an embedded document to this working paper.

2. GENERAL INTRODUCTION OF VOLUME II

2.1 Chapter 1 of the Handbook contains material outlining the general methodology and general aspects that should be used for frequency assignment planning and compatibility analysis. It provides background material that has been further used in developing actual frequency assignment planning criteria in the Handbook. It addresses various aspects on the compatibility and propagation modelling. The criteria in the Handbook, Volume II contain the minimum requirements to be satisfied in frequency assignment planning.

2.2 Chapter 2 of Volume II of the Handbook contains detailed material on the frequency assignment planning for VHF air/ground communication systems. This material is based on the principles for frequency assignment planning as outlined in the amendments to Annex 10 Volume III and Volume V (Re. State Letter AN 7/1.3.99-12/33). This chapter provides details on frequency assignment planning for VHF air/ground communication systems (voice, VDL Mode 2 and VDL Mode 4) that should be applied globally, in order to ensure that these systems are protected globally to the same level. This material should replace much of the current Regionally agreed planning criteria.

3. FREQUENCY ASSIGNMENT PLANNING CRITERIA FOR VHF COM SYSTEMS

3.1 Volume II of the Handbook describes in Chapter 2 the development of detailed frequency assignment planning criteria for VHF COM systems with the following method.

3.1.1 Interference model for VHF COM systems

The interference model follows the principles outlined in Annex 10 which states that the protection shall be based on a minimum separation between the Designated Operational Coverage (frequency protected service volume) not less than to achieve a Desired/Undesired (D/U) protection ratio of 20 dB or the sum of the distances to the associated radio horizon of each service volume. This is the same model that is used in current frequency assignment planning in all Regions. Also, the interference model to be used in areas where the frequency assignment planning is based on a D/U ratio of 14 dB is described in detail (this method is only used in Europe). It also describes the method to establish minimum separation distances for adjacent VHF COM frequencies.

3.1.2 Allotments in the frequency band 117.975 - 137 MHz

The allotment of the frequency band 117.975 - 137 MHz as specified in Annex 10, Volume V, is briefly described, together with the Regional allotments that are incorporated in the Regional Air Navigation Plans. The details of these Regional allotment plans, which to the maximum extent possible should be applied in frequency assignment planning, have been incorporated in Appendices. Special attention should be given in Regional planning to the Regional allotment of frequencies for VDL (VDL Mode 2 and VDL Mode 4) and, where possible, should be aligned on a global basis.

3.1.3 Frequency separation and channelling

Although Annex 10 stipulates that the minimum separation between assignable frequencies shall be 8.33 kHz, it is recognized that in areas where with the use of 25 kHz channel spacing sufficient frequencies can be provided for national and international operations, the use of 25 kHz channel spacing can continue. Such continued use of 25 kHz channel spacing would secure continuing use of radio equipment already installed on many aircraft. Since one Region (Europe) has implemented 8.33 kHz channel spacing, the Handbook explains issues surrounding this implementation, including aspects related to the inter-regional coordination of these (8.33 kHz) frequency assignments. Implementation of 8.33 kHz channel spacing in (parts of) other Regions is expected. In principle, since all ICAO Regions have already implemented in the Regional plans provisions for 25 kHz channel spacing, the relevant material in the Handbook is in line with current practice.

3.1.4 Services and Designated Operational Coverage (DOC)

Current frequency assignment planning is based on using uniform values of the DOC for specific Services (TWR, APP, ACC). However, with the introduction of computer programs that can quickly assess the compatibility of other frequency assignments, a more flexible (and more frequency efficient) method can be implemented by determining for each frequency assignment the actual required DOC (range/height). However, since the method of using uniform values for Services is a widely used practice, the Handbook has incorporated a table of uniform values (DOC) for specific Services, based on the values already used in the Regions. Special attention is necessary by each Region to validate this table. All Regions are invited to consider also the use of non-standard values for the DOC; the global table of frequency assignments that is being developed provides for this.

3.1.5 Calculation of separation distances

The methodology for calculation geographical separation distances is explained in detail. The methodology describes the calculation of circular service areas for both air/ground communication services as well as for aeronautical broadcast services (like VOLMIET and ATIS).

Details concerning the principles for calculation of separation distances in cases where the protection ratio to be used is 20 dB or radio line-of-sight as well as 14 dB (1:5 distance ratio; only used in the EUR Region) have been incorporated.

Material for calculating separation distances with area services (like ACC and FIR) has been incorporated. For area services the protection should be calculated from the edge of the area service, even in case the actual coverage of a (ground) station could extend into an adjacent area. Similarly, in case a single (ground) facility cannot provide coverage throughout a certain area (FIR), protection of all points within the FIR would enable, through the implementation of so-called extended range facilities operating on the same (nominal) frequency coverage can be improved without the need for additional frequency assignment planning. In this case, the new frequency assignment planning criteria differ from current practice.

Using the methodology mentioned above, a table of separation distances (with separation distances measured between the edge of the DOC areas) has been developed for Services with uniform DOC.

3.1.6 Based on extensive work in the Aeronautical Communications Panel over a long period, frequency assignment planning criteria for VDL Mode 2 and VDL Mode 4 were completed in 2008. These criteria are to be applied to protect VDL networks operating on different frequencies as well as to secure compatibility with air/ground voice communication services.

4. REGULATORY STATUS OF FREQUENCY ASSIGNMENT PLANNING CRITERIA

4.1 The frequency assignment planning criteria in Volume II of the Handbook are to be considered as guidance material for frequency assignment planning (currently only for VHF air/ground communication systems). Implementation of these (minimum) criteria in the Regions has to take place through relevant decisions from the Regional Planning and Implementation Groups (PIRGs) that take into account the specific requirements from each Region. This method provides for the most adequate implementation of the updated frequency assignment planning criteria and permits Regions to add specific conditions to satisfy specific Regional requirements.

4.2 For the implementation of these planning criteria in the relevant Regional Plans, a single statement referring to the planning criteria in the Handbook Volume II that are to be applied may be sufficient (e.g. planning criteria for 25 kHz channel spacing; 20 dB or line of sight protection). When considered necessary, additional conditions or criteria can be added. The provisions in Annex 10, Volume V, include provisions for additional criteria or conditions to be applied on a Regional basis.

5. IMPLEMENTATION OF THE FREQUENCY ASSIGNMENT PLANNING CRITERIA IN FREQUENCY FINDER

5.1 ICAO has, in principle, completed the development of a computer program (Frequency Finder) that will assist Regional Offices and ICAO Contracting States to in frequency assignment planning. This program is described in a separate working paper. In conjunction with the completion of this program, ICAO will place the global database of frequency assignments (which is a concatenation of the current Regional frequency assignment plans) on the ICAO website which can be downloaded by States. Currently, Frequency Finder is being updated with the revised planning criteria as contained in the Handbook, Volume II. It is expected that Frequency Finder can be made available to States and Regional Offices during the first quarter of 2013. Frequency Finder is to be used with the ICAO global database. Regional Offices may use this program to coordinate frequency assignments within the Region and update the global data base as and when required.

6. ACTION BY THE MEETING

- 6.1 The meeting is invited to:
- a) consider the material presented in this working paper in conjunction with the material provided in the Handbook, Volume II;
 - b) provide any comment relating to the updated planning criteria; and
 - c) agree that detailed material will be developed for implementing in the Regional Air Navigation Plan while giving due account to any specific additional Regional requirements, if any.
