International Civil Aviation Organization

EIGHTH MEETING OF SPECTRUM REVIEW WORKING GROUP (SRWG/8)

Bangkok, Thailand, 05 – 07 March 2024

Agenda Item 3: Review Frequency planning requirements for the Asia/Pacific Region

3.2 HF utilization in APAC

PROPOSED NEW TABLE WITH HF FREQUENCY ASSIGNMENTS

(Presented by the Secretariat)

SUMMARY

This paper presents the frequency assignments in the Aeronautical HF bands that are registered with the ITU and with ICAO. This paper proposes to combine the two databases in a single table that can be used for further coordination of HF frequency assignments.
This paper also proposes to request States to update this table with current frequency assignments that are in use or planned to be used.
Action by the meeting is in Section **5**.

1. INTRODUCTION

1.1 ICAO has developed in 2009 a database with frequency assignments in the aeronautical HF frequency bands for the APAC Region.

1.2 States have also registered with the ITU, through the relevant radio regulatory authorities, frequency assignments which have been published in the International Frequency List (IFL) through the BR International Frequency Information Circular (BRIFIC). Frequency assignments that have been coordinated with the ITU are entered in the Master International Frequency Register (MIFR)

1.3 This paper compares the ICAO database (2009) together with the HF frequencies that have currently been registered with the ITU. The purpose of this table is to use it as a basis for further work on difficulties that are experienced when using frequencies from the aeronautical HF bands. States are being invited to update the material in this table as necessary.

1.4 Extensive material for the planning and use of HF frequencies in the frequency bands between 2850 kHz and 22000 kHz is in **Appendix 27** to the **ITU Radio Regulations**[1]. This Appendix includes the Allotment Plan for the Aeronautical Mobile (R) Service in these frequency bands.

2. Description of the (new) database

2.1 For the comparison of the two databases (ICAO and ITU), all records from each database were imported in a new database, HF_APAC 2024. This database is using Filemaker Pro Advanced and is similar to the databases used in Frequency Finder for the planning and coordination of VHF-COM and VHF-NAV frequency assignments. This new database contains the following information and is embedded below (file *HF_APAC-2024.xlsx*):

Key	Unique Key number of the ICAO database
BR ID	Unique Key number of the ITU database
Country	ICAO Country name
Ctry	ICAO abbreviation of the country name
Ctry_ITU	ITU Country code for the relevant Country or territory
Geo Area	ITU Code for the relevant country or territory
Assigned Frequency	Assigned frequency as per the ITU MIFR (kHz)
Reference Frequency	Assigned frequency minus 1.4 kHz.
Coordinates	Geographical coordinates of the station
Class of Station	Station classification. Re. ITU preface to BRIFIC section 6, (Reproduced in Appendix A)
Location	Location name
Emission class	Class of emission. Re. ITU RR, Appendix 1, Section II and IIA. (Reproduced in Appendix B)
Allotment	Allotment area, relevant to the frequency assignment (to be completed)
Remarks	Comments, relevant to the frequency assignment.

HF_APAC_2024.xlsx

2.1.1 Notes relevant to the table **HF_APAC 2024**:

a) When the field *Key* is empty and the field BR ID contains a number, the record is not listed in the ICAO data base; it is only listed in the ITU database (MIFR);
b) When the field *Key* contains a number and the field *BR ID* is empty, the record is not listed in the ITU database (MIFR); it is only listed in the ICAO database;
c) When both the fields *Key* and *BR ID* contain a number, the record is listed in both the ICAO database as well as the ITU database (IFL/MIFR).

3. Use of the HF bands

3.1 The frequency bands in the range between 2850 kHz – 22000 kHz and are allocated *exclusively* for use by the Aeronautical Mobile (R) Service are:

2 850-3 025 kHz	AERONAUTICAL MOBILE (R) 5.111 5.115

[1] Note: The ITU Radio Regulations, including Appendix 27 can be downloaded from the ITU website.

3 400-3 500 kHz	AERONAUTICAL MOBILE (R)

4 650-4 700 kHz	AERONAUTICAL MOBILE (R)

	5 450-5 480 kHz AERONAUTICAL MOBILE (R) (only in ITU Region 2)	

5 480-5 680 kHz	AERONAUTICAL MOBILE (R) 5.111 5.115

6 525-6 685 kHz	AERONAUTICAL MOBILE (R)

8 815-8 965 kHz	AERONAUTICAL MOBILE (R)

10 005-10 100 kHz	AERONAUTICAL MOBILE (R) 5.111

11 275-11 400 kHz	AERONAUTICAL MOBILE (R)

13 260-13 360 kHz	AERONAUTICAL MOBILE (R)

17 900-17 970 kHz	AERONAUTICAL MOBILE (R)

21 924-22 000 kHz	AERONAUTICAL MOBILE (R)

3.1.1 **RR 5.111 and 5.115** refer to the special use of the frequencies 3023 kHz 5680 Hz:

> **5.111** The carrier frequencies 2 182 kHz, 3 023 kHz, 5 680 kHz, 8 364 kHz and the frequencies 121.5 MHz, 156.525 MHz, 156.8 MHz and 243 MHz may also be used, in accordance with the procedures in force for terrestrial radiocommunication services, for search and rescue operations concerning manned space vehicles. The conditions for the use of the frequencies are prescribed in Article **31**.
>
> The same applies to the frequencies 10 003 kHz, 14 993 kHz and 19 993 kHz, but in each of these cases emissions must be confined in a band of ±3 kHz about the frequency. (WRC-07)
>
> **5.115** The carrier (reference) frequencies 3 023 kHz and 5 680 kHz may also be used, in accordance with Article **31**, by stations of the maritime mobile service engaged in coordinated search and rescue operations. (WRC-07)

3.2 The conditions for the use of these frequency bands are in Appendix 27 to the ITU Radio Regulations. Some of these, relevant to the channeling and use are in Appendix C to this paper. Relevant to the use as shown in the table of frequency assignments (embedded in this paper) are those that are not in conformity with the provisions of the Radio Regulations. These include, in particular, frequency assignments registered for the Fixed Service and for double sideband operations.

4. Notes relevant to a number of frequency assignments in the draft new table.

4.1 The ITU Radio Regulations stipulate:

> **27/15** The use of channels derived from the frequencies indicated in No. **27**/18 for the various classes of emissions other than J3E and H2B will be subject to special arrangements by the administrations concerned and affected in order to avoid harmful interference which may result from the simultaneous use of the same channel for several classes of emission.

4.2 Class of Station and Class of emission.

4.2.1 Typically, the Class of Station used for the communication with aircraft in the HF bands is FD for an Aeronautical Station[2] in the Aeronautical Mobile (R) Service. The Class of Emission is J3E for single sideband transmissions with a suppressed carrier.

4.2.2 A number of frequency assignments registered in the APAC table of frequency assignments for the HF bands are for different uses and/or emission class as summarized in the following table.

Class of Station	**Class of emission**	**Use**

[2] RR 1.81: An aeronautical station is a land station in the aeronautical mobile service.

BC	A3E	Sound broadcasting; this assignment is most likely an error
FA	A1A	Aeronautical station; Double sideband; telegraphy
FA	A1B	Aeronautical station; Double sideband; telegraphy
FA	A3E	Aeronautical station; Double sideband; Telephony
FB	A!A	Base Station, Land mobile; Double sideband; telegraphy
FB	A1B	Base Station, Land mobile; Double sideband; telegraphy
FB	A3E	Base Station, Land mobile; Double sideband; telephony
FC	A1B	Coast station; Maritime mobile; Double sideband; telegraphy
FD	A1A	Aeronautical station, AM(R)S; Double sideband; telegraphy
FD	A1B	Aeronautical station, AM(R)S; Double sideband; telegraphy
FD	A3E	Aeronautical station, AM(R)S; Double sideband; telephony
FD	F1B	Aeronautical station, AM(R)S; Frequency modulation; telegraphy
FD	H3E	Aeronautical station, AM(R)S; Single sideband, full carrier; telephony
FD	J2D	Aeronautical station, AM(R)S; Single sideband, suppressed carrier, data transmission
FD	**J3E**	**Aeronautical station, AM(R)S; Single sideband, suppressed carrier, telephony**
FD	R3E	Aeronautical station, AM(R)S; Single sideband, reduced carrier, telephony
FG	A1B	Aeronautical station, AM(OR)S. Double sideband, telegraphy
FX	A1A	Fixed station in the Fixed Service; telegraphy
FX	A1B	Fixed station in the Fixed Service; telegraphy
FX	A3E	Fixed station in the Fixed Service; telephony
FX	F1B	Fixed station in the Fixed Service; Frequency modulation; telegraphy
FX	J3E	Fixed station in the Fixed Service; Single sideband, suppressed carrier; telephony
FX	R3E	Fixed station in the Fixed Service; Reduced carrier; telephony
ML	A3E	Land mobile station in the Land Mobile Service; double sideband; telephony

4.2.3 Typically, assignments made under the provisions of **Appendix 27** should be for an aeronautical station operating in the AM(R)S service (Class of station is FD) and with single side band emission, suppressed carrier and for radio telephony (Class of emission is J3E).

4.2.3.1 A large number of frequency assignments in the HF Table are not inconformity with this requirement. It is understood that the provision of App.27 No. 27/15 as reproduced in paragraph 4.1 above would allow for such use *in the Aeronautical Mobile (R) Service.*

4.2.3.2 This leaves the assignments for Land mobile or for Fixed stations as not in conformity with the Radio Regulations.

4.2.4 The main purpose of this paper is to request States to update this list with frequency assignments that are currently in use with the view to have a correct statement of frequency assignments in the aeronautical HF bands.

5. ACTION BY THE MEETING

5.1 The meeting is invited to request the ICAO APAC Regional Office to coordinate with States to share updates to the table of HF frequency assignments.

Note: The updated table can be used to further assess problems with using HF frequencies in the APAC Region and future frequency assignment planning of HF frequency assignment.

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Class of STATION

Source: Preface to the ITU BRIFIC; Chapter IV; Section 6

Symbol Description
AL Aeronautical radionavigation land station (transmitting station in the aeronautical radionavigation service)
AM Aeronautical radionavigation mobile station (receiving station in the aeronautical radionavigation service)
AT Amateur station
BC Broadcasting station, sound
BT Broadcasting station, television
FA Aeronautical station (transmitting station in the aeronautical mobile service)
FB Base station (transmitting station in the land mobile service)
FC Coast station (transmitting station in the maritime mobile service)
FD Aeronautical station in the aeronautical mobile (R) service
FG Aeronautical station in the aeronautical mobile (OR) service
FL Land station (transmitting station in the mobile service)
FP Port station (transmitting station in the maritime mobile service, for port operation)
FX Fixed station (transmitting station in the fixed service)
LR Radiolocation land station (transmitting station in the radiolocation service)
MA Aircraft station (receiving station in the aeronautical mobile, aeronautical mobile (R) or aeronautical mobile (OR service)
ML Land mobile station (receiving station in the land mobile service)
MO Mobile station (receiving station in the mobile service)
MR Radiolocation mobile station (receiving station in the radiolocation service)
MS Ship station (receiving station in the maritime mobile service)
NL Maritime radionavigation land station (transmitting station in the maritime radionavigation service)
NR Radionavigation mobile station (receiving station in the radionavigation service)
OD Oceanographic data station (receiving station in the maritime mobile service for oceanographic purposes)
OE Oceanographic data interrogation station (transmitting station in the maritime mobile service for oceanographic purposes)
PL Combination of two or more classes of station (limited to collective entries made under the terms of RR20.5)
RM Maritime radionavigation mobile station (receiving station in the maritime radionavigation service)
RN Radionavigation land station (transmitting station in the radionavigation service)
SA Meteorological aids mobile station (mobile station in the meteorological aids service)
SM Meteorological aids base station (land station in the meteorological aids service)
SS Standard frequency and time signal station (transmitting station in the standard frequency and time signal service)

Classification of Emissions

Partly reproduced from Appendix 1 to the Radio Regulations.

Section II – Classification

§ 3 The class of emission is a set of characteristics conforming to § 4 below.

§ 4 Emissions shall be classified and symbolized according to their basic characteristics as given in Sub-Section IIA and any optional additional characteristics as provided for in Sub Section IIB.

§ 5 The basic characteristics (see Sub-Section IIA) are:

1) first symbol – type of modulation of the main carrier;

2) second symbol – nature of signal(s) modulating the main carrier;

3) third symbol – type of information to be transmitted.

Modulation used only for short periods and for incidental purposes (such as, in many cases, for identification or calling) may be ignored provided that the necessary bandwidth as indicated is not thereby increased.

Sub-Section IIA – Basic characteristics

§ 6 1) **First symbol – Type of modulation of the main carrier**

1.1)	Emission of an unmodulated carrier	N
1.2)	Emission in which the main carrier is amplitude-modulated (including cases where sub-carriers are angle-modulated)	
1.2.1)	Double-sideband	A
1.2.2)	Single-sideband, full carrier	H
1.2.3)	Single-sideband, reduced or variable level carrier	R
1.2.4)	Single-sideband, suppressed carrier	J
1.2.5)	Independent sidebands	B
1.2.6)	Vestigial sideband	C
1.3)	Emission in which the main carrier is angle-modulated	

1.3.1) Frequency modulation F

1.3.2) Phase modulation G

1.4) Emission in which the main carrier is amplitude-and angle-modulated either simultaneously or in a pre-established sequence D

1.5) Emission of pulses:

1.5.1) Sequence of unmodulated pulses P

1.5.2) A sequence of pulses
- 1.5.2.1) modulated in amplitude K
- 1.5.2.2) modulated in width/duration L
- 1.5.2.3) modulated in position/phase M
- 1.5.2.4) in which the carrier is angle-modulated during the angle-period of the pulse Q
- 1.5.2.5) which is a combination of the foregoing or is produced by other means V

1.6) Cases not covered above, in which an emission consists of the main carrier modulated, either simultaneously or in a pre-established sequence, in a combination of two or more of the following modes: amplitude, angle, pulse W

1.7) Cases not otherwise covered X

2) Second symbol – Nature of signal(s) modulating the main carrier

2.1) No modulating signal 0

2.2) A single channel containing quantized or digital information without the use of a modulating sub-carrier 1

2.3) A single channel containing quantized or digital information with the use of a modulating sub-carrier 2

2.4) A single channel containing analogue information 3

2.5) Two or more channels containing quantized or digital information 7

2.6) Two or more channels containing analogue information 8

2.7) Composite system with one or more channels containing quantized or digital information, together with one or more channels containing analogue information 9

2.8) Cases not otherwise covered X

3) Third symbol – Type of information to be transmitted4

3.1) No information transmitted N

3.2)	Telegraphy – for aural reception	A
3.3)	Telegraphy – for automatic reception	B
3.4)	Facsimile	C
3.5)	Data transmission, telemetry, telecommand	D
3.6)	Telephony (including sound broadcasting)	E
3.7)	Television (video)	F
3.8)	Combination of the above	W
3.9)	Cases not otherwise covered	X

Source: Appendix 27 to the ITU Radio Regulations

Section II – Technical and operational principles used for the establishment of the Plan of allotment of frequencies in the aeronautical mobile (R) service

A – Channel characteristics and utilization

1 Frequency separation

27/11 1.1 The frequency separation between carrier (reference) frequencies shall be 3 kHz. This is adequate to permit communications using the classes of emission referred to in Nos. **27**/56 to **27**/59 in the frequency bands between 2 850 kHz and 22 000 kHz allocated exclusively to the aeronautical mobile (R) service. The carrier (reference) frequency of the channels in the Plan shall be an integral multiple of 1 kHz.

27/12 1.2 For radiotelephone emissions the audio frequencies will be limited to between 300 Hz and 2 700 Hz and the occupied bandwidth of other authorized emissions will not exceed the upper limit of J3E emissions. In specifying these limits, however, no restriction in their extension is implied in so far as emissions other than J3E are concerned, provided that the limits of unwanted emissions are met (see Nos. **27**/73 and **27**/74).

27/13 NOTE – For aircraft and aeronautical station transmitter types first installed before 1 February 1983, the audio frequencies will be limited to 3 000 Hz.

27/14 1.3 On account of the possibility of interference, a given channel should not be used in the same allotment area for radiotelephony and data transmissions.

27/15 1.4 The use of channels derived from the frequencies indicated in No. **27**/18 for the various classes of emissions other than J3E and H2B will be subject to special arrangements by the administrations concerned and affected in order to avoid harmful interference which may result from the simultaneous use of the same channel for several classes of emission.

27/16 1.5 To preclude the possibility of interference, adjacent channels in the list of frequencies in No. **27**/18 have not as a rule been allotted to the same MWARA, RDARA or VOLMET areas. However, to satisfy particular needs, the administrations concerned may conclude special arrangements for the assignment of adjacent channels derived from the frequencies in the Table.

27/17 1.6 The arrangements contemplated in Nos. **27**/15 and **27**/16 should be made under the Articles of the Constitution and Convention of the International Telecommunication Union and the Radio Regulations entitled "Special agreements"[*]. (WRC-03)

2 Frequencies allotted

27/18 The list of carrier (reference) frequencies allotted in the bands allocated exclusively to the aeronautical mobile (R) service, on the basis of the frequency separation provided for under No. **27**/11, will be found in the following Table[2].

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[*] *Note by the Secretariat:* The relevant Article in the Radio Regulations is now Article **6** entitled "Special Agreements".

[2] **27/18.1** To calculate the assigned frequency from a carrier (reference) frequency given in the table, reference should be made to Nos. **27**/75, **27**/77 and **27**/78.

27/19 3 The International Civil Aviation Organization (ICAO) coordinates radiocommunications of the aeronautical mobile (R) service with international aeronautical operations and this Organization should be consulted in all appropriate cases in the operational use of the frequencies in the Plan.