



International Civil Aviation Organization

FIRST MEETING OF SPECTRUM REVIEW WORKING GROUP (SRWG/1)

Bangkok, Thailand 26 – 27 June 2014

Agenda Item 5: Improvement of VHF frequency assignment procedure

**AERONAUTICAL FREQUENCY SPECTRUM COORDINATION AND
MANAGEMENT IN THE APAC REGION**

(Presented by the Secretariat)

SUMMARY

This paper reviews current practices and coordination procedure for aeronautical facilities and services operating in the aeronautical frequencies bands of 190-526.5 kHz – NDB; 108-117.975 MHz and - 960 – 1215 MHz - VOR/DME and ILS, VDL Mode 4 and VHF Frequency **Bands from 117.975 to 137 MHz.**

1. INTRODUCTION

1.1 The ICAO Third Asia/Pacific Regional Air Navigation (ASIA/PAC/3 RAN) Meeting, held in Bangkok from 19 April to 7 May 1993, agreed that the frequency lists prepared by the Asia and Pacific Regional Office will be the frequency planning documents for the Regions. The relevant conclusions of the meeting which outline the procedure are as follows:

Conclusion 12/9 - Procedure for Radio Navigation Aids Frequency Assignment

That:

- a) the development of the radio navigation aids plan, and its subsequent documentation in relevant air navigation plan (ANP) publications, will define the respective radio navigation aid requirements at each location without reference to discrete frequency assignment;
- b) the ICAO Regional Office will continue to maintain its frequency selection and coordination role, including the maintenance and promulgation of Frequency List Nos. 1 and 2 in a timely and periodic manner; and
- c) additions, deletions and changes to discrete frequency assignments to radio navigation aids will not require amendment to the ANP.

Conclusion 11/4 - Procedure for very high frequency (VHF) aeronautical mobile Service (AMS) frequency assignment

That:

- a) the development of the VHF AMS plan, and its subsequent documentation in relevant air navigation plan (ANP) publications, will define the numbers of VHF assignments (channels) required for the respective functions at each location without reference to discrete frequency assignment; and
- b) the ICAO Regional Office will continue to maintain its frequency selection and coordination role, including the maintenance and promulgation of Frequency List No. 3 at appropriate periodic intervals.

1.2 In accordance with above Conclusions of the RAN Meeting, ICAO APAC Regional Office maintains and publishes the updated APAC frequency lists 1 , 2 and 3 annually in the end of each year.

1.3 New Editions of this list will be issued on a regular basis. Any errors or discrepancies should be communicated to the ICAO Asia and Pacific Regional Office.

1.4 The latest frequencies lists were updated by the end of December 2013. The updated lists are published under – CNS More Documents through secure portal of ICAO APAC website webpage.

2. DISCUSSION

2.1 Updating of the Lists

2.1.1 Frequency List 1 (29th Edition) for the navigation facilities in the band of 190-526.5 kHz – NDB ;

2.1.2 Frequency List 2 (28th Edition) for the navigations facilities in the bands of 108-117.975 MHz and - 960 – 1215 MHz - VOR/DME and ILS, VDL Mode 4.

2.1.3 Frequency List 3 (27th Edition) for aeronautical communication facilities in the VHF Frequency Bands from 117.975 to 137 MHz.

2.2 Planning Principles for Frequency Assignment and Criteria adopted by the RAN Meeting

Planning principles for Non-Directional Radio Beacons (NDBs)

2.2.1 NDB Frequency assignments should be based on the criteria contained in Annex 10, Volume 1, Volume 5 and the principles agreed to by the ASIA/PAC/3 RAN Meeting (several conclusions and recommendations in this connection) also the materials contained in Annex 10 Vol I Chapter 3 paragraph 3.4.3 and the guidance material contained in Attachment C paragraph 6 of Annex 10 Vol I.

2.2.2 Planning principles for VHF omnidirectional radio range (VOR), distance measuring equipment (DME) and Instrument Landing System (ILS):

The following criteria are used in the selection of frequencies for VOR and/or VOR/DME:

- i) For VORs used for en-route flight operations, the required geographic separations are;

550 NM between 200 NM/45K co-channel facilities,
705 NM between 300 NM/45K ER co-channel facilities, and
220 NM for adjacent channel facilities.
- ii) For VORs providing service up to 60K, the required geographic separation between co-channel facilities is 720NM;
- iii) For VORs used in terminal areas, (40 NM/25K), the required geographic separations are;

200 NM for co-channel, and
60 NM for adjacent channel. (based on 100 kHz channel spacing)
- iv) For VORs used for final approach and landing (25 NM/10K), the required geographic separations are;

130 NM for co-channel, and
30 NM for adjacent channel. (based on 100 kHz channel spacing)

2.2.3 The density of ILS installations in the Asia and Pacific Regions permits the assignment of frequencies with 175 NM as the geographic separation for co-channel operation.

2.2.4 **Geographical separation for Co-channel VHF assignments**

AIR - GROUND COMMUNICATION FOR	SYMBOL	SERVICE RANGE NM	SERVICE HEIGHT m/ft	CO-CHANNEL SEPARATION NM
Aerodrome Control	TWR	25	1200/4000	175 (1)
Surface Movement Control	SMC	limits of aerodrome	surface	50 (1)
Approach Control (upper)	APP - U	150	13700/45000	820 (1)
Approach Control (intermediate)	APP - I	75	7600/25000	550 (1)
Approach Control (lower)	APP - L	50	3650/12000	370 (1)
Area Control or Flight Information (upper)	ACC - U	Specified area plus 50 NM	13700/45000	520 (2)
	FIS - U		19800/65000 (3)	630 (2)
Area Control (lower)	ACC - L	Specified area plus 50 NM	7600/25000	500 (2)
Area Control or Flight Information (extended range)	ACC-SR-L			
VOLMET/ATIS	ACC - ER	to be specified	13700/45000	1000 (1)
	FIS - ER		19800/65000 (3)	1200 (1)
	VOLMET or ATIS	omni - directional	13700/45000 or 19800/65000 (3)	520 (1) 660 (1)

- (1) Distance between stations
- (2) Distance between limits of service areas
- (3) If required for SST operations

Explanation of Functions

2.2.5 The explanation to the type of service/functions commonly used in this frequency list is provided below.

ACC-L	Area control service for flights up to FL 250
ACC-SR-I	Surveillance radar area control service up to FL 250
ACC-SR-U	Surveillance radar area control service up to FL 450
ACC-U	Area control service for flights up to FL 450
AD	Within limits of aerodrome
AFIS	Aerodrome flight information services
APP-L	Approach control service for flights below FL120
APP-I	Approach control service for flights below FL 250
APP-PAR	Precision approach radar service up to FL 40
APP-SR-I	Surveillance radar approach control service up to FL 250
APP-SR-L	Surveillance radar approach control service up to FL 120
APP-SR-LU	Surveillance radar approach control service up to FL 450
APP-U	Approach control service for flights up to FL 450
ATIS	Automatic terminal information service
CD	Clearance delivery
CTA	CTA
DF	Direction finding
ER	Requirement to utilize extended range technique, RCAG or repeater stations
RCAG	Remote controlled air-ground communication
FIR	Flight information region
FIS-L	Flight information service for flights up to FL 250
FIS-U	Flight information service for flights between FL 250 and FL 450
GPS	VHF en-route general purpose system
RCAG	Remote controlled air-ground communication
SMC	Surface movement control up to limits of aerodrome
TWR	Aerodrome control service
VOLMET	VOLMET broadcasts

2.2.6 VHF frequency utilization plan

Function	Frequencies/Bands (MHz)			
TWR	118.000	118.025	118.050	118.075
	118.100	118.125	118.150	118.175
	118.200	118.225	118.250	118.275
	118.300	118.325	118.350	118.375
	118.400	118.425	118.450	118.475
	118.500	118.525	118.550	118.575
	118.600	118.625	118.650	118.675
	118.700	118.725	118.750	118.775
	118.800	118.825	118.850	118.875
		124.300	124.325	124.350	124.375
SMC	121.600	121.625	121.650	121.675
	121.700	121.725	121.750	121.775
	121.800	121.825	121.850	121.875
	121.900	121.925	121.950	121.975

APP-PAR	119.500	119.525	119.550	119.575
	119.600	119.625	119.650	119.675
	119.800	119.825	119.850	119.875
	119.900	119.925	119.950	119.975
APP-L, APP-I, APP/DF I, APP/SR-I	119.000	119.025	119.050	119.075
	119.100	119.125	119.150	119.175
	119.200	119.225	119.250	119.275
	119.400	119.425	119.450	119.475
	119.700	119.725	119.750	119.775
	120.000	120.025	120.050	120.075
	120.200	120.225	120.250	120.275
	120.400	120.425	120.450	120.475
	120.600	120.625	120.650	120.675
	120.800	120.825	120.850	120.875
	121.000	121.025	121.050	121.075
	121.100	121.125	121.150	121.175
	121.200	121.225	121.250	121.275
	121.400			
	123.800	123.825	123.850	123.875
	124.000	124.025	124.050	124.075
	124.700	124.725	124.750	124.775
	125.100	125.125	125.150	125.175
	125.500	125.525	125.550	125.575
	126.500	126.525	126.550	126.575
127.700	127.725	127.750	127.775	
127.900	127.925	127.950	127.975	
APP-U	120.300	120.325	120.350	120.375
	121.300	121.325	121.350	121.375
	124.200	124.225	124.250	124.275
	124.400	124.425	124.450	124.475
	124.600	124.625	124.650	124.675
	124.800	124.825	124.850	124.875
	125.000	125.025	125.050	125.075
	125.200	125.225	125.250	125.275
	125.400	125.425	125.450	125.475
	125.600	125.625	125.650	125.675
	125.800	125.825	125.850	125.875
	126.000	126.025	126.050	126.075
	126.300	126.325	126.350	126.375
ACC-L ACC/SR-L	126.100	126.125	126.150	126.175
	127.500	127.525	127.550	127.575
	128.300	128.325	128.350	128.375
	128.700	128.725	128.750	128.775

ACC-U	118.900	118.925	118.950	118.975
ACC-LU	119.300	119.325	119.350	119.375
	120.500	120.525	120.550	120.575
	120.700	120.725	120.750	120.775
	120.900	120.925	120.950	120.975
	123.700	123.725	123.750	123.775
	124.500	124.525	124.550	124.575
	125.300	125.325	125.350	125.375
	125.700	125.725	125.750	125.775
	125.900	125.925	125.950	125.975
	128.100	128.125	128.150	128.175
	132.100	132.125	132.150	132.175
	132.200	132.225	132.250	132.275
	132.300	132.325	132.350	132.375
	132.400	132.425	132.450	132.475
	132.500	132.525	132.550	132.575
	132.600	132.625	132.650	132.675
	132.700	132.725	132.750	132.775
	132.800	132.825	132.850	132.875
	132.900	132.925	132.950	132.975
	133.000	133.025	133.050	133.075
	133.100	133.125	133.150	133.175
	133.200	133.225	133.250	133.275
	133.300	133.325	133.350	133.375
	133.400	133.425	133.450	133.475
	133.500	133.525	133.550	133.575
	133.600	133.625	133.650	133.675
	133.700	133.725	133.750	133.775
	133.800	133.825	133.850	133.875
	133.900	133.925	133.950	133.975
	134.000	134.025	134.050	134.075
	134.100	134.125	134.150	134.175
	134.200	134.225	134.250	134.275
	134.300	134.325	134.350	134.375
	134.400	134.425	134.450	134.475
	134.500			
FIS-LU	120.100	120.125	120.150	120.175
	123.900	123.925	123.950	123.975
	124.100	124.125	124.150	124.175
	124.900	124.925	124.950	124.975
	126.700	126.725	126.750	126.775
	126.900	126.925	126.950	126.975
	127.100	127.125	127.150	127.175
	127.300	127.325	127.350	127.375
	128.500	128.525	128.550	128.575
FIS-U (GPS)	134.600	134.625	134.650	134.675
	134.700	134.725	134.750	134.775
	134.800	134.825	134.850	134.875
	134.900	134.925	134.950	134.975
	135.000	135.025	135.050	135.075
	135.100	135.125	135.150	135.175

	135.200	135.225	135.250	135.275
	135.300	135.325	135.350	135.375
	135.400	135.425	135.450	135.475
	135.500	135.525	135.550	135.575
	135.600	135.625	135.650	135.675
	135.700	135.725	135.750	135.775
	135.800			
VOLMET/ATIS	126.200	126.225	126.250	126.275
	126.400	126.425	126.450	126.475
	126.600	126.625	126.650	126.675
	126.800	126.825	126.850	126.875
	127.000	127.025	127.050	127.075
	127.200	127.225	127.250	127.275
	127.400	127.425	127.450	127.475
	127.600	127.625	127.650	127.675
	127.800	127.825	127.850	127.875
	128.000	128.025	128.050	128.075
	128.200	128.225	128.250	128.275
	128.400	128.425	128.450	128.475
	128.600	128.625	128.650	128.675
	128.800	128.825	128.850	128.875
DATA LINK	136.900	136.925	136.950	136.975
AIR-TO-AIR	123.450			

2.3 HF coordination is recommended to be carried out between States. Coordination and registration of HF frequencies is undertaken by the ITU, through the Radio Regulatory Authorities in each country. ICAO does not coordinate assignments for HF frequencies. Pre-coordination of HF frequencies could be arranged through the ICAO ASIA/PAC Office in Bangkok. However, national radio regulator is required to develop a proposal for the required assignments. Such proposals should be based on the provisions of Appendix 27 to the ITU Radio Regulations, together with the information contained in the ITU International Frequency List (ILS) taking into consideration the protection requirements for HF as contained in Appendix 27. It may be noted that within the ITU, Radio Regulatory Authorities do not allow any role for ICAO to play in HF frequency assignments. In general, ICAO's role in HF assignment coordination is limited because of the current ITU procedures.

2.3.1 The Regional Air Navigation Plan, ICAO regional office and PIRGs act for grouping aeronautical stations among the MWARA frequencies allotments.

2.4 Some issues observed in the coordination process for frequencies assignments are as follows:

- Interference between aeronautical stations and other applications operating illegally in the same bands;

(The reporting FORM for radio interference (a sample) which is placed in the current regional air navigation plan is provided in **Attachmen 1A** to this paper for verification of its applicability and effectiveness, the latest updated FORM from ITU is placed at **Attachment 1B** to this paper for review and consideration)

- Lack of coordination from States with ICAO regional office in advance and late provision of annual updates based on the national assignment and coordination with own radio regulators. This is very difficult for the regional office to fully update the master list and reflect all changes in the database since conflicts with neighbouring Administrations frequencies arise each time geographical separation criteria adopted by RAN meeting are not met;
- there are difficulties to identify appropriate frequencies for new requirements resulting from new sectors of ACCs being established in the high density areas and for new facilities added for additional function or services;
- Interference between stations – frequencies assignment coordination has to be carried out in a number of cases with geographical separation criteria not met, which is being considered as acceptable;
- Minimum information required for the coordination – location of the facilities in coordinates and the type services to be provided by the service. Preferred candidate frequencies from initial study should be provided to the regional office with request for coordination; and
- lack of coordination for frequencies coordination between ICAO air navigation Regions cause problems when the same frequency is allocated to two different stations located closely.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper and discuss any relevant issues identified in section 2.4.

Attachment C

HARMFUL INTERFERENCE REPORT FORM

This form should be used in cases of harmful interference with aeronautical services and only in those instances where the procedure outlined in the ITU-R Radio Regulations has not produced satisfactory results. The form should only be submitted after at least the sections marked with an asterisk have been completed.

- * State or organization submitting report: **NorthEast Regional Administration of ATMB China**
- * 1. Frequency of channel interfered with: **VHF 133.200 MHz**– ACC Upper Level Frequency for Shenyang/Harbin ACC
- * 2. Station or route interfered with: **ATS Route G212**.....
- * 3. Is the interference persistent? **Now and Then**
- * 3.1 Date, time, altitude and position at which interference was observed:

Date	Time (GMT)	Altitude	Position
5 December 2013 through a flight inspection aircraft type/Registration no. Dedicated for searching source of the interference: XLS/B-3666 also the interference experienced by flights on the same day CCA997 (Beijing – Vancouver); CCA981 (Beijing-New York); CCA987 (Beijing – LA, USA)	06:00 – 09:00 UTC	QNH: 6000-9500 M	In the sectors and area: Harbin – Jamusi-Jixi-Harbin along ATS Route G212

Note.— Report forms should not be sent unless the interference has been observed a sufficient number of times to justify setting international administrative machinery into motion, or unless it is considered to be endangering a radio navigation or safety service.

4. Has your administration already applied, regarding this case of interference, any part(s) (state which) of the ITU procedures laid down in Article S15 of the ITU-R Radio Regulations?

Investigation through monitoring stations

* 5. Call sign of IS (IS = interfering station) (See note below.) Unidentified.....

6. Name of IS corresponding to the call sign : Unidentified.....

7. Notified frequency on which IS should operate (if known) in the VHF AMS Bands.....

8. (a) Approximate frequency of IS : **133.178 MHz**kHz/MHz (circle applicable abbreviation)

(b) Strength of IS (QSA or SINPFEMO — See ICAO Doc 8400) QSA 4/4 (-85dbm).....

9. Class of emission of IS: Frequency Modulation Narrow band

10. Language used by IS: Unidentified

11. Call sign of station in communication with IS Unidentified.....

Note.— If the call sign referred to in 5 could not be received, or if the call sign received is not in the international series and cannot be interpreted, the report form should not be sent unless at least one of the questions under 12, 13 and 14 can be answered.

12. Location of the IS (accurate or approximate coordinates) N48202726 E13139104581

13. Country where interfering station is believed to be located: Far East -Russian Federation.....

14. Bearing (in degrees true) of the IS (with indication of location of D/F station) Various as resulted from a flight inspection.....

ITU DEFINITION OF HARMFUL INTERFERENCE

Harmful interference: interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with these Regulations.

APPENDIX 10 (REV.WRC-07)

Report of harmful interference

(See Article 15, Section VI)

Particulars concerning the station causing the interference:

- a* Name, call sign or other means of identification
- b* Frequency measured
- Date:
- Time (UTC):
- c* Class of emission¹
- d* Bandwidth (indicate whether measured or estimated)
- e* Measured field strength or power flux-density²
- Date:
- Time (UTC):
- f* Observed polarization
- g* Class of station and nature of service
- h* Location/position/area/bearing (QTE³) (WRC-07)
- i* Location of the facility which made the above measurements

Particulars concerning the transmitting station interfered with:

- j* Name, call sign or other means of identification
- k* Frequency assigned

¹ The class of emission shall contain the basic characteristics listed in Appendix 1. If any characteristic cannot be determined, indicate the unknown symbol with a dash. However, if a station is not able to identify unambiguously whether the modulation is frequency or phase modulation, indicate frequency modulation (F).

² When measurements are not available, signal strengths according to the QSA scale should be provided.

³ See the most recent version of Recommendation ITU-R M.1172. (WRC-07)

<i>l</i>	Frequency measured	.....
	Date:	.....
	Time (UTC):	.....
<i>m</i>	Class of emission ⁴	.....
<i>n</i>	Bandwidth (indicate whether measured or estimated, or indicate the necessary bandwidth notified to the Radiocommunication Bureau)	.....
<i>o</i>	Location/position/area	.....
<i>p</i>	Location of the facility which made the above measurements	.....
 <i>Particulars furnished by the receiving station experiencing the interference:</i>		
<i>q</i>	Name of station	.....
<i>r</i>	Location/position/area	.....
<i>s</i>	Dates and times (UTC) of occurrence of harmful interference	.....
<i>t</i>	Bearings (QTE ⁵) or other particulars (WRC-07)	.....
<i>u</i>	Nature of interference	.....
<i>v</i>	Field strength or power flux-density of the wanted emission at the receiving station experiencing the interference ⁶	.....
	Date:	.....
	Time (UTC):	.....
<i>w</i>	Polarization of the receiving antenna or observed polarization	.....
<i>x</i>	Action requested	.....

NOTE – For convenience and brevity, telegraphic reports shall be in the format above, using the letters in the order listed in lieu of the explanatory titles, but only those letters for which information is provided should be used. However, sufficient information shall be provided to the administration receiving the report, so that an appropriate investigation can be conducted.

⁴ See footnote 1.

⁵ See footnote 3.

⁶ See footnote 2.