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

THE UTILIZATION OF HF BANDS IN THE APAC REGION

(Presented by Indonesia)

SUMMARY

This paper presents the results on the review of relevant documents and existing conditions of HF bands utilization in Asia Pacific region. It is a follow up of the **Action Item 7-3** from SRWG/7.

1. INTRODUCTION

1.1. At the SRWG/7 meeting, issues concerning the utilization of HF frequency allocation in the frequency band from 2,850 kHz to 22,000 kHz were raised and discussed. SRWG/7 agreed that Indonesia as a rapporteur to an ad-hoc group consisting of other volunteer States, namely Australia, China, India, and Thailand, to conduct a review of the operational use of HF in the Asia-Pacific Region and the applicable international provisions.

1.2. The joint effort to address issues regarding the utilization of HF frequencies is conducted through a methodical review of documents and existing operational conditions in the APAC Region. This involves comparing data on existing users from both ICAO and ITU, as well as sharing best practices among States in the Asia-Pacific.

1.3. The review regarding applicable international provisions is conducted based on ITU Radio Regulation Appendix 27 and relevant ICAO documents such as: ICAO Annex 10 Vol. II, III and V, Doc. 9718 Vol. I, Regional Doc. APAC ANP Vol. II, and reports from the RAN meetings reports.

1.4. The guidelines for the utilization of HF frequencies in the South Pacific region have been addressed in the Document HF Management Guidance Material V 1.0 adopted by APANPIRG/21.

1.5. The ad-hoc group also conducts a review of existing HF band user data, which is based on the ITU Master International Frequency Register (MIFR) database maintained by the ITU and HF users registered with the ICAO APAC Regional Office.

1.6. Moreover, the ad-hoc group and the ICAO Secretariat have been preparing a draft questionnaire (provided in **Attachment A** to this paper) for the APAC States to gather information regarding existing operations in the States. This draft survey form is scheduled to be circulated after

SRWG/8 and is expected to elicit responses from all States in the Asia-Pacific Region to obtain relevant information.

1.7. This paper represents the outcome of the ad-hoc discussion in the form of an interim report that contains the results of the review of relevant documents and existing conditions of HF utilization, as well as the outcomes of the WRC-23 session on agenda item 1.9. It is presented at SRWG/8 meeting for further review and discussion.

2. DISCUSSION

2.1. The global aeronautical HF frequency bands provide aviation with a means for long-distance communications for all aircraft operating in oceanic or remote regions and is an integral part of the associated safety case. HF communications consist of both air-ground voice, and HF data link (HFDL). HFDL has continued to evolve to support more aeronautical operational control (AOC) and ATS applications, such as controller-pilot data link communication (CPDLC) and ADS-C reporting and as of 2017 over 3 000 aircraft are equipped with HFDL.

2.2. The provisions regarding the planning of the HF allotment are stipulated in ITU Radio Regulation Appendix 27, Frequency allotment Plan for the aeronautical mobile (R) service and related information.

2.3. In accordance with the ITU Radio Regulation Appendix 27, it is determined that the coordination and registration of frequency assignments in the HF bands (between 2 850 kHz and 22 000 kHz) is the prerogative of the ITU registered in the MIFR maintained at ITU. However, as conveyed in Doc 9718 Volume I, ICAO is contemplating the development of a pertinent ICAO list of HF frequency assignments in parallel.

2.4. To gain a more comprehensive understanding of the current utilization of HF, the following will be discussed: planning criteria based on Appendix 27, allotment area division according to ICAO, and HF users in the Asia-Pacific region.

HF Frequency Planning Criteria

2.5. HF frequency assignments for the aeronautical mobile (R) service carriers are allocated in accordance with Reference No**. 27/18** of ITU Radio Regulation Appendix 27. These frequency channels are further subdivided into areas and sub-areas for MWARA, RDARA, and VOLMET purposes.

2.6. The detailed allocation of MWARA areas is governed by Article 1 of Appendix 27. The distribution of allocated frequency channels for the Asia-Pacific region can be summarized as follows:

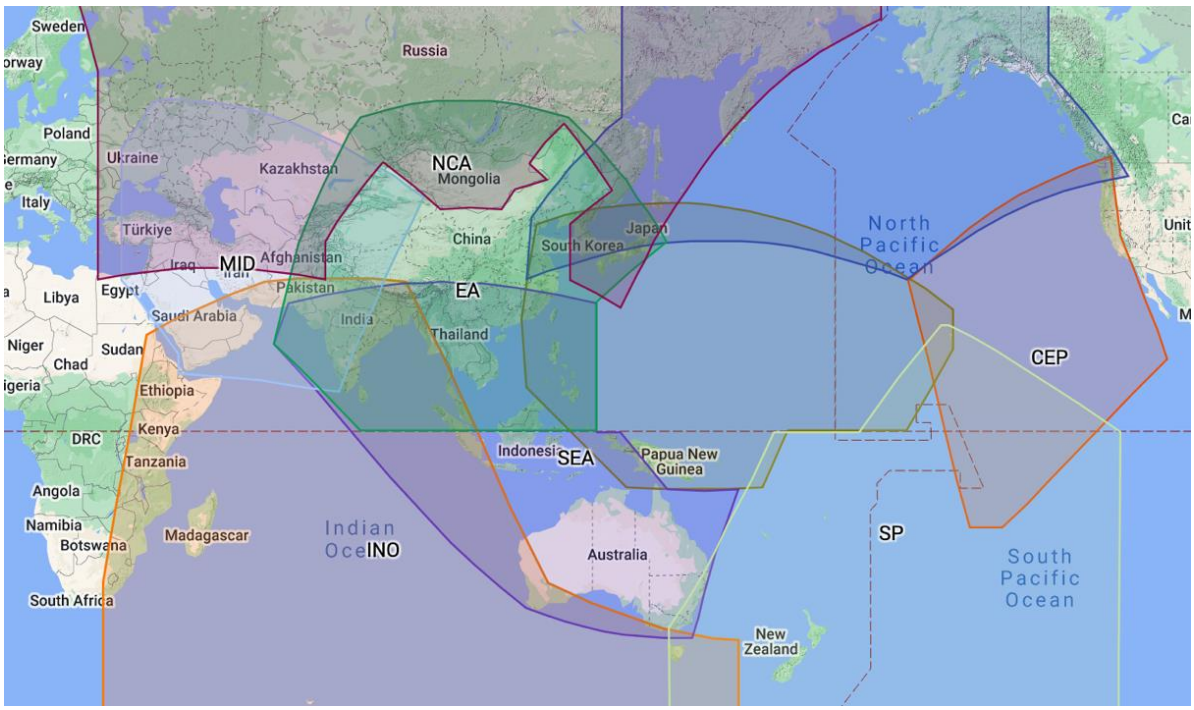
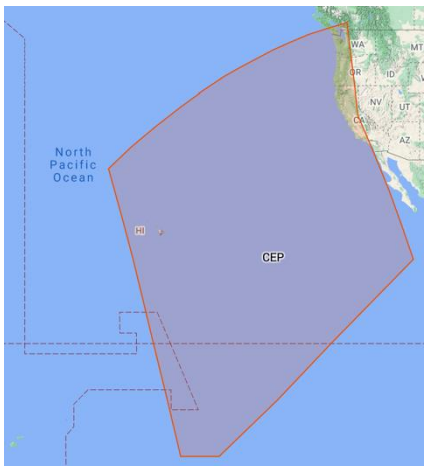


Figure 1- Allotment area for MWARA in APAC Region

2.7. The specific allocations of frequency channels for each area of MWARA are determined as follows:



CEP

2 869	3 413	4 657	5 547
5 574	6 673	8 843	10 057
11 282	13 300	17 904	

CWP

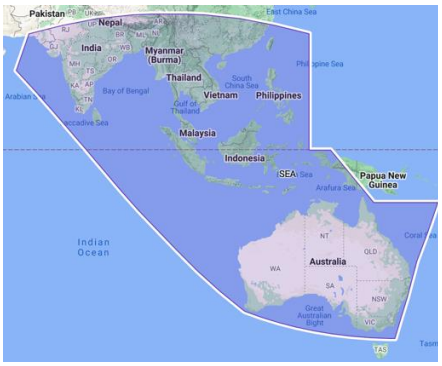
2 998	3 455	4 666	5 652
5 661	6 532	6 562	8 903
10 081	11 384	13 300	17 904

EA

3 016	3 485	3 491	5 655
5 670	6 571	8 897	10 042
11 396	13 297	13 303	13 309
17 907			

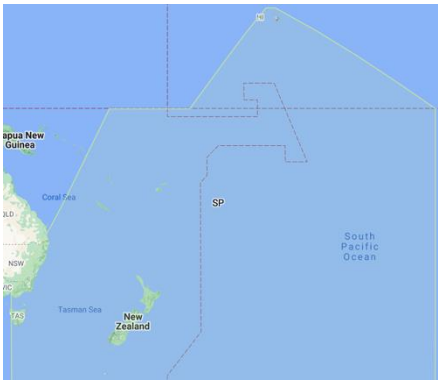
INO

3 476	5 634	8 879	13 306
17 961			



SEA

3 470	3 485	5 649	5 655
6 556	8 942	10 066	11 396
13 309	13 318	17 907	



SP

3 467	5 559	5 643	8 867
10 084	11 327	13 300	17 904

NCA

3 004	3 019	4 678	5 646
5 664	6 592	10 096	13 303
13 315	17 958		

NP

2 932	5 628	6 655	6 661
10 048	11 330	13 300	17 904

MID

2 944	2 992	3 467	3 473
4 669	5 658	5 667	6 625
6 631	8 918	8 951	10 018
11 375	13 288	13 312	17 961

2.8. The detailed allocation of RDARA areas is governed by Article 2 of Appendix 27. The distribution of allocated frequency channels for the Asia-Pacific region can be summarized as follows.

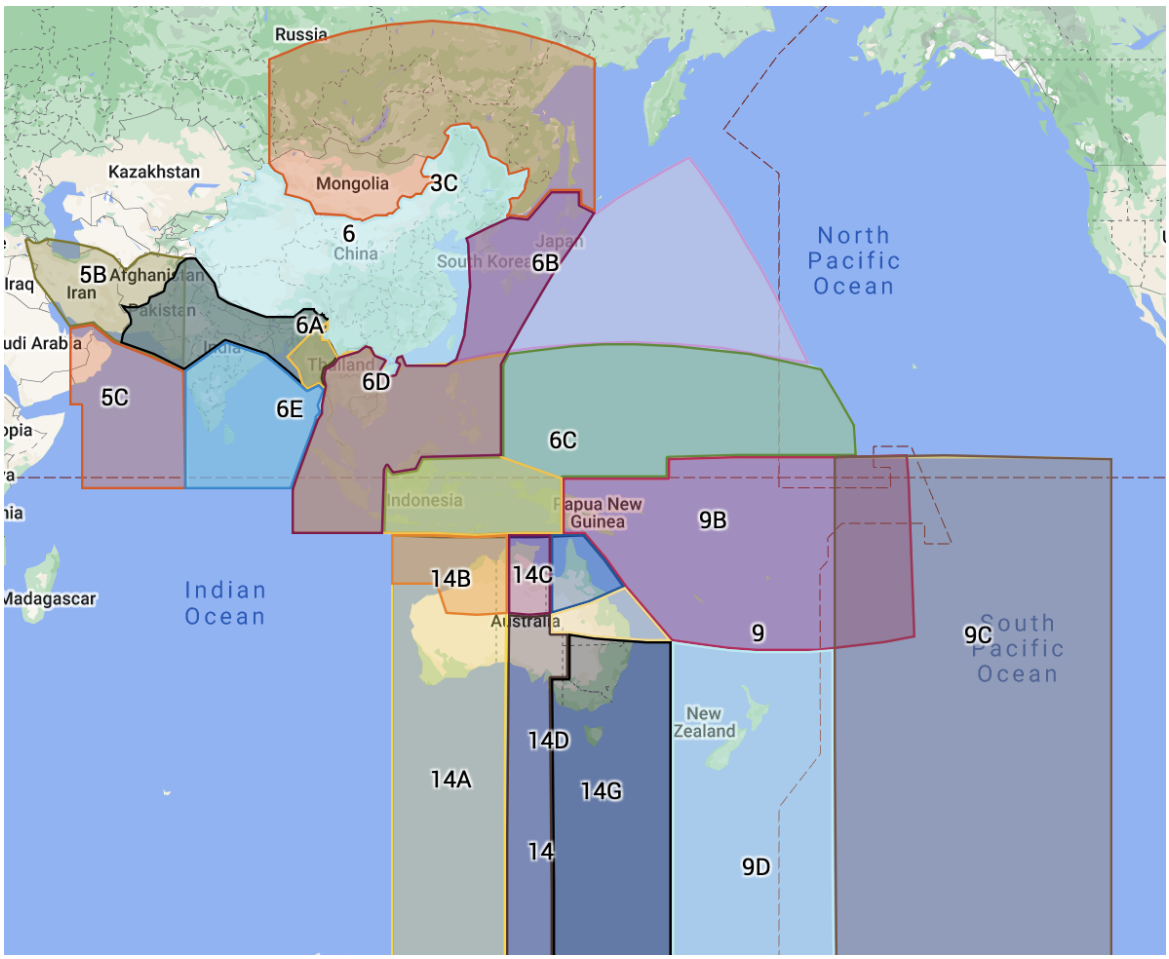
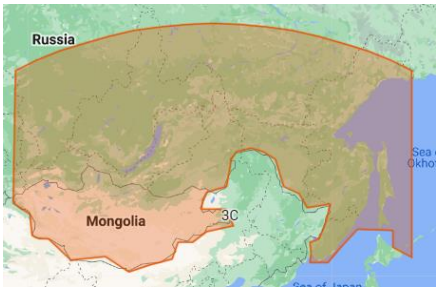


Figure 2 - Allotment area for RDARA in APAC Region

2.9. The specific allocations of frequency channels for each area of RDARA are determined as follows:



3C

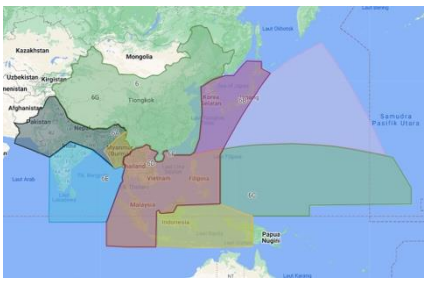
2851	2860	2866*	2878
2905	2950	2974	2980
2986	3404	3410	3419
3425	3452	4684	5484
5514	5562	5568	5586
5637	5643	6550	6556
6595	6658	6664	6670
8837	8852	8894	8915
10039	11291	11303	11324
11378			

5B

2911	2968	3431	3488
5577	5583	6544	6664
8822	8915	11288	

5C

2905	3452	5583	6544
8822			



6

8840	11381	13291	17943

6A

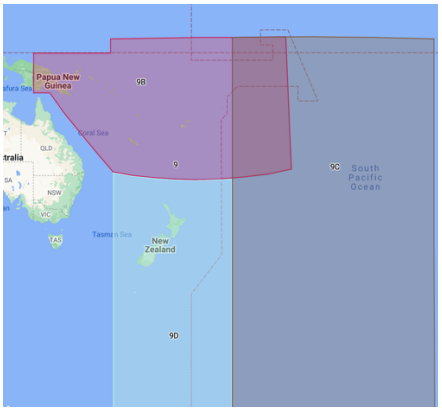
2872	2923	2947	3001
3479	4657*	4675	5484
5580	5601	6607	6613
6658	8891	8906	8948
10006	10051	10081*	11321
11357			

6B

2857	2920	3479	3488
5502	5595	5625	6607
6613	6619	8864	8885
10021	10093	11339	11366
17955			

6C	2881	2956	3473	4651
	5550	5580	6544	6631
	8834	8918	10015	
6D	2866	2884	3416	5490
	5520	5568	5574	5631
	6550	6568	6577	6595
	8882	8957	11309	11372
6E	2854	2872	2917	3001
	3443	4657*	4675	5514
	5526	5550	6583	6655
	6661	8861*	8906	8909
	10036	10051	10084	11357
	11363			
6F	2926	2941	3434	3440
	5496	5508	6526	6667
	8864	8939	10060	11279
	11366			
6G	2869*	2875*	2890	2896*
	2899	2902*	2911*	2917*
	2938	2953	2962	2968*
	2971	2977	2983	2989
	2995	3413*	3422*	3431*
	3437	3446	3449*	3464
	3482	4651*	4663*	4669*
	4672*	4690*	4696*	5481
	5481	5487	5493*	5499*
	5505*	5511*	5517*	5523
	5547	5553*	5559	5565
	5571	5577	5583	5592
	5598	5604	5610	5616
	5622	5628*	5634*	5640*
	6529	6535	6541	6547
	6553	6559	6565	6574
	6580	6586	6598	6604
	6610	6616	6622	6628
	6634	6649	6652	6673
	6682	8816	8825	8831
	8843	8858	8867	8870*

	8873	8888*	8912*	8960
	10018*	10054*	10063*	11276*
	11282*	11288	11294*	11300*
	11306	11315	11369	13270
	13276	17913		



9

4696	5583	6553	8846
8852	10018	11339	

9B

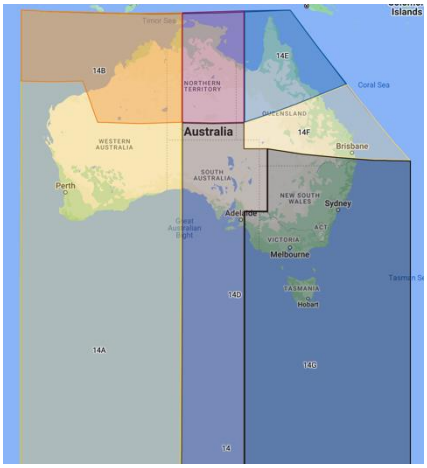
2860	2905	2929*	3401*
3419	3425	3476*	4660
5484	5508	5523	5565
6538	6547	6598	6622
8819	8837	8861	8906
10009	10024	10039	11393

9C

2851	3404	3461	4675
5481	6580	8873	10042
11279	11312		

9D

3016	3404	5592	6535
8873	11312		



14

2851	2878	3446	3461
3479	5526	5604	6580
6628	8822	8855	8870
10045	10087	11360	13264
17946			

14A

2950	3413	4678*	6547
6553	8816	8894	

14B

3488	4684*	6535	6604
6673	8900	8954	

14C

2887	3452	4684*	6541
6586	8885	8912	

14D

2950	3407	4693*	5481
6559	6574	8843	8858

14E

3413	6565	6616	8891

	8945			
14F	3 488	6 526	6 610	8 825
	8 831			
14G	2869	2944	4678*	5481
	5550	5580	8876	8957

2.10. The VOLMET area is divided into two segments: the allotment area and the reception area. As specified in **27/7** of Appendix 27, the allotment area comprises all points where an HF broadcast facility might be required to operate on a family of frequencies common to the area. On the other hand, as referenced in **27/8** of Appendix 27, the reception area is defined as an area within which aircraft should be capable of receiving broadcasts from VOLMET stations located in the allotment area.

2.11. The following provides an overview of the VOLMET area in the Asia-Pacific region based on Article 3, which describes the boundaries of the VOLMET allotment areas and VOLMET reception areas.

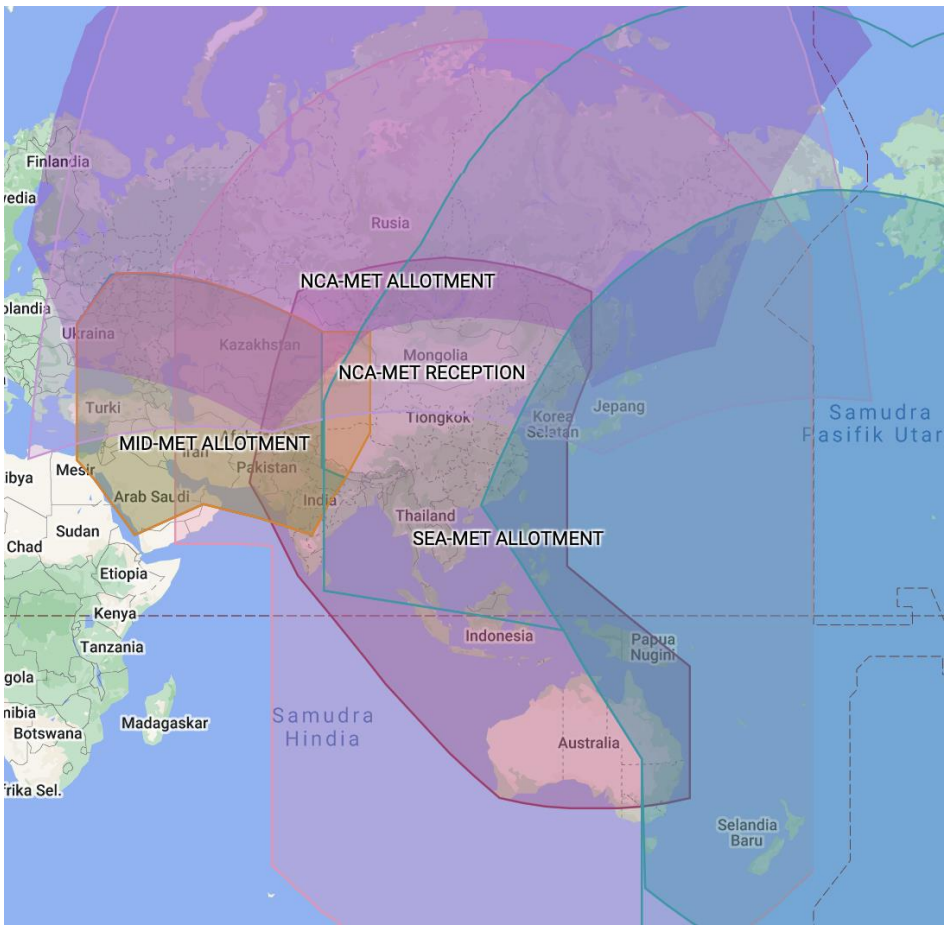


Figure 3 Allotment area for VOLMET in APAC Region

2.12. In detail, the frequency allocation for each area of VOLMET is governed as follows:

VSEA

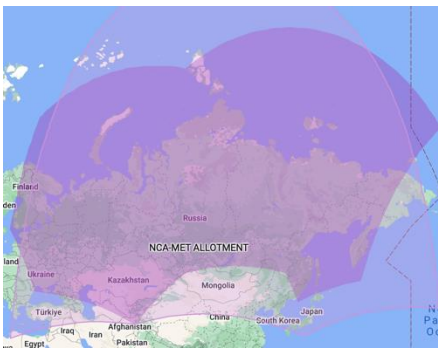
2965	3458	5673	6676
8849	11387	13285	

VMID

2956	5589	8945	11393

VPAC

2863	6679	8828	13282



VNCA	3461	4663	5676	10090
	13279			

2.13. In addition to the allocation guidelines based on the allotment area mentioned above, HF planning also regulates the utilization of HF for Worldwide purposes. The distribution of these areas is outlined in Article 4, which frequencies are allotted to provide long-distance communication anywhere in the world.

HF frequency allotment in ICAO Asia-Pacific region

2.14. According to Ref. **27/19** of the ITU Radio Regulations Appendix 27, it was agreed that ICAO would coordinate the operational utilization of frequencies in the Plan, thereby accommodating the adaptation to the allotment procedure.

2.15. The adaptation of allotments in ICAO APAC has been occurring annually. Several adjustments, such as the addition of sub-areas within the MWARA or modifications to the RDARA area, have been implemented, as evidenced by the outcomes of RAN meeting reports. At present, the current arrangement of HF utilization in Asia-Pacific can be observed in APAC ANP, Volume II.

2.16. On Page III-58 of the APAC ANP Vol. II, the Table of HF frequencies and their ICAO network designators based on ITU Appendix S27 Allotment areas, presents current sectorized sub-networks. These sub-networks are available for States to use in determining the HF frequency allocation for MWARA and VOLMET purposes.

2.17. The following provides the detailed allocation of frequencies based on their sectorized sub-networks.

CEP-1	3 413	4 657	5 574	8 843
	10 057	13 354	17 904	
CEP-2	2 869	4 657	5 547	6 673
	11 282	13 288	17 904	
CWP-1	3 455	6 532	8 903	10 081
	13 300	17 904		
CWP-2	2 998	4 666	8 903	10 081
	11 384	13 300	17 904	
EA-1	3 016	6 571	8 897	10 042

	13 297			
EA-2	3 485	5 655	11 396	13 309
	17 907			
INO-1	3 476	5 634	8 879	13 306
	17 961			
MID-2	3 467	5 658	10 018	13 288
NCA-3	3 004	5 664	10 039	13 303
	17 958			
NP	2 932	6 655	8 951	10 048
	11 330	13 273	17 904	
RDARA-9	2 947	3 425	5 628	6 553
	8 846	11 339		
SEA-1A	3 491	6 556	10 066	
SEA-1B	3 470	5 670	11 285	13 318
	17 907			
SEA-2	3 485	5 649	5 655	8 942
	11 297	11 396	13 306	17 907
SEA-3	3 470	6 556	11 396	13 318
	17 907			
SP	3 476	5 559	5 643	8 867
	8 879	13 261	17 904	
VASIA	2 965	5 673	6 676	8 849
	11 387	13 285		
VPAC	2 863	3 458	6 679	8 828
	13 282			

The utilization of HF in the Asia-Pacific region

2.18. In order to obtain information regarding the current utilization of HF in the Asia-Pacific Region, an ad-hoc group has endeavoured to extract HF data listed in both the ITU MIFR and ICAO Frequency List databases. We have sought to compare these databases in a general manner, taking into account the classification based on the class of station. This classification aligns with the categories already established in the ICAO Frequency List, namely:

a. Fixed Station (FX);
b. Base Station (FB);
c. Land mobile station (ML);
d. Coast Station (FC);
e. Aeronautical station (FA);
f. Aeronautical mobile Route station (FD);
g. Aeronautical mobile off route station (FG); and
h. Sound Broadcasting station (BC).

2.19. A notable discrepancy in the quantity of data was observed between the two databases. Specifically, the MIFR-ITU contains 76,801 entries, whereas the ICAO Frequency List comprises 1,918 allocations, as depicted in the following Figure 4.

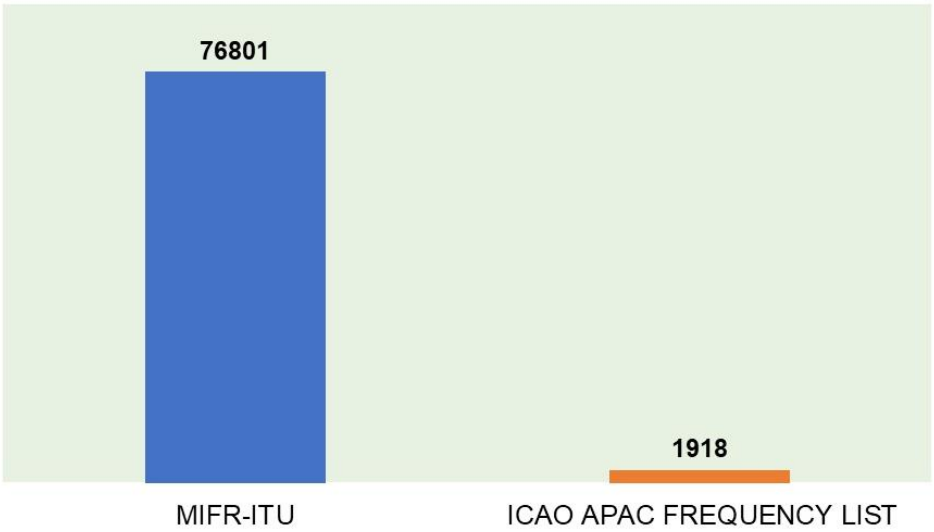


***Figure 4** HF registered in APAC region*

(ITU MIFR database accessed in January, 2024.)

2.20. Based on the comprehensive comparison of the total HF data above, categorized by their class of station, the comparison between the two databases is depicted in the **Figure 5** below.

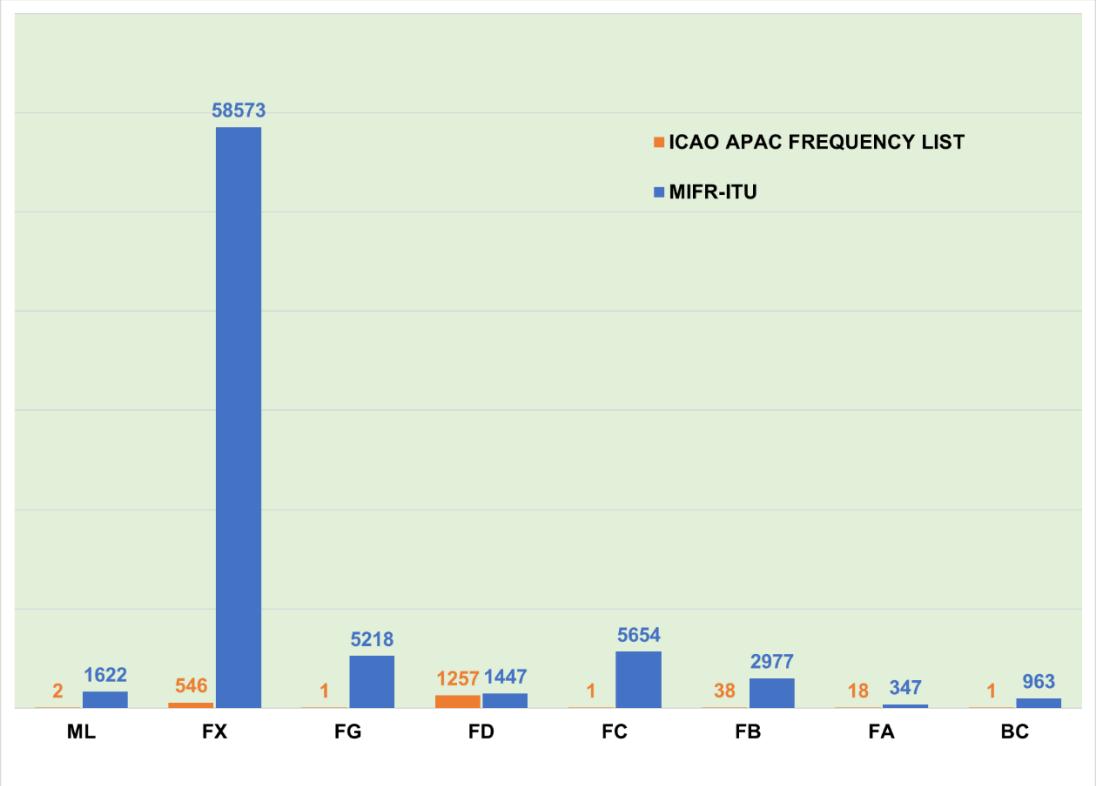


Figure 5 *Comparison of HF registered based on class station*

2.21. Furthermore, the ad-hoc group conducted a comparison of data pertaining to countries in the Asia-Pacific region, divided into two figures presented below. **Figure 6** indicates the number of allocated HF data registered below 1000, whereas **Figure 7** illustrates the number of allocated HF data registered exceeding 1000.

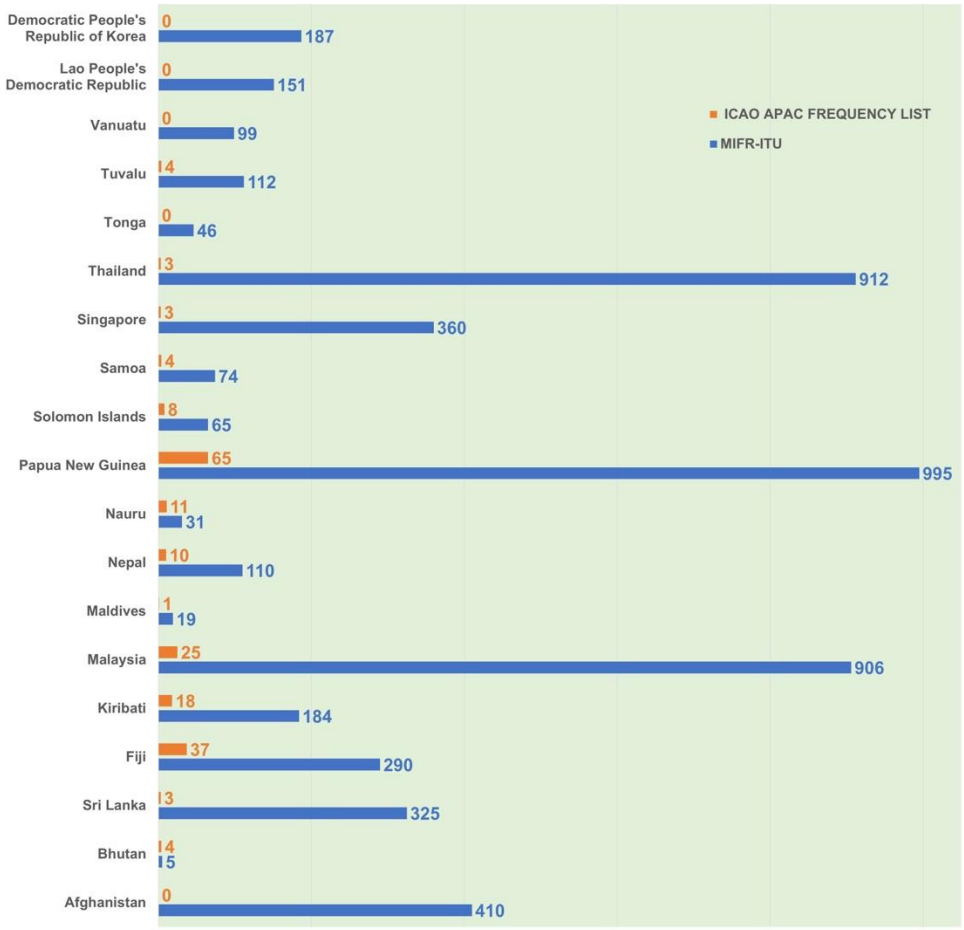


***Figure 6** HF registered in APAC States below 1000*

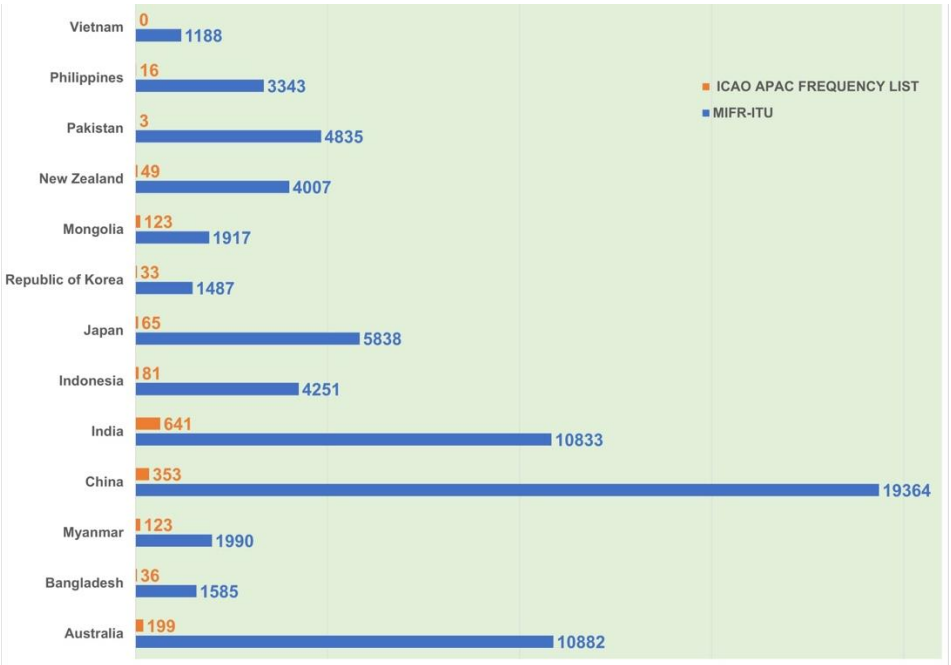


***Figure 7** HF registered in APAC States above 1000*

2.22. It should be noted that significant discrepancies in data may arise since the information obtained from ITU MIFR is solely based on the class of station, whereas obtaining more accurate data requires additional effort to examine detailed information on each registered allocation.

HF frequency on WRC-23

2.23. The WRC-23 in Dubai has adopted Resolution 429 (WRC-19) as an outcome of Agenda Item 1.9, which pertains to the Consideration of regulatory provisions for updating Appendix 27 of the Radio Regulations in support of aeronautical HF modernization. This resolution entails amendments to Appendix 27 aimed at introducing the use of wideband communication without changing the Plan of individual channels. Changes also encompass modifications to the classes of emission and the specifications regarding permissible power usage.

2.24. The alterations to the ITU Radio Regulation Appendix 27 will also result in adaptations to the Standard and Recommended Practices delineated in ICAO Annex 10 Vol. III, Part HF Data Link and HF Voice.

2.25. Additionally, the WRC-23 also agreed upon the Next Agenda for WRC-27 concerning the consideration of appropriate regulatory actions to Appendix 26 in support of aeronautical mobile (off-road) high-frequency modernization.

Summary

2.26. Based on the review of relevant documents and existing conditions of HF utilization in Asia Pacific region, it has been found that discrepancies persist between what is stipulated in the ITU Radio Regulations (RR) and the operational conditions, both in terms of allocation Plans and the registered HF data.

2.27. Reviewing the discussion on HF Frequency Planning Criteria and HF frequency allotment in the ICAO Asia-Pacific region above, modifications are noted in both allotment areas and frequency allocations. An example of this is as follows:

ITU RR Appendix 27

SEA	3 470	3 485	5 649	5 655
	6 556	8 942	10 066	11 396
	13 309	13 318	17 907	

ICAO ANP Vol. II

SEA-1A	3 491	6 556	10 066	
SEA-1B	3 470	5 670	11 285	13 318
	17 907			
SEA-2	3 485	5 649	5 655	8 942
	11 297	11 396	13 306	17 907
SEA-3	3 470	6 556	11 396	13 318
	17 907			

It has been noted that the frequencies 3 491, 5 670, 11 285, 11 297, and 13 306, as per the allotment based on ANP Doc., are not included in the SEA area in ITU Radio Regulation Appendix 27. The discrepancy in frequency allocation may occur due to special agreements that have been agreed upon in accordance with ref. **27/**17 of ITU Radio Regulation Appendix 27, or for other reasons.

2.28. When it specifically pertains to HF frequency channel allocation, another issue arises when it is found that certain frequency allocations experience congestion. Therefore, it is considered that not only is the assurance of utilizing the appropriate allocations based on suitable allotment areas highly necessary, but also the clarity of the endorsement process to meet its demand is crucial.

2.29. To address the aforementioned issues, it is recognized that there is a necessity to encourage all States or administrations to maintain precise and current information in the ITU Master International Frequency Register (MIFR). This step is the first and essential measure to prevent additional frequency assignments from being limited by outdated allocations that are no longer in use.

2.30. In parallel with that, the promulgation of the ICAO HF frequency List is necessary to facilitate the regulatory compliances.

2.31. Additionally, the maintenance of accurate data and information is fundamental for facilitating improved decision-making regarding future issues. Moreover, it encourages enhanced efficiency in current operational endeavours.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) Note and review the information contained in this paper;

b) Encourage States/Administrations to ensure that their HF data is accurate, both in the ITU Master International Frequency Register (MIFR) and related ICAO documents/databases;

c) Review and endorse the Survey Questionnaire provided in **Attachment A**; and

d) discuss any relevant matter as appropriate.

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GLOSSARY

ADS-C	: Automatic Dependent Surveillance - Contract
APAC ANP	: Asia and Pacific Regions Air Navigation Plan
AOC	: Aeronautical Operational Control
CPDLC	: Controller – Pilot Data Link Communication
HFDL	: High Frequency Data Link
ITU	: International Telecommunication Union
ICAO	: International Civil Aviation Organization
MIFR	: Master International Frequency Register
MWARA	: Major World Air Route Area
CEP	: Central East Pacific
CWP	: Central West Pacific
EA	: East Asia
INO	: Indian Ocean
SEA	: South East Asia
SP	: South Pacific
NCA	: North Central Asia
NP	: North Pacific
MID	: Middle East
RDARA	: Regional and Domestic Air Route Area
VSEA	: VOLMET South East Asia
VMID	: VOLMET Middle East
VPAC	: VOLMET Pacific
VNCA	: VOLMET North Central Asia
WRC	: World Radiocommunication Conferences

Survey Questionnaire

The Utilization of HF Spectrum Frequency bands to the Operation of Aeronautical Communications in the APAC Region

Please proceed to answer following questions until you reach to "End of Questionnaire"

1. Does your State/Administration implement the HF frequency bands between 2 850 kHz and 22 000 kHz for aeronautical communication purposes?
   ☐ YES
   ☐ NO (Proceed to Question No. 16)

2. How much Power is transmitted for HF communication (e.g. A/G, Broadcast) in its current operational mode?
   _____
   _____
   _____

3. Does your State/Administration refer to Table CNS II-4 HF Network Designators in the APAC ANP Vol. II, Part III (CNS), in order to assign the HF frequency?
   ☐ YES
   ☐ NO

4. Are there any other users currently assigning the HF frequency band aside from the Air Navigation Service Provider (e.g., Airline operator)?
   ☐ YES
   ☐ NO (Proceed to Question No. 8)

5. In relation to the above, what kinds of services that utilize the HF frequency (e.g., Long-distance operational control (LDOC))?
   _____
   _____
   _____

6. Referring to Question No. 5, what channels do you use for this HF frequency assignment?
   _____
   _____
   _____

7. Referring to Question No. 5, how much power is transmitted to each service?
   _____
   _____
   _____

8. Does your State/Administration refer to the Appendix 27 - Radio Regulations of the Frequency Allotment Plan for the Aeronautical Mobile (R) Service and related information, in order to assign the HF frequency?
   ☐ YES
   ☐ NO

9. Does your State/Administration refer to the Appendix 26 - Radio Regulation of the Provisions and associated Frequency Allotment Plan for the aeronautical mobile (OR) service in the bands allocated exclusively to that service between 3 025 kHz and 18 030 kHz, in order to assign to the specific services?
   ☐ YES
   ☐ NO (Proceed to Question No. 12)

10. In relation to the above, what kinds of services utilize the frequency band 3 025 kHz and 18 030 kHz?

    _____

    _____

    _____

11. Does your State/Administration register the HF frequency allocated to The Master International Frequency Register (MIFR) of ITU?
    ☐ YES
    ☐ NO

12. In accordance with Resolution A41-7 adopted by the Assembly - 41st Session, the Assembly urges Member States, international organizations, and other civil aviation stakeholders to support firmly the ICAO frequency spectrum strategy and the ICAO position at WRCs and in regional and other international activities conducted in preparation for WRCs. In relation to that, is your state or administration actively involved in the discussion of Agenda Items at WRC-23?
    ☐ YES
    ☐ NO

13. As per the aforementioned agenda to the WRC-23, do you comprehend Agenda Item 1.9 of the WRC-23?
    ☐ YES
    ☐ NO

14. Related to the previous Question, do you foresee any issues with regard to Agenda Item 1.9, considering the existence of the HF frequency allotted?
    ☐ YES - Please provide details: _____

    _____

    ☐ NO

15. As pointed out by the ICAO APAC Secretariat during the SRWG/7 meeting, there's Frequency List No. 4 that was discussed in 1999 and then revisited in 2007. According to that, is it necessary for ICAO APAC to update the database of Frequency List No. 4?
    ☐ YES
    ☐ NO

16. Are there any other issues pertinent to your situation that ICAO should consider regarding the HF frequency band?

_____

_____

_____

-End of Questionnaire-